UNCLASSIFIED

AD NUMBER
AD852104
LIMITATION CHANGES
TO: **Approved for public release; distribution is unlimited.**
FROM: **Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; MAY 1969. Other requests shall be referred to AFHRL, Attn: HRTT, Wright-Patterson AFB, OH 45433. This document contains export-controlled technical data.**
AUTHORITY
AEHRL ltr dtd 3 Dec 1971

THIS PAGE IS UNCLASSIFIED

AD 852 104

PROJECT PIMO FINAL REPORT

PIMO TECHNICAL DATA FORMAT SPECIFICATIONS

PREPARED BY:

R.Grieme

David Cleveland

G.P.Chubb

et al

SERENDIPITY, INC.

This document is subject to export controls and each transmittal to Foreign Government or Foreign National may be made only with prior approval of Wright-Patterson AFB, AFHRL (HRTT).

FOREWORD

This report (Volume I through Volume VIII) represents the final phase of a study and test which was initiated in September 1964 to explore newly developed techniques and devices for presenting T. O. (Technical Order) type instructions and information. The eight volumes of data contain the result of a test conducted in an operational environment using concepts developed during an earlier phase under Contract AF 04(694)-729 and documented in BSD-TR-65-456. Both the early phase and final phases which were accomplished under Contract AF 04(694)-984, Project 1316, "Presentation of Information for Maintenance and Operation (PIMO)", were started in June 1966 and completed in April 1969. This final report was submitted in May 1969.

The original program documentation was prepared by Mr. C. L. Schaffer, SMTE, in 1964. He subsequently functioned as the Air Force Program Director and Chairman of a Working Group which monitored all development throughout the life of the project. This Group was composed of individuals from various Air Force commands (AFLC, MAC, ATC, ADC, AFSC) and the Army Command (AMCPM, AXMLE) knowledgeable in the various maintenance disciplines and all facets of the T. O. system. Capt. Don Tetemeyer, the Project Scientist during the formulative stages of the Program was largely responsible for the basic test structure. Mr. John Saunders was the monitor for all contractual aspects until his reassignment in 1968.

Any success one may attribute to the project must be shared by numerous individuals; however, major credit and appreciation are due General Howell M. Estes, Jr., Commander of the Military Airlift Command, who provided the C-141A aircraft and the bases at Charleston, Dover and Norton for the operational test. Sharing in the credit for the MAC contributions are Lt. Col. Don Watt and his staff at Hq. MAC, and Col. Foreman, Col. Henzi, W/O Van Riper and all the personnel at Charleston Air Force Base and also at Dover and Norton who participated in the test. The hardships imposed on their organizations are recognized, and we sincerely appreciate the special efforts put forth to overcome all obstacles. The test could never have been conducted without the cooperation and competent performance of these many individuals.

We are especially indebted to the Air Force Human Resources Laboratory, Wright-Patterson Air Force Base for their financial contributions at a critical point in the project; and also to the Army Materiel Command, who believed the test potential of sufficient magnitude to warrant the expenditure of their funds. We are most grateful for their confidence and assistance. It is most assuredly the primary factor that permitted completion of the test.

This technical report has been reviewed and is approved.

D A Cook

D. A. Cook, Lt. Col. USAF
Hq. AFSC (SCS-2)

ABSTRACT

This report describes the latest phase in the program to develop and evaluate PIMO (Presentation of Information for Maintenance and Operation); a job guide concept applied to maintenance. Between August 1968 and April 1969, a test was conducted at Charleston AFB, South Carolina, to determine the effectiveness of PIMO. Three immediate behavioral effects were expected: 1) reduction in maintenance time, 2) reduction in maintenance errors, and 3) allow usage of inexperienced technicians with no significant penalty. Experienced and inexperienced Air Force technicians performed maintenance on C-141A aircraft using PIMO Job Guides presented in audio-visual and booklet modes. Performance was measured in terms of time to perform and procedural errors. The performance was compared with the performance on the same jobs by a control group, i.e., experienced technicians performing in the normal manner. The following conclusions were drawn from the test results: 1) after initial learning trials, both experienced and inexperienced technicians using PIMO can perform error-free maintenance within the same time as experienced technicians performing in the normal manner, 2) inexperienced technicians perform as well as experienced technicians when both use PIMO, 3) there is no significant difference between audio-visual and booklet modes, 4) the users revealed an overwhelmingly positive reaction to PIMO, and 5) the performance improvements provide the capabilities to significantly improve system performance defined in terms of departure reliability, time-in-maintenance, and operational readiness. This report also presents a description of the recommended operational system, specifications and guidelines for PIMO format development, including troubleshooting.

LIST OF ILLUSTRATIONS

FIGURE NO.		Page
3.1	Title Page and Cover	25
3.2	List of Effective Pages	26
3.3	Table of Contents	27
3.4	Input Conditions	28
3.5	Preparation Procedures	29
3.6	Location Information	30
3.7	Activity Parts	31
3.8	End of Activity Notation	32

TABLE OF CONTENTS

		Page
1.	SCOPE	1
2.	APPLICABLE DOCUMENTS	2
3.	REQUIREMENTS	3
3.1	Definitions	3
3.2	Data Base	3
3.3	Front Matter	4
3.4	Introduction	4
3.5	Divided Publications	4
3.6	Job Guide Additions	5
3.7	Basic Characteristics of Text	5
3.8	Writing Style	10
3.9	Arrangement and Titles	14
3.10	Special Arrangement for Multi-Man Activities	14
3.11	Special Arrangements for Repeated Tasks, Sequences, Combined Activities, and Special Instructions	17
3.12	Notes, Cautions, and Warnings	21
3.13	Numbering	21
3.14	Preparation of Reproducible Copy	22
3.15	Covers and Binders	23
3.16	Photolith Negatives/Photo Direct	23
	APPENDIX	A-1

PIMO FORMAT SPECIFICATION

1. SCOPE

1.1 This specification provides the requirements for modification of MIL-M-38730 (USAF) and MIL-M-4410E (USAF) for:

(a) Definitions of maintenance information;

(b) Data base;

(c) Front matter;

(d) Introduction;

(e) Divided publication;

(f) Job guide additions;

(g) Basic characteristics of text;

(h) Level of detail;

(i) Presentation format;

(j) Writing style;

(k) Arrangement and titles;

(l) Special arrangement for multi-man activities;

(m) Notes, Cautions, and Warnings;

(n) Numbering;

(o) Preparation of reproducible copy;

(p) Covers and binders; and

(q) Photolith negatives/photo direct.

These modifications specifically define the changes to implement the PIMO Job Guides. The modifications apply specifically to the Checkout (operational or unit level), Remove, Install, and Adjust maintenance functions. Modifications in this specification do not apply to troubleshooting. Requirements for troubleshooting information are covered in Volume V. These requirements

also apply to changes and revisions.

1.2 Where the requirements specified in the referenced documents conflict with the requirements cited herein, the requirements of this specification shall apply when the PIMO Job Guides have been specified for the system of concern.

The specifications apply to the following type of documents:

(a) Organizational maintenance instructions (job guides);

(b) Index volume;

(c) Maintenance support information volume.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of Invitation for Bids or Requests for Proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS: –

MILITARY

MIL-M-38730	–	Manuals, Technical: General requirements for preparation of
MIL-M-4410E	–	Manuals, Technical: Title page and list of effective pages; certificate of destruction page; transmittal notice; reproduction assembly sheet; photolithographic negatives; printing; and binders.

STANDARDS

MIL-STD-12	–	Abbreviations for use on drawings and in technical-type publications.

MIL-STD-17 — Mechanical Symbols.

PUBLICATIONS

Technical Order — 00-5-1 Air Force Technical Order System.

3. REQUIREMENTS

3.1 DEFINITIONS

3.1.1 Maintenance Function. A generic group of maintenance actions performed to assure that the system, or portion thereof, is in an operational or operationally ready state, or to return the system, or a portion thereof, to an operational or operationally ready state after it malfunctions.

3.1.2 Maintenance Activity. A maintenance function applied to a specific equipment item, group, or system.

3.1.3 Maintenance Task. A group of related steps, generally consisting of at most three steps, unless a fourth step closes the task. A task is the basic unit of presentation in the PIMO format. In certain cases, a task may be equivalent to a step.

3.1.4 Maintenance Step. A single maintenance action, e.g., setting a power switch to the OFF position. Generally, a step is comprised of one action but in certain cases it may be comprised of a series of identical actions, such as removing seven bolts.

3.2 DATA BASE

Before any procedures are prepared, a data base shall be established and the activities which must be covered shall be clearly defined. This data base will be defined in terms of a matrix which will have on one axis all end items and subsystems comprising the system of concern, and on the other axis the maintenance functions. Criteria for inclusion or exclusion of activities shall be established commensurate with the knowledge and skill of the intended users of the Job Guides. Specific contractual requirements will dictate whether the preparing agency will review and approve the data base.

3.3 FRONT MATTER

3.3.1 Title Page, Cover, and List of Effective Pages. The title page and list of effective pages shall be arranged in accordance with MIL-M-4410E and shall be oriented in a horizontal format. The cover shall contain the same information as the title page, with only the date excluded. See Figures 3.1 and 3.2.

3.3.2 Table of Contents. A table of contents shall be included in each volume. Each job guide manual for organizational maintenance shall index the various activities within the particular volume or book. Maintenance support information books shall index the various figures and tables located within the book. A matrix format shall be used. Equipment title will be arranged by system and indentured by equipment items within the system in alphabetical order. Maintenance function titles will be used as column headings. The section number shall be shown for each function applicable to the equipment system or item. See Figure 3.3.

3.4 INTRODUCTION

A time compliance technical order (TCTO) list shall appear in the introductory section of each job guide volume. Additional introductions will not be necessary. One exception is the introduction for a classified manual, in which case the directive of MIL-M-38730 shall be followed.

3.5 DIVIDED PUBLICATIONS

The index volume and maintenance support information shall be separate books. The job guides for organizational maintenance shall be organized into a series of volumes or books. The criteria for division of the total data into separate volumes shall be the equipment systems or subsystems. The usability criterion shall be used to determine whether a system will be contained in two or more volumes. Each volume shall be packaged as a separate book. No volume shall contain more than 250 pages.

3.6 JOB GUIDE ADDITIONS

3.6.1 Maintenance Support Information. All required graphs, charts, and statistical data which cannot be presented on one page or which interfere with the pictorial presentation shall be gathered into one manual. This manual shall be designed to complement organizational maintenance job guides. This manual shall have a table of contents, which need not be organized alphabetically but must allow ready location of specific pages. In most cases, reference to specific data in this manual will be contained in the job guides.

3.6.2 Index Volume. The index volume shall be organized in two ways. The first index to be displayed in the index volume shall be organized by aircraft systems. The second shall be the alphabetical order of equipment end item nomenclature. Each item in the index volume shall refer to specific job guide volumes.

3.6.3 Appendices. Appendices shall not appear in job guide volumes. When deemed necessary, appendices shall be included at the end of the last volume of maintenance support information. References may be made to the appendices from the job guides.

3.7 BASIC CHARACTERISTICS OF TEXT

3.7.1 Content

3.7.1.1 Maintenance Activities. Job guide information (maintenance instructions) shall be provided for performing the following functions: Remove, Install, Operational Checkout, Adjust.

3.7.1.1.1 Remove. All hardware items which are to be removed shall be specified by number and nomenclature. Instructions shall be included for matching, marking, or labeling for installation of any component(s) which could be installed incorrectly. This shall be done also for any cables, hoses, or lines which are disconnected during removal of an item. Special hardware items (non-standard fasteners, brackets, or fittings slightly different from others in the same assembly) shall be specified by part number or other

identifying characteristic (longer, thicker, plastic, etc.). This number or characteristic shall also appear as a callout on the illustration. Instructions shall be included to retain items for installation and to record position of items removed, e.g., number of shims at each attaching point.

3.7.1.1.2 Install. All hardware items which are to be installed shall be specified by number and nomenclature. Instructions shall refer to any items which were retained during removal and to any record of item position. No item need be installed which must be immediately removed in a required subsequent activity.

3.7.1.1.3 Operational Checkout. Activities shall include location data for all functional end items encompassed in the check. All primary equipment and test set turn-on and warm-up procedures shall be included. If obvious, immediate and simple corrective actions are indicated by certain no-go conditions, those corrective actions shall be included in the procedures. If a no-go condition in an operational checkout can be corrected by an adjustment procedure requiring less than ten pages, such a procedure may be incorporated in the operational checkout as a subset of the checkout.

3.7.1.1.4 Adjust. Go/no-go checks shall be provided to enable the user to determine whether the unit of concern is within tolerance and what adjustment is required to bring the unit into tolerance. Instructions shall be provided as required to adjust a string of interconnected units within tolerance such that the total system is fully operational.

3.7.1.1.5 Preparatory Procedures. The information for individual maintenance activities will include those subsets of activities required to prepare the equipment for the activity of concern. These subsets include energizing or de-energizing systems, and gaining access to equipment items of concern.

3.7.1.2. Information Types. The information provided for each activity and task shall be sufficiently complete to allow an inexperienced technician with just a general knowledge of aircraft and standard tools to conduct the necessary maintenance. The types of information which shall be covered include the following: a) preparatory information -- that information required

to allow the technician to prepare for the activity; b) instructions -- detailed information on how to accomplish a given task, and the order in which tasks are to be accomplished; c) tolerance -- information on how the equipment must respond, either in numerical or qualitative terms; d) location -- information on the specific location of the equipment item upon which the action is to be taken; e) context -- the relationship of the equipment item of concern to its surroundings.

3.7.2 Level of Detail. Task is the basic unit of presentation in that it is that set of information which the user will read immediately before performing. A task is comprised of generally no more than three steps, which is the lowest unit of instructional information. There may be cases when four steps are included in a task if the fourth step closes out a series of related actions. No task can leave the user in an awkward or dangerous situation. See Figure 3.7.

3.7.3 Presentation Format

3.7.3.1 Input Conditions Page. All the information required to prepare for an activity shall be contained in the input conditions page. This will be the first page of an activity. See Figure 3.4. The following items shall be included in the input conditions page.

3.7.3.1.1 Activity Title. Activity titles shall specify the type of maintenance to be performed (Remove, Install, Operational Checkout, or Adjust) and the end item (component or subsystem) that is to receive the maintenance.

3.7.3.1.2 Applicability. Applicability of the instructions to vary the equipment configurations shall be stated in accordance with MIL-M-38730. If the instructions apply to all configurations, the word "all" shall be entered.

3.7.3.1.3 Supplies. Expendable items and support materials of no particular stock number or grade shall be listed. Sealants, lubricants, replacement lamps, "maintenance in progress" labels, etc. are considered expendable items. When the item can be identified by a federal stock number, the number must be given. The quantity of each expendable item required to complete the activity shall be given.

3.7.3.1.4 Personnel Required. The minimum of personnel required to effectively perform the maintenance activity shall be specified. Action requirements shall be summarized for each technician including location(s) and duties at the beginning of the activity. "Specialists" (i.e., personnel competent in certain procedures, such as connecting hydraulic pressure to aircraft) required during the activity will be noted but separately listed.

3.7.3.1.5 Special Tools and Test Equipment. Non-expendable equipment that is not included in technicians' tool kits shall be listed, including the quantity required. Common name, specific name and part number shall be noted. Those activities which require the maintenance support information manuals shall list the volume required.

3.7.3.1.6 Equipment Condition. Certain activities are dependent upon the aircraft being in a given condition (e.g., aircraft must be on hydraulic jacks before removing the shock strut). These required conditions shall be stated. Any information pertinent to safety shall also be included and presented as a Caution or Warning. When the required conditions can be obtained by performing other organizational maintenance instructions, those activities shall be indicated as prerequisites.

3.7.3.1.7 Illustrated Parts Breakdown. When the organizational maintenance instructions pertain to the Remove and/or Install of a given end item, the applicable figure in the Illustrated Parts Breakdown shall be given. The reference shall include the technical order number and volume, figure number and title.

3.7.3.1.8 General Information. Any Notes, Cautions, Warnings which pertain to the entire activity shall be provided (e.g., Note -- local attitude must be known; Warning -- advise tower that test signals will be transmitted on a specified frequency).

3.7.3.2 Instructions Page

3.7.3.2.1 An instructions page shall consist of two facing pages (when using the small booklet form) with the instructions on the left and the associated

pictorials on the right. Each page will have the following information: a) volume number; b) page number; c) subtitle (optional), the same format for activity title shall be used for subtitles; d) pictorial; e) Note/Caution/Warning; f) instructions (including branching instructions). See Figure 3.6.

3.7.3.2.2 Pictorials. Pictorials shall be placed on the right side of the page (or page facing the narrative instructions) and shall convey contextual, location and tolerance information.

3.7.3.2.2.1 The pictorial shall be limited to only the equipment upon which the actions on the facing pages refer, plus sufficient surroundings to allow a technician to clearly define the equipment item of concern.

3.7.3.2.2.2 Callouts or identifiers on pictorials shall be limited to seven, with a leader line connecting the nomenclature to the correct point on the illustration. The callouts or identifiers shall be limited to only those used in the instructions on the facing page.

3.7.3.2.2.3 When an equipment item is first illustrated in an activity and its location has not yet been specified, a general locator illustration shall be used to identify the location of the equipment item of concern on the system.

3.7.3.2.2.4 Directional arrows shall be used to help the reader orient himself with respect to the illustration.

3.7.3.2.2.5 All numerical tolerances will be repeated on the illustration in list form in an area of the illustration which will not affect the readability of the identifiers or callouts.

3.7.3.3 Instructions.

3.7.3.3.1 No more than seven instructions shall be provided on one page. More than seven can be provided if additional space is provided between each group of seven tasks.

3.7.3.3.2 Instructions shall be placed on the left side of a page or the left facing page.

3.8 WRITING STYLE

3.8.1 Mood. The second person imperative shall be used for maintenance instructions. The third person indicative shall be used for description and discussion statements. The second person imperative mood is command language, telling the technician what to do, e.g., Set power switch to ON. Articles shall be excluded for brevity. The third person indicative mood shall be used primarily in Notes, Cautions and Warnings. An example is "Man A starts at flight station and goes to cargo compartment".

3.8.3 Sentence Structure. The elements of a sentence should be arranged generally in the following order: 1) subject, 2) verb, 3) object, 4) predicate object, 5) indirect object.

1. Subject -- implicit only, except when more than one technician is required.

2. Verb -- select from verb list that word (or phrase) which best describes the technician's behavior with respect to the object.

3. Object -- the specific equipment to which the technician's behavior is directed.

4. Predicate Object -- the term (or terms) which qualify the condition of the object (may not always be necessary).

5. Indirect Object -- the location of the object (not preferred over pictorials to give such information).

Example:

(1) -- (2) Do something to (3) X to (4) state or condition Y.
E. g., (2) Set (3) RUD COMP switch to (4) OFF.

Or

(1) -- (2) Do something to (3) X at (5) location X.
E g., (2) Lower (3) cargo door to (5) ground.

Or

(1) -- (2) Do something to (3) X (4) in state or condition Y at (5) location Z.
E.g., (2) Set (3) MASTER switch to (4) NORM position on (5) IFF control panel.

When a special tool is called out as part of a step, the step will be preceded by: (1) using (2) tool name (3) step statement.

E.g., (1) Using (2) snap-ringed pliers (3) pull bushing from hinge.

3.8.3 Verb List. A verb list, constructed specifically for each group of users, shall be a part of this specification. A verb list for the C-141A maintenance technicians is contained in the appendix for this volume. Verbs used in any instruction shall be selected from the list, always using the verb with the highest order of preference.

3.8.4 Nomenclature. Paragraph consistency in nomenclature shall be maintained in accordance with the requirements of MIL-M-38730, with the following modifications:

3.8.4.1 Consistency shall be maintained between nomenclature in text and in callouts on illustrations on the first occurrence of an equipment item. On subsequent occasions, if there is no other name with which it might be confused, it may be shortened. For example, the frequency track or test switch may be called the track or test switch, test switch or simply switch if no other switch has been mentioned already or is illustrated on the same frame.

3.8.4.2 Simple identifying nomenclature may be provided for attaching parts in both pictorial callouts and text, e.g., lower attach bolts.

3.8.4.3 Nomenclature corresponding to that appearing on the equipment in decals, engraved legends, nameplates, or other markings shall be repeated verbatim on the first occurrence.

3.8.4.4 All hardware items involved in a task shall be specifically mentioned. Terminology that conveys the purpose, function or nature of an item that is irrelevant to the task requirement shall not be used. For instance, the spoiler center wing input quadrant need not be called such in an instruction to insert

a rig pin. The presence of a pictorial showing the location of the unit enables the instruction to be written simply: "Insert rig pin in quadrant", or even just "Insert rig pin". Modifiers are required only when more than one item of the same object nomenclature is acted upon in the same task.

3.8.5 Capitalization. The following words and items shall be capitalized: Note, Caution, Warning, input conditions, title, component names, control and display titles as engraved on the equipment, and all callouts on the pictorials. Equipment names shall not be capitalized unless they are so engraved.

3.8.6 Numbers. When using numbers in texts, write them out if they are nine or less, except for quoting equipment markings, which should always be written as the technician sees them. If the numbers are ten or higher, they shall be written as numerals.

3.8.7 Tolerances.

3.8.7.1 When numerical tolerances are required, the step shall be treated as a task. The tolerances shall be written at the end of the step, e.g., torque mounting bolts to 40 pounds ± one pound. Most measurements of length should be written as fractions of an inch. Decimals would usually be appropriate if the technician uses a feeler gauge.

3.8.7.2 Verbal tolerances (usually called results) shall be treated as follows:

(a) The results shall be listed beneath the "do" statement;

(b) No more than two results shall be included per task unless the third logically closes out the task; if more than two, a new task shall be created.

(c) All results from a given action shall be placed on the same page.

3.8.8 Shorthand Notations. If the same equipment has been discussed on previous pages and cannot be confused with other equipment, the full equipment/component names should not be used each time. For example, if Doppler Memory Light and the Ground Speed Indicator Memory Lights are used on one page, or even the previous task and then must be used again, they can be called light or lights in the text unless it is important to distinguish between them.

3.8.9 Supplies, Special Tools and Test Equipment Callouts. Only the nomenclature shall be used in calling out supplies, special tools or test equipment in the text. Federal specifications, military specifications, or part numbers should not be included in the text.

3.8.10 Switches. The following conventions shall be adopted for writing instructions with switches. For switches which hold their position once they are set, write: Set (name) switch to (position).

For spring-loaded switches which do not hold their position, write, a) for a momentary setting: momentarily hold (name) switch to (position). b) for a longer action when a specific setting is required: place (name) switch to (position) and hold until (result).

3.8.11 References. References in the text shall be in accordance with MIL-M-38730 with the following modifications:

(a) Refer to government specifications and standards only in identifying special tools, supplies, spares, etc. References shall be placed in the Input Conditions page, and in case of multiple items of the same kind, also at the point in the procedure where the item is used.

(b) Refer to items as shown in the illustration only when necessary, e.g., position Bell Cranks as shown in illustration.

(c) Refer to illustrations or tables in the Maintenance Support Information Manual by number and title. Reference shall be

placed both in the Input Conditions page and at the point in the procedure where the data is needed.

(d) Refer to other tasks of the same activity by page number, or in the case of the immediately following task, by the phrase "next task".

(e) Refer to other activities by title in the form of a note, as required to assure efficient use of job guides in transferring from one activity to the next.

3.9 ARRANGEMENT AND TITLES

Each volume shall be comprised of as many sections as there are activities contained within the volume. There shall be no chapters. The Input Conditions page will be the first page of each activity. Procedures preparing for the activity of concern, when applicable, will follow the Input Conditions page. These pages shall be followed by the pages covering the procedures for the activity of concern. The title should appear only in the Input Conditions page. Identifiable segments of the procedure may be titled when such differentiation will help the user.

3.10 SPECIAL ARRANGEMENT FOR MULTI-MAN ACTIVITIES

Whenever the nature of the maintenance activity necessitates more than one technician, the procedures should be analyzed to determine how the technicians must interact. The arrangement of the instructions will differ depending upon the condition of interactions.

3.10.1 Procedures Using Assistants or Support from Specialists. A requirement for one or more assistants shall exist whenever:

(a) The activity requires cooperation, coordination, or other teamwork under the direction of a primary technician.

(b) The activity involves large or heavy items that would be

dangerous or difficult for one man to handle.

(c) Simple observations or actions must be taken, in conjunction with actions of the primary technician at some location out of his sight or reach.

Assistants may be employed when the procedure can be accomplished most effectively by their presence, if they perform a maximum of three independent tasks at the request and direction of the primary technician. Tasks for an assistant shall all be written exactly as those for the primary technician, except that they shall be introduced by the phrase, "request that assistant...." They shall be incorporated in the procedures in places appropriate for proper coordination and smooth flow. Locator information shall be provided as necessary for assistants.

The number of men required shall be identified in the Personnel Required section of the Input Conditions page. The role of each man shall be defined briefly and the assistant shall be so identified.

3.10.2 Multi-man Activities. When two or more technicians must perform more than three tasks, procedures shall be prepared separately for each man. Each procedure shall include all tasks required of the individual during the activity. All tasks shall be written as for a solitary technician. Only those tasks actually performed by the individual technician shall appear in his respective activity procedures.

3.10.2.1 Personnel Required. The number of men required for the activity and their location shall be indicated in the Input Conditions page. The technicians shall be designated as Man A, Man B, etc. The specific designation is arbitrary but once the designation is made it should be used consistently throughout the activity. Location information shall be provided in the Input Conditions page to allow the technicians to proceed to their respective stations at the beginning of the activity.

3.10.2.2 Special Tools. Special tools required for each man shall be specified in the Input Conditions page. If a standard tool is to be used, this should either be indicated or implied such that the technician can prepare for the task of concern.

3.10.2.3 Equipment Condition. Equipment condition applicable to each man shall be specified only when necessary. No attempt should be made to specify equipment condition to be encountered by each man separately unless doing so would provide useful preparatory information.

3.10.2.4 Starting Page. A special section of the Input Conditions page shall be provided specifying the starting page for each man.

3.10.2.5 Division of Procedures. Man A's tasks shall not be presented to Man B and vice versa, except in those cases needed to clarify coordination and communication.

3.10.2.6 Communication Procedures. The communication instruction shall pick up both men at that point in the activity where they must cooperate.

(a) Situation 1 -- when one man's task is not to be started until the second man completes a given task. A note shall be provided to the first man advising him not to start until a report is received from the second man. The second man shall be instructed to report when he completes the given task, and the instructions shall be incorporated in the task. A description of the nature of the report shall be specified for each report and each response, e.g., report when ready to observe pointer; do not start until Man A reports he is ready to observe pointer.

(b) Situation 2 -- when one man performs a given task and the second man checks the equipment response to the task. A note shall be provided to the first man not to start until the second man reports he is ready. A one sentence description of the equipment action controlled by the task shall be included. A note shall be provided to the second man indicating that the task is in response to an

action by the first man and to report when ready. Instructions shall be provided in each task description telling when to report.

(c) Situation 3 -- when the cooperative task may require repetition and instructions to repeat the task cannot be condensed. A short description of the equipment response shall be provided in a note preceding the task to the man checking the equipment response. If subsequent cooperative actions are different from those in the completed action, they should be treated the same as Situations 1 and 2. If subsequent cooperative actions are the same as those of the completed action, the ground rules for repeated tasks or sequences shall be used.

3.11 SPECIAL ARRANGEMENTS FOR REPEATED TASKS, SEQUENCES, COMBINED ACTIVITIES, AND SPECIAL INSTRUCTIONS.

3.11.1 Repeated Tasks. Repeated tasks will generally involve a maximum of four steps. The special treatment for repeated tasks specified in this section can be used when the following conditions are met:

(a) The task in no way involves danger to the technician or the equipment.

(b) The sequence of steps within the task is always the same.

(c) The task is repeated at least once.

(d) The task is not longer than four steps.

(e) Not more than seven steps intervene between the first and the subsequent presentation of the task (Note: each task can contain as many as three steps).

(f) No numerical reference is involved.

NOTE

The basic approach for repeated tasks is different from the job guide in that the intent is to "train" the technicians to perform the task the first time the

task occurs and thereafter just to refer to the task. This requires a descriptive title for the task which can be repeated and makes sense to the technician, e.g., take station bearing, check Doppler lock-on, etc. The approach also requires presentation of information in such a way as to facilitate retention. The information must not overburden the experienced technician who does not need the training information.

3.11.1.1 Approach. Select a descriptive title for the task. Provide a brief description (25 words or less) of what the technician is supposed to do and how the equipment responds, in the form of a note preceding the task.

The format is basically the same as used in presenting tasks. The difference is that the note should be presented in descriptive form. The training note should be used generally when a task requires a certain degree of psychomotor proficiency which is difficult to divide into procedural steps. For example:

(a) Aligning something which is motor-driven and the rate is independent of the control. This frequently requires a series of very small movements and close observation of the display.

(b) Working on tasks requiring close coordination, especially when the equipment response is rapid.

(c) Any alignment requiring setting of multiple controls or dials.

Example:

NOTE

Doppler lock-on is indicated when the PRESS TO TEST on the indicator goes out after a ground speed is selected on the simulator.

1. Set simulator GROUND SPEED selector to 200 knots. Check that lock-on occurs within 30 seconds.

2. Check for lock-on within 30 seconds at each of four other ground speeds: 240 knots, 280 knots, 320 knots, 400 knots.

3.11.2 Repeated Sequences. Repeated sequences are those cases when a group of tasks is repeated within an activity. Repeated sequences occur primarily during Operational Checkout, although they may also appear in Adjust. The primary reason for such repeats is that many systems are redundant and all redundancies need to be checked out.

The following conditions must be met before the repeated sequence approach can be used:

(a) Two or more tasks are repeated in sequence.

(b) If reference information is used, the same reference holds true for each repeat.

(c) The tasks are identical except a different control or display within the set is used, e.g., one of the ADF indicator sets of controls.

3.11.2.1 Approach. An explanatory page shall be presented at the beginning of the sequence which shows the controls and displays to be used, the set within which an individual control or display exists, the nomenclature used to refer to a set, and the location of the sets. The task shall be written as a Standard Operating Procedure, i.e., the instructions shall not be specific to any single use. Thus, specific controls and displays should not be identified; only the set should be identified, e.g., compass rather than pilot's or co-pilot's compass; ADF indicator rather than ADF-1 indicator.

A "go to" task shall be provided at the completion of the sequence. The "go to" task should provide instructions on the conditions under which the sequence should be repeated and the next page to go to if the necessary repeats are completed.

3.11.3 Combined Activities. Combined activities consist of two or more functions and/or items sharing a common Input Conditions page and shall be

handled as a single package. The most usual case is the combination of Remove and Install functions for a given end item.

3.11.3.1 Order of Presentation. In combining activities, the major break shall be between men for multi-man activities. The secondary break shall be by function, and the third order break shall be between end items. The following input conditions locator indicates this hierarchy.

NOTE

Man A: Remove nose cowl starts on page 3.
Remove seals starts on page 4.
Install seals starts on page 5.
Install nose cowls starts on page 6.

Man B: Remove nose cowl starts on page 7.
Remove seals starts on page 8.
Install seals starts on page 9.
Install nose cowl starts on page 10.

The activities shall be presented for each man in the order in which they would normally be accomplished.

3.11.2 Page Divisions. In combined activities, the start of a new activity shall require the start of a new page. In sequences where removal or installation procedures are presented for more than one end item, it is not necessary to start a new page with each new end item, e.g., remove seals and support fittings. This is especially true if the parts are interconnected so that they cannot be removed or installed separately, or if the procedures are so short that the complete procedure for two or more end items can be presented on a single page.

3.11.3.3 Activities Titles. The Input Conditions and special set-up pages (i.e., electrical and hydraulic shutoff) shall carry the full title of the package, encompassing all of the activities within a package; e.g., remove and install nose cowl and seals.

3.11.3.4 Activity Endings. The phrase "end of activity" shall appear at the end of each activity for each man's pages within a combined package. See Figure 3.8. Within a function group (e.g., Removes), the phrase shall not appear between end items. Instead, a branching note shall handle the contingency.

3.11.4. Special Instructions. Routine procedures which must be performed more than once in an activity shall be presented as special instructions. Reference to the start of the appropriate special instruction shall be a standardized note, followed by a task directing accomplishment of the required procedure, at each point within the activity at which the procedure must be performed. Example: A special instruction may be provided for installing safety wire for every type of turn buckle installation. At each point where the procedure must be performed, a note "special instruction for safetying turn buckles is found on page___" and a single step task "safety wire turn buckle." shall be provided.

3.12 NOTES, CAUTIONS, AND WARNINGS

Notes, Cautions, and Warnings shall be provided in accordance with MIL-M-38730.

3.13 NUMBERING

3.13.1 Volumes. Each volume shall be assigned a volume number, with the first volume starting with 1. When systems are divided into volumes, the numbers of the volumes shall be in consecutive order.

3.13.2 Pages. Pages shall be numbered consecutively only within an activity, i.e., a section. Each activity shall be assigned a number in accordance with the location of that activity in relation to the other activities in the volume.

An individual page shall have the activity number followed by the page number within that activity. Thus, the input conditions page for the first activity in the volume will be 1-1. The second page for that activity will be 1-2, the

third page will be 1-3, etc. The input conditions page for the second activity will be 2-1.

3.13.3 Tasks. The tasks shall be numbered only in accordance with their arrangement on a given page. Thus, the tasks on each page shall be numbered separately.

3.14 PREPARATION OF REPRODUCIBLE COPY

Unless otherwise specified, the final copy shall be prepared from an oversized reproducible copy. The reduction shall be no less than 25%. The type size specified in this section will be for the original reproducible copy which will be reduced by no more than 25%.

3.14.1 Title Pages. Specific title information shall be furnished by the procuring activity. The requirements of MIL-M-38730 shall apply except that the title page will be the reduced size of 5 inches by 6-1/2 inches. See Figure 3.1 for format.

3.14.2 List of Effective Pages. This listing shall contain a complete list of all pages in accordance with MIL-M-38730 and MIL-M-4410E except it will be on the booklet size pages, i.e., 5 inches by 6-1/2 inches. See Figure 3.2 for format.

3.14.3 Table of Contents. The table of contents shall be presented in a matrix form with equipment items arranged by systems serving as rows and maintenance functions serving as columns. The column headings identifying the maintenance functions will be typed in 12 point Mid-Century type style using a proportional spacing typewriter. The rows shall be typed in 12 point Gothic Face type style using a proportional spacing typewriter. The entries in the cells shall be the number assigned to the activity, which shall be in the order of arrangement within the book. See Figure 3.3 for format.

3.14.4 Input Conditions. The titles for input conditions will be in 12 or 14 Gothic Face using a proportional spacing typewriter. The body of the input conditions will be typed in 12 point Gothic Face. Page numbers shall be placed on the lower left corner and volume number on the lower right corner

of the left side page. The order will be reversed for the right side page, i.e., page number on the lower right corner and the volume number on the lower left corner. See Figure 3.4 for format.

3.14.5 Instruction Pages. The instruction pages will be typed in 12 point Roman (IBM Documentary or equivalent). Each paragraph shall be numbered. A paragraph shall be comprised of no more than four sentences, generally three. Each sentence will be a step. A paragraph is equivalent to a task. See Figures 3.5, 3.6, 3.7, and 3.8 for format.

3.14.6 Illustrations. There shall be an illustration for each page of narrative instructions and on the facing page. Identifiers on illustrations will be in 14 point Gothic Face using proportional spacing typewriter. Line width shall hold true upon 25% reduction. Page numbers shall be placed in the lower right corner and volume numbers shall be placed in the lower left corner. See Figure 3.6 for format.

3.14.7 Index Volume Pages. The index volume shall be typed with the same type style as the instruction pages. Reference shall be made only to volumes.

3.15 COVERS AND BINDERS

Covers and binders shall be as outlined in MIL-M-4410E for pocket-sized manuals with the exception of size. The covers shall be approximately 5 inches by 6-1/2 inches.

3.15.1 Binders. Two-piece combs with sliding back or metal ring binders should be used. Only the volume number shall be imprinted on the binder, using silk screen techniques.

3.15.3 Cover Copy. Information for copy shall be furnished by the procuring agency. See Figure 3.1 for format.

3.16 PHOTOLITH NEGATIVES/PHOTO DIRECT

The requirements of MIL-M-38730 are applicable except as specified herein.

3.16.1 Photo Direct. For reasons of economy on limited distribution of printed matter, the photo direct process of offset plate making may be used. Authority for use of this process shall be issued by the procuring agency. It is recommended that prior to photo direct plate making, one complete set of negatives be produced and stored for insurance purposes.

PIMO TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

USAF SERIES

C-141A

AIRCRAFT

VOLUME 23

CHANGE NOTICE

LATEST CHANGED PAGES SUPERSEDE THE SAME PAGES OF PREVIOUS DATE

Insert changed pages into basic publication. Destroy superseded pages.

1 January 1968

CHANGED 15 APRIL 1968

Figure 3.1 Title Page and Cover

INSERT LATEST CHANGED PAGES, DESTROY SUPERSEDED PAGES

LIST OF EFFECTIVE PAGES

PAGE NO.	ISSUE
*Title	15 April 1968
*A	15 April 1968
i	Original
*1-1 thru 1-21	15 April 1968
*1-22 thru 1-23 Added	15 April 1968
2-1 thru 2-6	Original
3-1 thru 3-3	Original
4-1 thru 4-5	Original
5-1 thru 5-9	Original
6-1 thru 6-15	Original
7-1 thru 7-17	Original
*8-1	15 April 1968
8-2	Original
*8-3	15 April 1968
8-4 thru 8-7	Original
*8-8	15 April 1968
*8-9	15 April 1968
*8-10 thru 8-11 Added	15 April 1968
9-1 thru 9-22	Original

*THE ASTERISK INDICATES PAGES CHANGED, ADDED, OR DELETED BY THE CURRENT CHANGE

A Changed 15 April 1968

Figure 3.2 List of Effective Pages

REMOVE AND INSTALL NOSE LANDING GEAR
AERODYNAMIC BAFFLE ASSEMBLY

INPUT CONDITIONS

Applicable Serial Nos.

All

Supplies

One circuit breaker label to indicate maintenance in progress.
Three labels to indicate maintenance in progress.
One maintenance in progress tag, No. 1492.

Personnel Required: Two

Primary technicion starts at flight station to deenergize hydraulic and electrical power. Moves to NLG wheel well.
Assistant at NLG wheel well supports baffle.

Equipment Condition

Nose landing gear must be extended.
Nose ground safety pin must be installed.

Applicable IPB

T.O. 1C-141A-4, Volume V, Figure 77, Nose Landing Gear Door Mechanism.

WARNING

Be sure that electrical power to system remains off until this activity is completed.

Be sure that they hydraulic system No. 2 remains depressurized until this activity is completed.

2-1 VOL. 23

Figure 3.4 Input Conditions

VOLUME 23	SECTION			
	OPERATIONAL CHECKOUT	REMOVE AND INSTALL	ADJUST	CALIBRATE
Nose Landing Gear Doors			1	
Aerodynamic Baffle Assembly		2		
Aft Door		3		
Forward Door		4 5*	5	
Nose Landing Gear Steering Systems				
Rudder Pedal Steering System	6		7	
Steering Wheel Steering System	8		9	

* Open & Close

Figure 3.3 Table of Contents

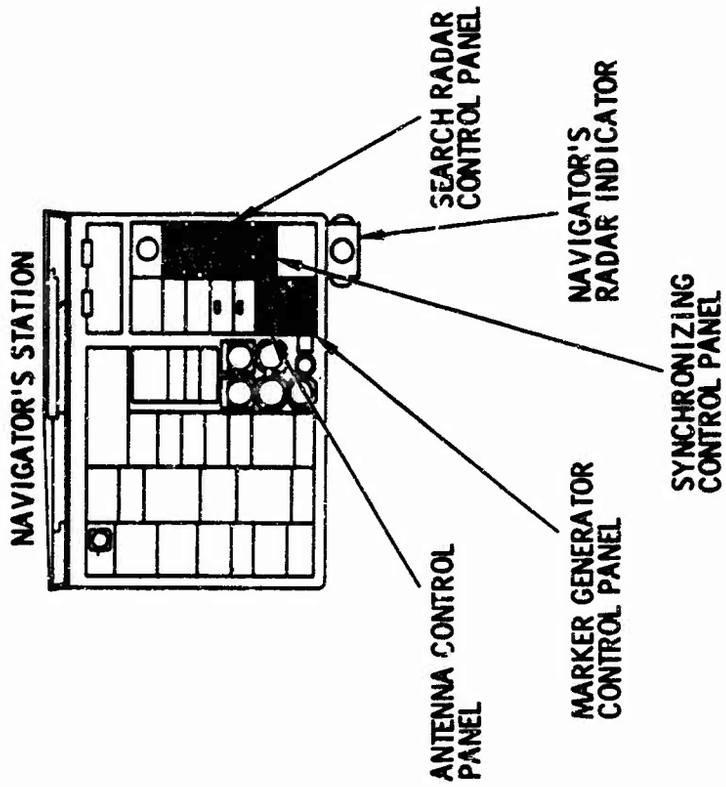
REMOVE AND INSTALL NOSE LANDING GEAR
AERODYNAMIC BAFFLE ASSEMBLY

Deenergize electrical power.

1. Open and label LANDING GEAR CONT circuit breaker.

2-3 VOL. 23

Figure 3.5 Preparation Procedures



1. Check that search radar control panel is installed.
2. Check that synchronizing control panel is installed.
3. Check that antenna control panel is installed.
4. Check that marker generator control panel is installed.
5. Check that navigator's radar indicator is installed.

VOL. 5

4-5

Figure 3.6 Location Information

STEP

1. Rotate HDG SEL control to 90 degrees. Check that flashing line appears at 270 degrees.

TASK

2. Rotate HDG SEL control to 180 degrees. Check that flashing line appears at 180 degrees.

3. Rotate HDG SEL control to 270 degrees. Check that flashing line appears at 90 degrees.

4. Rotate HDG SEL control to zero degrees. Check that flashing line appears at zero degrees.

5. Place PATT switch at PENCIL. Check that targets disappear for approximately 20 seconds and then reappear.

4-30 VOL. 5

Figure 3.7 Activity Parts

INSTALL NOSE LANDING GEAR UP-DOWNLOCK ACTUATOR

1. Remove plugs from ports. Screw elbows into actuator.

2. Place a new washer on each crank. Install actuator with piston rod end on crank attached to strut.

3. Install washers and screw on nuts. Torque nuts to 720 (± 60) inch-pounds.

4. Install cotter pin.

5. Screw on three hydraulic lines onto elbows, matching label on line with label on port.

6. Request that specialist bleed nose gear hydraulic system.

NOTE

The illustration contains a listing of the activities which must now be accomplished.

END OF ACTIVITY

8-5 VOL. 16

Figure 3.8 End of Activity Notation

APPENDIX

FORMATTING VERB LIST

In the following list, each verb is defined in terms of one or more meanings associated with aircraft maintenance. A simple sentence has been provided for each usage. A number entry in the preference rank column indicates the standing of that verb compared to others with the same or similar meaning (highest rank is 1). Any synonyms with which the verb was ranked are listed, in terms of their own ranking. If a synonym holds first rank, it is underlined. Where necessary, special notes are also included. Lower ranking verbs can be used when the first-ranked verb is particularly awkward or misleading in a given statement.

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Accomplish	To do, carry out or bring about; to reach an objective.	Accomplish a periodic inspection on the landing gear.	2	1. Perform 3. Effect	
Actuate	To put into mechanical motion or action; to move to action.	Actuate the handpump until the pressure gage indicates 3000 psi.	-		
Adapt	To make fit a new situation or use, often by modifying.	Use the bushing to adapt the fuse to the projectile.	-		
Add	To put more in.	Add water to the battery.	-		
Adjust	1. To bring to a specified position or state.	1. Adjust the micrometer to the given measurements	-		
	2. To bring to a more satisfactory state; to manipulate controls, levers, linkages, etc., to return equipment from an out-of-tolerance condition to an in-tolerance condition.	2. Adjust cable tension using the turnbuckles.			
Advise	To give information or notice to.	Advise man B that the brakes have been set.	4	1. Report to 2. Inform 3. Notify 5. Communicate to	
Advance	To move forward; to move ahead.	Advance the throttle.	-		
Agitate	To move with a jerky, quick or violent action.	Agitate the container so that the paint will be well mixed.	2	1. Shake	
Aid	To give help or support to; to assist	Aid man B to lift the load.	3	1. Assist 2. Help	
Alert	To warn; to call to a state of readiness or watchfulness; to notify (a person) of an impending action.	Alert personnel that area will be cleared.	-		
Align	To bring into line, to line up; to bring into precise adjustment, correct relative position or coincidence.	Align slot in turnbuckle barrel with slot in cable terminal.	-		
Allocate	To apportion for a specific purpose or to particular persons or things.	Allocate the various maintenance tasks to technicians.	3	1. Assign 2. Distribute	
Allow	1. To permit, to give opportunity to.	1. Allow the sediment to settle out.	1	2. Let	
	2. To allot or provide for.	2. Allow a 2-inch slack in the rope.	1	2. Leave	
Alternate	To perform or cause to occur by turns or in succession.	Alternate between pilot's and copilot's instrument test.	-		
Analyze	To examine and interpret test or inspection results to determine system or equipment condition or capabilities.	Analyze engine inspection findings to determine need for repairs.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Apply	1. To lay or spread on.	1. Apply scalant to gap between the windshield and the aircraft structure.	1	2. Put	Use "lubricate" rather than "apply lubricant."
	2. To energize.	2. Apply power or load.	-		
Arrange	To group according to quality, value or other characteristics, to put in proper order.	Arrange components by size from smallest to largest.	1	2. Order	
Ascertain	To find out with certainty that a proper condition exists.	Ascertain that the light is off.	5	1. Be sure 2. Verify 3. Check 4. Determine	
Assemble	To fit and secure together the several parts of; to make or form by combining parts.	Assemble a jet engine in accordance with specified procedures.	1	2. Construct	
Assess	To determine the importance, size or value of; to evaluate.	Assess the success of the maintenance action.	2	1. Evaluate	
Assign	To apportion to for a specific purpose or to particular persons or things; to appoint to a duty.	Assign the various maintenance tasks to technicians.	1	2. Distribute 3. Allocate	
Assist	To give support or help; to aid.	Assist man B to lift the antenna.	1	2. Help 3. Aid	
Assure	To make somcone sure or certain, to inform positively.	Assure other technicians that all warning lights are off.	-		
Attach	To join or fasten to.	Attach electrical leads to the multimeter.	2	1. Connect	Use "tag" in preference to "attach" a tag.
Back off	To cause to go in reverse or backward.	Back off nut to the nearest castellation.	-		
Balance	To equalize in weight, height, number or proportion.	Balance aircraft so that it is stable.	-		
Be sure	To confirm that a proper condition exists, to find out with certainty.	Be sure that the light is off.	1	2. Verify 3. Check 4. Determine 5. Ascertain	
Be careful	To exercise caution, to take care.	Be careful not to inhale the fumes of the solvent.	-		
Bend	To turn or force from straight or even to curved or angular, or to force, back to an original straight or even position.	Bend wire until it lies flat against the turnbuckle wall.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Bleed	To extract or let out some or all of a contained substance from.	Bleed off tank air pressure	-		
Blow	To send forth air, particularly from the lungs through the mouth.	Check for obstructions by dis-connecting the hose at the air inlet and blowing through it.	-		
Break	1. To separate into parts with suddenness or violence.	1. Never break safety wire to release air pressure.	-		
	2. To pull away.	2. Break the bead of the tire.	-		
Buck	To reseat or tighten rivets from the shank side.	Buck rivets to stop the leak.	-		
Calculate	To determine by arithmetic processes.	Calculate the voltage in a circuit with 10 amp of current and 5 ohms of resistance.	1	2. Figure 3. Compute	
Calibrate	To determine accuracy, deviation or variation by special measurement or by comparison with a standard.	Calibrate torque handles at least once each month so that the accuracy can be depended upon.	-		
Cap	To provide with a covering; to install or provide with a device for closing off the end of a tube which has a male fitting.	Cap all lines which have exposed male fittings.	1	2. Install caps	
Care for	To take responsibility for the proper handling and upkeep of.	A mechanic calls for his tools.	-		
Catch	To prevent from falling to the ground. to capture.	Catch any fluid drippings in a drip pan.	-		
Categorize	To put into categories or general classes.	Categorize components by their function.	2	1. Classify	For determining the classification of a supply item, use "identify"
Center	1. To adjust so that axes coincide.	1. Center the nose wheel of the aircraft.	-		
	2. To place in the middle of.	2. Center the pointer on the dial.	-		
Change	To replace with another comparable item; to substitute serviceable equipment for malfunctioning, wornout or damaged equipment.	Change the switch contact points.	2	1. Replace	
Channel	To form, cut, or wear a groove in.	Channel the rods so that they can be inserted easily.	-		
Charge	To restore the active materials in a storage battery by the passage of a direct current through in the opposite direction to that of the discharge.	Charge the battery for a short time before making a specific gravity check.	1	2. Cycle	

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Check	1. To confirm or establish that a proper condition exists; to ascertain that a given operation produces a specified result; to examine for satisfactory accuracy, safety or performance; to confirm or determine measurements by use of visual or mechanical means.	1. Check that the light is off.	3	1. Be sure 2. Verify 4. Determine 5. Ascertain	
	2. To perform a critical visual observation or check for specific conditions; to test the condition of.	2. Check the components for wear, deterioration or defects.	3	1. Inspect 2. Examine	
Checkout	To perform specified operations to verify operational readiness of a subcomponent, component, subsystem, or system.	Checkout the landing gear.	1	2. Test	
Chock	To place chocks adjacent to, and in front of and behind.	Chock main and nose landing gear wheels.	-		
Choke	To enrich the fuel mixture of a motor by partially shutting off the air intake of the carburetor.	Choke engine as required to start.	-		
Clamp	To fasten or press two or more parts together so as to hold them firmly.	Clamp the tensiometer to the cable by releasing the handle slowly.	-		
Classify	To put into categories or general classes.	Classify components by their function.	1	2. Categorize	For determing the classification of a supply item, use "identify."
Clean	To wash, scrub or apply solvents to; remove dirt, corrosion or grease.	Clean petroleum products from oxygen equipment.	-		
Clear	1. To move people and/or objects away from.	1. Clear the area.	-		
	2. To open the throttle of an idling engine to free it from carbon.	2. Clear the engine.	-		
Close	1. To block against entry or passage; to turn, push or pull in the direction in which flow is impeded.	1. Close the valve.	-		
	2. To set a circuit breaker into the position allowing current to flow through.	2. Close the circuit breaker.	-		
Coat	To cover or spread with a finishing, protecting layer.	Coat battery cables with grease.	-		
Code	To put into the form or symbols of a system used to represent words; to mark with identifying symbols.	Color code equipment parts.	-		
Collect	To bring together into one body or place; to accumulate.	Collect the required hand tools.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Communicate	1. To exchange information.	1. Communicate with man B during the entire procedure.	-		
	2. To make known.	2. Communicate to man B that the brakes have been set.	5	1. Report to 2. Inform 3. Notify 4. Advise	
Compare	To examine the character or qualities of two or more items to discover resemblances or differences.	Compare the readings from protractor and template.	-		
Compile	To compose or put together out of materials from several sources.	Compile the records of all maintenance on the specified aircraft.	-		
Comply	To conform with directions or rules; to accept as authority, to obey.	Comply with directions.	2	1. Follow	
Compress	To squeeze together; to condense.	Compress the forward and aft sections of the hydraulic pitch lever.	-		
Compute	To determine by arithmetic processes.	Compute the voltage in a circuit with 10 amps of current and 5 ohms of resistance.	3	1. Calculate 2. Figure	
Condition	To put into a proper state for work or use.	Condition components before installing them.	-		
Conduct	To lead, manage or direct.	Conduct the class in proper servicing procedures.	-		
Confer	To consult; to exchange views.	Confer with maintenance supervisor if necessary.	-		
Connect	1. To bring or fit together so as to form a unit, to couple keyed or matched equipment items.	1. Connect the torquometer to the socket wrench.	1	2. Mate 3. Join	
	2. To attach or mate (an electrical device) to a service outlet.	2. Connect the soldering iron to the service power outlet.	2	1. Plug in	
Consolidate	To join together into one whole, to form into a compact mass.	Consolidate contents of both containers.	-		
Construct	To make or form by combining parts; to fit and secure together the several parts of.	Construct a jet engine in accordance with specified procedures.	2	1. Assemble	
Control	To exercise restraining or directing influence over, to fix or adjust the time, amount or rate of.	Control electrical current generation and distribution.	2	1. Regulate	
Coordinate	To bring into a common action, movement or condition.	Coordinate the activities of man B and man C.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Copy	To make an imitation, transcript or reproduction of.	Copy the tail number on the record form.	-		
Correct	To make or set right, to alter or adjust so as to bring to some standard or required condition.	Correct any error before proceeding with activity.	-		
Cover	To protect or shelter by placing something over or around.	Cover tires whenever maintenance is done on the aircraft.	-		
Crack	To open slightly (the throttle) of an aircraft engine preparatory to starting the engine.	Crack and lock the throttle to 1/8 open.	-		
Cut	To divide into parts using a sharp instrument such as a scissors or knife.	If the prongs of the cotter pin are too long, they should be cut to proper length.	-		
Cycle	To charge (a battery) for a short time.	Cycle the battery before making the specific gravity check.	2	1. Charge for a short time.	
Deflate	To release air or gas from.	Deflate the shock strut to check fluid level.	-		
Deflect	To move aircraft control surfaces (elevators, ailerons, etc.) to a position different from the major axes of the aircraft.	Deflect the surface upward to the mechanical stops.	-		
Deplete	To lessen markedly in quantity, content or power.	Deplete system pressure.	-		
Depress	To press or push down.	Depress both brake pedals	-		
Depressurize	To release gas or fluid pressure from.	Depressurize the hydraulic system.	-		
Destroy	To ruin, demolish or put out of existence; to make unfit for further use.	Destroy used hydraulic fuel containers.	-		
Detect	To discover or determine the existence, presence or fact of.	Watch very carefully so as to detect any needle movement.	-		
Determine	1. To obtain definite and first-hand knowledge of, to confirm or establish that a proper condition exists.	1. Determine that the light is off.	4	1. Be sure 2. Verify 3. Check 5. Ascertain	
	2. To investigate and decide, to discover by study or experiment.	2. Determine the amount of tension on a cable by following specified procedures.	1	2. Find	

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Develop	To set forth or make clear by degrees or in detail.	Develop procedures fully.	-		
Devise	To form by new combinations or applications of ideas or principles: to invent.	Devise new methods of troubleshooting the system.	-		
Diagnose	To make an investigation or analysis of the cause or nature of a condition, situation or problem.	Diagnose the cause of the malfunction.	-		
Disassemble	To take to pieces; to take apart to the level of the next smaller unit or down to all removable parts.	Disassemble the No. 1 engine.	1	2. Dismantle	
Dismantle	To take to pieces; to take apart to the level of the next smaller unit or down to all removable parts.	Dismantle the No. 1 engine.	2	1. Disassemble	
Disconnect	1. To sever the connection between: to separate keyed or matched equipment parts.	1. Disconnect the bleedair hose from the leading edge anti-icing system.	-		
	2. To detach or separate (an electrical device) from a service outlet.	2. Disconnect the soldering iron from the service power outlet.	2	1. Unplug	
Disengage	To release or detach interlocking parts, to unfasten, to set free from an inactive or fixed position.	Disengage the parking brake.	2	2. Release 3. Unlock	For circuit breaker, use "open"
Dispatch	To send off or away with promptness or speed.	Dispatch report to supervizing technician.	-		
Dispose of	To get rid of.	Dispose of unused hydraulic fluid left in the can.	-		
Distribute	1. To apportion for a specific purpose or to particular persons or things.	1. Distribute the various maintenance tasks to technicians.	2	1. Assign 3. Allocate	
	2. To divide among several or many: to divide or separate, especially into kinds.	2. Distribute paint for various sections of the aircraft.	-		
Drain	To draw off (liquid) gradually or completely.	Drain servicing hose after removing it from the filter valve.	-		
Draw in	To pull (liquid) up into a container through suction.	Fill hydrometer by drawing in electrolyte.	-		
Dry	To cause to be free from water or liquid.	Dry bearings with low-pressure air.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Effect	To do, carry out or bring about; to reach an objective.	Effect a periodic inspection on the landing gear.	3	1. Perform 2. Accomplish	
Eliminate	To expel; to ignore or set aside as unimportant.	Eliminate all unnecessary movement.	-		
Employ	To put into action or service, to carry out a purpose or action by means of; to avail oneself of.	Employ only antimagnetic fasteners.	3	1. Use 2. Utilize	
Enforce	To compel or constrain.	Enforce safety regulations	-		
Engage	To cause to interlock or mesh.	Engage threads of turnbuckle with threads of cable terminal.	-		For circuit breakers, use "close".
Enter	1. To go or come in.	1. Enter the aircraft through the troop doors.	-		
	2. To put on record.	2. Enter the data on the form.			
Erect	To put up by the fitting together.	Erect a special maintenance stand.	-		
Establish	To set on a firm basis.	Establish safety rules.	-		
Estimate	To judge or determine roughly the size, extent or nature of.	Estimate amount of cleaning solvent which will be necessary.	-		
Evaluate	To determine the importance, size or nature of; to appraise; to give a value or appraisal to on the basis of collected data.	Evaluate an operating engine	1	2. Assess	
Examine	To perform a critical visual observation or check for specific conditions; to test the condition of.	Examine the component for wear, deterioration or defects.	2	1. Inspect 3. Check	
Expedite	To accelerate the process or progress of.	Expedite the activity by assigning two men.	-		
Extend	To cause to be drawn out to fullest length.	Extend the main landing gear.	-		
Extract	To draw forth; to pull out forcibly.	Extract the cotter pin.	-		
Fabricate	To construct from standardized parts.	Fabricate rig pins from 0.25 inch rod.	-		
Figure	To determine by arithmetic processes.	Figure the voltage in a circuit with 10 amps of current and 5 ohms of resistance.	2	1. Calculate 3. Compute	
File	To rub smooth or cut away with a file (i.e., a tool with cutting ridges for forming or smoothing surfaces.)	File one end of the rod to a point.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Fill	To put into as much as can be held or conveniently contained.	Fill oil and de-icing tanks.	-		
Find	1. To discover or determine by search; to indicate the place, site or limits of.	1. Find the No. 9 fitting.	2	1. Locate	
	2. To discover by study or experiment; to investigate and decide.	2. Find the amount of tension on a cable by following specified procedures.	2	1. Determine	
Flush	To pour liquid over or through; to wash out with a rush of liquid.	Drain and flush the hydraulic system if it is serviced with a wrong fluid.	-		
Follow	To accept as authority, to obey; to conform with directions or rules.	Follow directions.	1	2. Comply with	
Form	To give a particular shape to: to shape or mold into a certain state; to make up.	Form the compound so that it will fill the hole completely.	-		
Furnish	To supply what is needed, to equip.	Furnish a flashlight for man B.	2	1. Provide	
Go to	To proceed to: to transport oneself to a given destination	Go to the control pedestal and position switches appropriately.	-		
Ground	To connect a current, wire or a piece of electrical equipment to a land or other specified surface.	Ground the servicing cart.	-		
Guard	To protect from danger, to defend.	Guard the area while maintenance is taking place.	-		
Guide	To manage or direct the movement of.	Guide the maintenance stand safely to its new position.	-		
Hand	To give, pass or transmit with the hands.	Hand the refueling hose to the technician stationed on the wing.	-		
Handle	To manipulate (load, turn, raise, etc.) objects and equipment manually or with specially designated equipment, such as hoists.	Handle charger cylinders carefully.	-		
Hang	To fasten to some elevated point without support from below, to suspend.	Do not hang tools on projecting parts of the aircraft.	-		
Help	To give support, aid or assistance to.	Help man B lift the load.	2	1. Assist 3. Aid	
Hold	To have or keep in the grasp.	Hold the power switch in position until the voltmeter stabilizes.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Identify	1. To establish the identity of.	1. Identify components by name and function.	-		
	2. To determine the classification of a supply item.	2. Identify the component to be ordered from supply.	-		
Idle	To run an aircraft engine under reduced power without sufficient power being developed for movement of the aircraft.	Idle the engine for five minutes at 800 rpm.	-		
Immerse	To plunge into something that surrounds or covers, especially to plunge or dip into a fluid.	Immerse component in solvent.	-		
Improve	To make greater in amount or degree: to make better.	Improve procedures whenever feasible.	-		
Indicate	To point out.	Indicate which dial should be monitored.	-		
Inflate	To fill with a given amount of gas or air.	Inflate tire to desired pressure.	-		
Inform	To make known to: to give notice or report the occurrence of.	Inform man B that the brakes have been set.	2	1. Report to 2. Notify 4. Advise	
Initiate	To perform actions necessary to set into operation, to set going, to begin.	Initiate operation of the powered AGE.	1	2. Start 3. Originate	
Inject	To throw, drive or force in.	Inject lubricant into proper joint.	-		
Insert	To put or thrust in, into or through	Insert a wire through the hole in the turnbuckle.	1	2. Put	
Inspect	To perform a critical visual observation or check for specific conditions: to test the condition of.	Inspect the components for wear, deterioration or defects.	1	2. Examine 3. Check	
Install	1. To perform operations necessary to properly fit an equipment unit into the next larger assembly or system.	1. Install fuel manifold	-		a. For wiring a circuit, use either "install wiring" or "wire".
	2. To place and attach.	2. Install nuts on bolts.	-		b. For safety-wiring use either "safety wire" or "install safety wire" c. For screws, use "install screws" rather than "screw"

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Install (Cont)					d. Use "cap" "plug" rather than install caps (plugs).
Insure	To make certain, to ensure.	Insure that the area is clear of unnecessary personnel and equipment.	-		
Intercept	To stop or interrupt the progress or course of.	Intercept messages between flight station and tail section technicians.	-		
Interpret	To explain the meaning of.	Interpret instructions for inexperienced technicians.	-		
Investigate	To observe or study by close examination and systematic inquiry.	Investigate the cause of the breakdown.	-		
Isolate	To use test equipment to identify or select a source of trouble.	Isolate the source of the malfunction using pressure gages.	-		
Jack	To use one or more jacks (i.e., mechanisms for exerting pressure to lift all or part of an aircraft.)	Jack and level the aircraft in accordance with specified procedures.	-		
Join	To bring or fit together so as to form a unit; to couple keyed or matched equipment items.	Join the torquometer to the socket wrench.	3	1. Connect 2. Mate	
Keep	To remain, to continue in a place.	Keep away from the danger area.	2	1. Stay	
Kick	To strike against with a foot.	Kick the wheel lightly if the strut binds.	-		
Latch	To catch with a device which holds a door when closed, even if not bolted.	Close and latch the aft petal doors.	-		
Leave	1. To go away from, depart.	1. Do not leave the area until this activity is complete.	-		
	2. To allot or provide for.	2. Leave a two-inch slack in the rope.	2	1. Allow	
Let	To permit; to give opportunity to.	Let the engine stabilize.	2	1. Allow	
Level	To cause an aircraft to become even or parallel with the plane of the horizon.	Jack and level the aircraft in accordance with specified procedure.	-		
Lift	To move or cause to be moved from a lower to a higher position; to elevate.	Lift the spoiler control lever to the ARMED position.	2	1. Raise	
Light	To cause to illuminate.	Light the field indicator light.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Listen	To pay attention to sound	Listen to the engine while it is operating.	-		
Load	To place in or on a means of conveyance; to place cargo or aircraft components on an airplane or other vehicle.	Load and secure aircraft components on specified truck.	-		
Locate	1. To find, determine or indicate the place, site or limits of.	1. Locate the No. 9 fitting	1	2 Find	
	2. To set or establish in a particular spot, to station.	2. Locate the test equipment so that it can be seen by both technicians.	3-4	1. Position 2. Place 3-4. Set 5. Put	
Lock	To hold fast or inactive, to fix.	Lock the throttle after it has been properly set.	-		
Look for	To visually search for.	Look for cracks, security, corrosion and damage during inspection of wheels and tires.	-		
Loop	To make into the form or shape of a loop (i.e., a fold or doubling of line leaving an aperture between the parts through which another line can be passed.)	Loop the wire.	-		
Loosen	To release from restraint, to cause to become less tight fitting.	Loosen the lock nut on the relief valve.	-		
Lower	To cause to move down; to depress as to direction.	Lower the exhaust stack into the stowed position.	-		
Lubricate	To put lubricant on specified locations.	Lubricate the wheel bearings.	1	2. Apply lubricant.	
Maintain	1. To hold or keep in any particular state or condition, especially in a state of efficiency or validity.	1 An aircraft mechanic maintains aircraft.	-		
	2. To sustain or keep up.	2. Maintain standard forms on power plant operations.	-		
Make	To carry out or cause to occur.	Make corrections where necessary.	-		
Mark	To label, to provide with an identifying or indicating symbol.	Mark each component before removing it.	-		If marking is to be done on a tag, use "tag"
Mate	To join or fit together, to couple.	Mate the torquometer to the socket wrench.	2	1. Connect 3. Join	

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Measure	To determine the dimensions, capacity or amount by use of standard instruments or utens	Measure voltage drop across each unit of resistance.	-		
Mix	To combine or blend into one mass.	Never mix oxygen with other gases.	-		
Modify	To alter or change somewhat the form or qualities of.	A jet engine mechanic modifies turbofan engines.	-		
Monitor	1. To visually take note of, to pay attention to in order to check on action or change.	1. Monitor the indicator for changes in airspeed.	3	1. Observe 2. Watch	
	2. To continually or periodically attend to displays to determine equipment condition or operating status.	2. Monitor all engine instruments while starting the engines.	-		
Moor	To secure an aircraft to the ground by tying it down by ropes or cables.	Moor the aircraft when it is to be parked for an extended period of time.	-		
Mount	To attach to a support.	Mount the split-type wheel.	-		
Move	To change the location or position of.	Move and position a B-4 maintenance stand.			
Neutralize	To destroy the effectiveness of, to nullify, to make chemically neutral or electrically inert.	Neutralize the solution before applying it to aircraft surface.	-		
Notify	To make known to; to give notice or report the occurrence of.	Notify man B that the brakes have been set.	3	1. Report to 2. Inform 4. Advise 5. Communicate to	
Observe	1. To conform one's actions or practice to.	1. Observe precautions.	-		
	2. To visually take note of, to pay attention to.	2. Observe the indicator for changes in airspeed.	1	2. Watch 3. Monitor	
Obtain	1. To get or find out by observation or special procedures.	1. Obtain a reading on the outside circle of the tensiometer.	2	1. Take	
	2. To gain or attain.	2. Obtain the necessary supplies before starting on maintenance.	-		
Open	1. To move from closed position; to make available for passage by turning in an appropriate direction.	1. Open the valve.	-		
	2. To make available for entry or passage by turning back, removing or clearing away.	2. Open the troop door.	-		
	3. To disengage or pull.	3. Open the appropriate circuit breakers.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Operate	To control equipment in order to accomplish a specific purpose.	Operate crew stands and auxiliary power equipment.	-		
Order	1. To requisition or request from supply.	1. Order three cans of appropriate solvent.	-		
	2. To group according to quality, value, or other characteristics.	2. Order components by size from smallest to largest.	2	1. Arrange	
Organize	To arrange elements into a whole of interdependent parts; to form into a coherent unity; to integrate.	Organize the activities of the assisting technicians.	-		
Orient	1. To acquaint with the existing situation or environment.	1. Orient new technicians to location of shops and supplies.	-		
	2. To set or arrange in any determinate position.	2. Orient the aircraft away from wind direction.	-		
Originate	To give rise to, to set going, to begin.	Originate a new procedure.	3	1. Initiate 2. Start	
Overhaul	The act of disassembling equipment units down to all removable parts; cleaning; critically inspecting, repairing, restoring and replacing where necessary; assembling, adjusting, aligning, recalibrating and verifying operational readiness by test or checkout; and packaging for transportation storage.	Overhaul the No. 2 engine.	-		
Pack	To fill completely with grease.	Pack the bearings.	-		
Paint	To apply color or pigment (suspended in suitable liquid) to the surface of.	Paint all exposed surfaces.	-		
Park	To bring (an aircraft) to a stop and leave it standing for a time, usually without pilot, in a specified area.	Park the aircraft between the yellow lines.	-		
Patch	To mend, cover, or fill up a hole or weak spot in.	Patch the tubes where necessary.	-		
Perform	To do, carry out or bring about; to reach an objective.	Perform a periodic inspection on the landing gear.	1	2. Accomplish 3. Effect	
Place	To put or set in a desired location or position.	Place the test equipment so that it can be seen by both technicians.	2	1 Position 3-4. Set 3-4. Locate 5. Put	
Plan	To devise or project the achievement of.	Plan the day's schedule for the technicians.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Plug	To provide with a device for closing off the end of a tube which has a female fitting	Plug all lines which have exposed female fittings.	1	2. Insert plugs 3. Install plugs	
Plug in	To attach or mate (an electrical device) to a service outlet.	Plug in the soldering iron at the service power outlet.	1	2. Connect	
Position	To put or set in given place, to locate.	Position the test equipment so that it can be seen by both technicians.	1	2. Place 3-4. Set 3-4. Locate 5. Put	
Post	To station at a given place.	Post one msn in front of the aircraft.	-		
Prepare	To make ready; to arrange things in readiness.	Prepare the surface for paint.	-		
	To prepare or make ready for a maintenance activity.	Prepare the Trunion Shaft Kit for removal of the MLG shock strut.	1	2. Set up 3. Ready	
Prescribe	To lay down as a guide, direction or rule of action; to specify with authority.	Prescribe repair activities to correct the malfunctions.	-		
Pre-set	To put in a desired position, adjustment or condition beforehand.	Pre-set tension indicator dial to size of cable being checked.	-		
Press	To act upon through thrusting force exerted in contact.	Press the blower start button.	1	2. Push	For circuit breakers, use "close".
Pressurize	To apply pressure within by filling with gas or liquid.	Pressurize the booster hydraulic system.	-		
Prevent	To keep from happening or existing.	Prevent oil from spilling over on components.	-		
Probe	To investigate thoroughly with a long, pointed device or by direct feeling.	Probe the tube with fingers	-		
Process	To submit to a series of actions or operations leading to a particular end.	Process the forms so they will be compatible with new recording methods.	-		
Program	To work out a plan or procedure or a sequence of operations to be performed.	Program the maintenance activity in logical sequence.	-		
Provide	To supply what is needed, to equip.	Provide a flashlight for msn B.	1	2. Furnish	
Pull	To exert force upon an object so as to cause motion toward the force.	Pull out knob No. 6 on the oxygen servicing cart.	-		For circuit breakers, use "open"

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Pump	1. Raise or lower by operating a device which raises, transfers or compresses fluids by suction, pressure or both.	1. Pump up the ramp several inches.	-		
	2. To move up and down or in and out as if with a pump handle.	2. Pump engine primer knob.	-		
Puncture	To pierce with pointed instrument or object.	Be careful not to puncture tube while probing the inside of it.	-		
Purge	1. To free of sediment or trapped air by flushing or bleeding.	1. Purge fuel tanks.	-		
	2. To remove fuel or fuel vapors from engine by motoring engine with fuel switch off.	2. Purge engines.	-		
Push	1. To press against with force so as to cause motion away from the force.	1. Push the blower start button.	2	1. Press	For circuit breakers, use "close".
	2. To move away or ahead by steady pressure.	2. Push the servicing cart toward the aircraft.	-		
Put	1. To place in or through.	1. Put a wire through the hole in the turnbuckle.	2	1. Insert	
	2. To place or set in a desired position or location.	2. Put the test equipment where it can be seen by both technicians.	5	1. Position 2. Place 3-4. Set 3-4. Locate	
	3. To deposit or leave.	3. Put tools out on the bench	-		Use "store" instead of "put away" for depositing or leaving in a specified place for future use.
	4. To lay or spread on or in.	4. Put sealant in the gap between the windshield and the aircraft structure.	1	1. Apply.	
Qualify	To declare competent or adequate.	Qualify components which checkout successfully.	-		
Raise	To move or cause to be moved from a lower to a higher position, to elevate.	Raise the spoiler control lever to the ARMED position.	1	2. Lift	
Read	To interpret the meaning of by visual observation.	Read the ammeter.	-		
Readjust	To adjust again, to move back to a specified condition; to bring back to an in-tolerance condition.	Readjust the voltage after performing an operational check of the system.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OR PREFERENCE	NOTES
Ready	To prepare for a maintenance activity.	Ready the Trunnion Shaft Kit for removal of the MLG shock strut.	3.	1. Set up 2. Prepare	
Reassemble	To refit and secure together the parts of after they have been taken apart.	Reassembly component before installation on aircraft.	-		
Recall	To call back.	Recall parts which have not been modified.	-		
Recap	To cap again; to replace a covering; to reinstall a fitting for closing the end of a tube.	Recap the filler valve.	-		
Recapitulate	To repeat briefly.	Recapitulate the task sequence.	-		Use "repeat briefly."
Receive	To come into possession of; to get.	Receive supplies as they arrive.	-		
Recognize	To perceive to be something previously known or designated.	A jet engine mechanic recognizes troubles through evaluation of engine operational checks.	-		
Recommend	To urge the acceptance or use of.	Recommend procedure changes where appropriate.	-		
Recondition	To renew; to bring or put back into good condition.	Recondition the pilot's and copilot's seats.	1	2. Renovate	
Reconnect	To rejoin or refasten that which has been separated.	Reconnect aft pistons to forward pistons.	-		
Record	To set down in writing.	Record maintenance time on appropriate form.	-		
Reduce	To cause to be diminished in strength, density or value.	Reduce pump flow.	-		
Refuel	To put fuel into the tanks of (an aircraft) again.	Refuel the system as outlined from applicable technical manuals.	-		
Regulate	To fix or adjust the time, amount or rate of; to exercise restraining or directing influence over.	Regulate electrical current generation and distribution.	1	2. Control	
Reinflate	To refill with a given amount of gas or air after deflation has occurred.	Reinflate tires to specified psi value.	-		
Reject	To refuse to have, use or take for some purpose.	Reject components which show excessive wear.	-		
Relay	To pass along by stages.	Relay the message to man D.			

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OR PREFERENCE	NOTES
Release	1. To set free from an inactive or fixed position; to unfasten or detach interlocking parts.	1. Release the parking brake.	1	2. Disengage 3. Unlock	
	2. To let go of.	2. Release tensionmeter handle.	-		
	3. To set free from restraint or confinement.	3. Release pressure.	-		
Relieve	To ease or set free of a burden, to partially release.	Relieve hydraulic pressure before working on a system.	-		
Remove	1. To perform operations necessary to take an equipment unit out of the next larger assembly or system.	1. a. Remove bleed air shutoff valves. b. Remove bolts from nuts.	-		For screws, use "remove" rather than "unscrew"
	2. To take off or eliminate.	2. Remove paint.	-		
	3. To take or move away.	3. Remove jacks.	-		
	4. To take off devices for closing off the end of a tube.	4. Remove caps (plugs) from all hydraulic lines.	1	2. Uncap (unplug)	
Renovate	To renew; to bring or put back into good condition.	Renovate the pilot's and copilot's seats.	2	1. Recondition	
Repair	To restore damaged, wornout or malfunctioning equipment to a serviceable, usable or operable condition.	Repair engine by replacing parts and removing defects.	1		Repair includes replacement, overhaul and reworking of constitutent parts or materials.
Repeat	To make, do or perform again.	If keys do not engage lugs, remove wheel assembly and repeat procedure.	-		
Replace	1. To restore to a former place or position.	1. Replace covers on jacks.	1		
	2. To substitute serviceable equipment for malfunctioning, wornout or damaged equipment.	2. Replace the switch contact points.	1	2. Change	
Replenish	To fill or build up again.	Replenish drinking water when supply runs low.	-		
Report	To describe as being in a specified state.	Report when ready.	1	2. Inform 3. Notify 4. Advise 5. Communicate to	
	To make known to; to give notice or report the occurrence of	Report to man B that the brakes have been set.			
Repressurize	To reapply pressure within by filling with gas or liquid after pressure has been released.	Repressurize the utility hydraulic system	-		
Request	To ask for.	Request further information if necessary.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OR PREFERENCE	NOTES
Reset	To put back into a desired position, adjustment or condition.	Reset the field after performing an operational check of the generator.	-		
Resolve	To clear up or find an answer to; to reach a decision about.	Resolve the inconsistenteney before proceeding with maintenance activity.	-		
Restore	To bring back or put back into a a former or original state.	Restore hydraulic pressure.	-		
Retard	To manipulate so as to hold back or slow down, to hold back or slow down.	Retard the throttle.	-		
Retract	To draw up against or into the aircraft.	Retract the landing gear.	-		
Return	To bring, send or put back to a former or proper place.	Return the horizontal stabilizer to the neutral position.	-		
Review	To examine again; to go over or examine critically or deliberately.	Review procedures which have not been performed for more than two months.	-		
Rework	To reprocess for further use; to revise.	Rework the report forms.	-		
Rig	To assemble, adjust and align the major components of an aircraft (i.e. airfoils or other surfaces); to fit out (an aircraft) with control cables, bracing cables, pulleys, turnbuckles, etc.	Rig and adjust the mechanical linkage in the flight control system.	-		
Rinse	To cleanse (as from soap used in washing) by clear water.	Rinse the battery after cleaning it with soda water solution.	-		
Rope off	To partition, separate or divide by a rope (i.e., a large stout cord of strands of fibers or wire twisted or braided together).	Clear and rope off an area around the aircraft and post warning signs.	-		
Rotate	To cause to revolve about an axis or center.	Rotate the door handle counter clockwise until latches retract.	1	2 Turn	
Route	To send by a selected course of travel; to divert in a specified direction.	Route the memo to all affected personnel.	-		
Rub	To move along the surface of a body with pressure.	Rub hands around connections.			

VERBS	DEFINITIONS	EXAMPLES	PREF RANK	SYNONYMS BY ORDER OR PREFERENCE	NOTES
Safeguard	To provide a technical contrivance to prevent accident; to comply with precautionary measures or stipulation.	Safeguard technical manuals	-		
Safety	1. To secure an aircraft part against loosening from vibration.	1. Safety the lock nut on the relief valve.	-		
	2. To use safety wire to make an aircraft component fast or safe or secure against loosening from vibration.	2. Safety the bolts with wire.	3	1. Safety wire. 2. Secure (with wire) 4. Install (with wire)	
	3. To use a cotter pin to make an aircraft component fast or safe or secure against loosening from vibration.	3. Safety the bolt with a cotter pin.	3	1. Secure 2. Install	
Safety wire	To use safety wire to make an aircraft component fast or safe or secure against loosening from vibration.	Safety wire the bolts.	1	2. Secure (with wire) 3. Safety 4. Install (with wire)	
Salvage	To rescue or save (as from discard, wreckage or ruin).	Salvage fuel which is drained from tanks.			
Scan	To make a wide, sweeping search of; to look through or over hastily.	Scan the flight engineer's panels before beginning maintenance activity.	-		
Schedule	To appoint, assign or designate for a fixed future time; to make a time-table of.	Schedule maintenance activities for the day.	-		
Screw	1. To attach, fasten or close by means of a screw	1. Screw the ram safety lock to the ram.	-		
	2. To attach by means of a twisting motion in the proper direction.	2. Screw in jack pad.	-		
	3. To attach screws by means of a twisting motion in the proper direction.	3. Screw in twelve screws around cover.	2	1. Install	
Scrub	To clean with hard rubbing.	Scrub all metal parts with a white powder deposit on them.	-		
Secure	1. To make fast or safe.	1. Load and secure components on trucks.	-		
	2. To safety (with safety wire or cotter pin) to make aircraft component fast or safe or to keep it from loosening during vibration.	2. a. Secure bolts with safety wire	2	1. Safety wire 3. Safety 4. Install (with wire)	
		b. Secure the bolt with a cotter pin.	1	2. Install 3. Safety	

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OR PREFERENCE	NOTES
Select	To take by preference or fitness from a number or group, to pick out, to choose.	Select a battery cell and insert hydrometer nozzle in the cell.	-		
Service	To perform such operations as cleanup, lubrication and replenishment to prepare for use.	Service each battery cell to only 3/8 inch above the plates.	-		
Set	1. To put a switch, pointer or knob into a given position; to put equipment into a given adjustment, condition a mode.	1. Set PWR switch to ON	-		
	2. To put or place in a desired orientation or location.	2. Set the test equipment so that it can be seen by both technicians.	3-4	1. Position 2. Place 3-4. Locate 5. Put	
Set up	To prepare or make ready for a maintenance activity.	Set up the Trunnion Shaft Kit for removal of the MLG shock strut.	2	1. Prepare 3. Ready	
Shake	To move or cause to move to and fro in a quick, jerky manner.	Shake the container so that the paint will be well mixed.	-		
Shut down	To perform operations necessary to cause an equipment to cease or suspend operation.	Shut down the air conditioning	1	2 Stop	
Signal	To notify or communicate by signals (i.e., a prearranged sign, notice or symbol conveying a command, warning, direction or other message).	Signal the pilot to move the the aircraft to the left.	-		
Simulate	To give the appearance or effect of.	Simulate doppler radar signals	-		
Slide	To cause to move in a smooth manner over a surface.	Slide the stand in close enough to do the work.	-		
Specify	To name or state explicitly or in detail.	Specify the manufacturer's number of the multimeter.	-		
Spill	To cause or allow to fall, flow or run out.	Be careful not to spill battery acid on clothing, hands.	-		
Spin	To cause to revolve rapidly.	Spin wheel by hand until a bearing drag is noticed.	-		
Spray	To apply with a device which disperses a jet of finely divided liquid.	Spray the fuselage and tail sections moving from center to ends.	-		
Start	To perform actions necessary to set into operation, to set going, to begin.	Start the powered AGE	2	1. Initiate 3. Originate	
Stay	To remain, to continue in a place.	Stay away from the danger area.	1	2. Keep	
Stimulate	To excite to activity or greater activity.	Stimulate flow by warming the lines.	-		
Stop	To perform actions necessary to cause an equipment to cease or suspend operation.	Stop the air conditioning	2	1 Shut down.	

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OR PREFERENCE	NOTES
Store	To deposit or leave in a specified place for future use.	Store the wheel covers after maintenance activity is completed.	1	2. Stow 3. Put away	
Stow	To deposit or leave in a specified place for future use.	Stow the wheel covers after maintenance activity is completed.	2	1. Store 3. Put away.	
Strike	To deliver or aim a blow or thrust, to hit.	Strike the designated spot with a hammer.	-		
Submit	To make available, to offer.	Submit request for modification of procedures.	-		
Suggest	To propose as desirable or fitting; to offer for consideration.	Suggest any changes which might be helpful.	-		
Superintend	To oversee; to have or exercise the charge of.	Superintend the repair of the engines.	2	1. Supervise	
Supervise	To oversee; to have or exercise the charge of.	Supervise the repair of the engines.	1	2 Superintend	
Support	To hold up or provide a foundation or props for.	Support the elevator at both ends.	-		
Survey	To examine comprehensively as to condition, situation or value.	Survey entire aircraft surface.	-		
Synchronize	To cause to happen at the same time.	Synchronize the activities of man A and man B.	-		
Tabulate	To set up in the form of a table (with rows and columns); to compute by means of a table.	Tabulate maintenance times for each occurrence of the various maintenance activities.	-		
Tag	To provide with an identifying or indicating symbol with or as if with a tag (i.e., a cardboard, plastic or metal marker used for identification or classification); to label.	Tag each hydraulic line before removing it.	1	2. Attach a tag. 3. Mark 4. Connect a tag to	
Take	1. To get into or carry in one's hands or one's possession.	1. Take supplies out to the aircraft.	-		
	2. To get or find out by observation or special procedures.	2. Take a reading on the outside circle of the tensiometer.	1	2. Obtain	

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OF PREFERENCE	NOTES
Tap	To strike lightly.	Tap the eye of the cotter pin to seat it.	-		
Test	To perform specified operations to verify operational readiness of a component, subcomponent, system or subsystem.	Test the true airspeed indicator.	3	1. Checkout	
Throw	To move (a switch) so as to make or break a connection.	Throw switch to ON position.	-		Use "set" for all switches.
Tie	To fasten, attach or close by means of a line or cord.	Tie moorning ropes to tie points under wing and on nose.	-		
Tighten	1. To perform necessary operations to fix more firmly in place.	1. Tighten all screws.	-		
	2. To apply a specified amount of force to produce a rotation or twisting motion to fix more firmly in place.	2. Tighten the nut to a torque value of 1000 inch-pounds.	2	1. Torque	
Tilt	To cause to slope, lean or incline.	Tilt maintenance stand backwards until wheels contact the ground.	-		
Torque	To apply a specified amount of force to produce a rotation or twisting motion to fix more firmly in place.	Torque the nut to 1000 inch-pounds.	1	2. Tighten	Torque (noun) - length of wrench handle times applied force
Tow	To pull along (an aircraft) by means of a towing vehicle and tow bar.	Tow aircraft to the wash-rack.	-		
Trace	To follow or study out in detail or step by step.	Visually trace the wiring diagram.	-		
Transfer	To convey or cause to pass from one place to another.	Transfer fuel and oil from one place to another.	1	2-3. Transport 2-3. Transmit	
Transmit	1. To convey or cause to pass from one place to another.	1. Transmit fuel and oil from one place to another.	2-3	1. Transfer 2-3. Transport	
	2. To send out a signal by radio waves or wire.	2. Transmit message to control tower.	-		
Transport	1. To convey or cause to pass from one place to another.	1. Transport fuel and oil from one tank to another.	2-3	1. Transfer 2-3. Transmit	
	2. To carry by hand or in a vehicle or hoist, or in a container, etc.	2. Transport landing gear to shop on dolly.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OR PREFERENCE	NOTES
Trim	1. To free of excess or extraneous matter by or as if by cutting.	1. Trim patch to fit.	-		
	2. To adjust (a jet engine) to compensate for wear.	2. Trim the No. 1 engine.	-		
Troubleshoot	To localize, isolate and correct the source of a malfunction or breakdown.	Troubleshoot the landing gear control circuit.	-		
Tune	To adjust for precise functioning.	Tune the transmitter for maximum output.	-		
Turn	To cause to revolve about an axis or center.	Turn the door handle counter clockwise until latches retract.	2	1. Rotate	
Turn off	To shut off or stop the flow of by or as if by moving a control to its OFF position.	Turn off power to the signal generator.	-		
Turn on	To cause to flow or operate by or as if by moving a control to its ON position.	Turn on power to the signal generator.	-		
Uncap	To remove a device for closing off the end of a tube with a male fitting.	Uncap and unplug all hydraulic lines.	2	1. Remove caps	
Unlock	To set free from an inactive or fixed position, to unfasten, to detach interlocking parts.	Unlock the parking brake.	3	1. Release 2. Disengage	
Unplug	1. To detach or separate (an electrical device) from a service outlet.	1. Unplug the soldering iron.	1	2. Disconnect	
	2. To remove a device for closing off the end of a tube with female fittings.	2. Unplug and uncap all hydraulic lines.	2	1. Remove plugs	
Unscrew	1. To loosen or withdraw by turning in the proper direction.	1. Unscrew the jack pad.	-		
	2. To draw the screws from.	2. Unscrew twelve screws around cover.	2	1. Remove	
Unwind	To cause to uncoil or unroll.	Unwind hoses from hose rack.	-		
Use	To put into action or service; to avail oneself of; to carry out a purpose or action by means of.	Use only antimagnetic fasteners.	1	2. Utilize 3. Employ	
Utilize	To put into action or service; to avail oneself of; to carry out a purpose or action by means of.	Utilize only antimagnetic fasteners.	2	1. Use 3. Employ	
Verify	1. To confirm or establish that a proper condition exists.	1. Verify that the light is off.	2	1. Be sure 3. Check 4. Determine 5. Ascertain	
	2. To establish the truth or accuracy of.	2. Verify the readings before recording them.	-		

VERBS	DEFINITIONS	EXAMPLES	PREF. RANK	SYNONYMS BY ORDER OR PREFERENCE	NOTES
Wait	To suspend activity in a sequence of activities until a given condition occurs or a given time has elapsed.	Wait five minutes before performing the next task.	-		
Wash	To cleanse by or as if by the action of liquid; to remove (dirt) by rubbing or drenching with liquid.	Wash the battery with a cleaning solution and a stiff brush.	-		
Watch	To visually take note of, to pay attention to in order to check on action or change.	Watch the indicator for changes in airspeed.	2	1. Observe 3. Monitor	
Wire	To provide with wire, to use wire on.	Wire the circuit.	1	2. Install wiring.	
Withdraw	To take back, away, or out.	Withdraw the bar magnet from the center of the coil.	-		
Wrap	To wind, coil or twine so as to encircle or cover something.	Wrap the wire around the terminal.	-		
Zero	To bring to a desired level or null position	Zero the protractor to the surface.	-		

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Serendipity Inc. 9760 Cozycroft Avenue Chatsworth, California	2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b. GROUP

3. REPORT TITLE
Project PIMO Final Report - PIMO Technical Data Format Specifications

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)
Technical Report -- June 1966 - April 1969

5. AUTHOR(S) (Last name, first name, initial)
Grieme, R.; Cleveland, David; Chubb, G.P., et al

6. REPORT DATE May 1969	7a. TOTAL NO. OF PAGES 66	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO. AF04(694)-984 b. PROJECT NO. c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) TR-315-69-14(U) 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) TR-69-155 Volume IV	

10. AVAILABILITY/LIMITATION NOTICES
This document is subject to export controls and each transmittal to Foreign Government or Foreign National may be made only with prior approval of Wright-Patterson AFB AFHRL (HRTT)

11. SUPPLEMENTARY NOTES Distribution of this report is limited because it contains technology restricted by Mutual Security Acts	12. SPONSORING MILITARY ACTIVITY Space and Missile Systems Organization Air Force Systems Command Norton Air Force Base, California

13. ABSTRACT

This report describes the latest phase in the program to develop and evaluate PIMO (Presentation of Information for Maintenance and Operation); a job guide concept applied to maintenance. Between August 1968 and April 1969, a test was conducted at Charleston AFB, South Carolina, to determine the effectiveness of PIMO. Three immediate behavioral effects were expected: 1) reduction in maintenance time, 2) reduction in maintenance errors, and 3) allow usage of inexperienced technicians with no significant penalty. Experienced and inexperienced Air Force technicians performed maintenance on C-141A aircraft using PIMO Job Guides presented in audio-visual and booklet modes. Performance was measured in terms of time to perform and procedural errors. The performance was compared with the performance on the same jobs by a control group, i.e., experienced technicians performing in the normal manner. The following conclusions were drawn from the test results: 1) after initial learning trials, both experienced and inexperienced technicians using PIMO can perform error-free maintenance within the same time as experienced technicians performing in the normal manner, 2) inexperienced technicians perform as well as experienced technicians when both use PIMO, 3) there is no significant difference between audio-visual and booklet modes, 4) the users revealed an overwhelmingly positive reaction to PIMO, and 5) the performance improvements provide the capabilities to significantly improve system performance defined in terms of departure reliability, time-to-maintenance, and operational readiness. This report also presents a description of the recommended operational system, specifications and guidelines for PIMO format development, including troubleshooting.

DD FORM 1 JAN 64 1473

UNCLASSIFIED
Security Classification

UNCLASSIFIED
Security Classification

14. KEY WORDS	LINK A ROLE	LINK A WT	LINK B ROLE	LINK B WT	LINK C ROLE	LINK C WT
Maintenance Aids, Improved						
Job-oriented Guides						
Aircraft Maintenance						
Troubleshooting Aids						
Field Test of Maintenance Aids						
Audio-visual Presentation, Maintenance Data						
Maintenance Dependency Charts, Preparation of						
PIMO, Programmed Information for Maintenance						
Technical Data, Reformatting of						
Technical Data, Specifications for						
Technical Orders, Comparison of (with PIMO)						
PIMO, Project Final Report						

INSTRUCTIONS

1. ORIGINATING ACTIVITY: Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization *(corporate author)* issuing the report.

2a. REPORT SECURITY CLASSIFICATION: Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.

2b. GROUP: Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

3. REPORT TITLE: Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.

4. DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

6. REPORT DATE: Enter the date of the report as day, month, year; or month, year. If more than one date appears on the report, use date of publication.

7a. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. NUMBER OF REFERENCES: Enter the total number of references cited in the report.

8a. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b, 8c, & 8d. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9a. ORIGINATOR'S REPORT NUMBER(S): Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. OTHER REPORT NUMBER(S): If the report has been assigned any other report numbers *(either by the originator or by the sponsor)*, also enter this number(s).

10. AVAILABILITY/LIMITATION NOTICES: Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:

(1) "Qualified requesters may obtain copies of this report from DDC."

(2) "Foreign announcement and dissemination of this report by DDC is not authorized."

(3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through _____."

(4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through _____."

(5) "All distribution of this report is controlled. Qualified DDC users shall request through _____."

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.

12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring *(paying for)* the research and development. Include address.

13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as *(TS)*, *(S)*, *(C)*, or *(U)*.

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14. KEY WORDS: Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, rules, and weights is optional.

UNCLASSIFIED
Security Classification