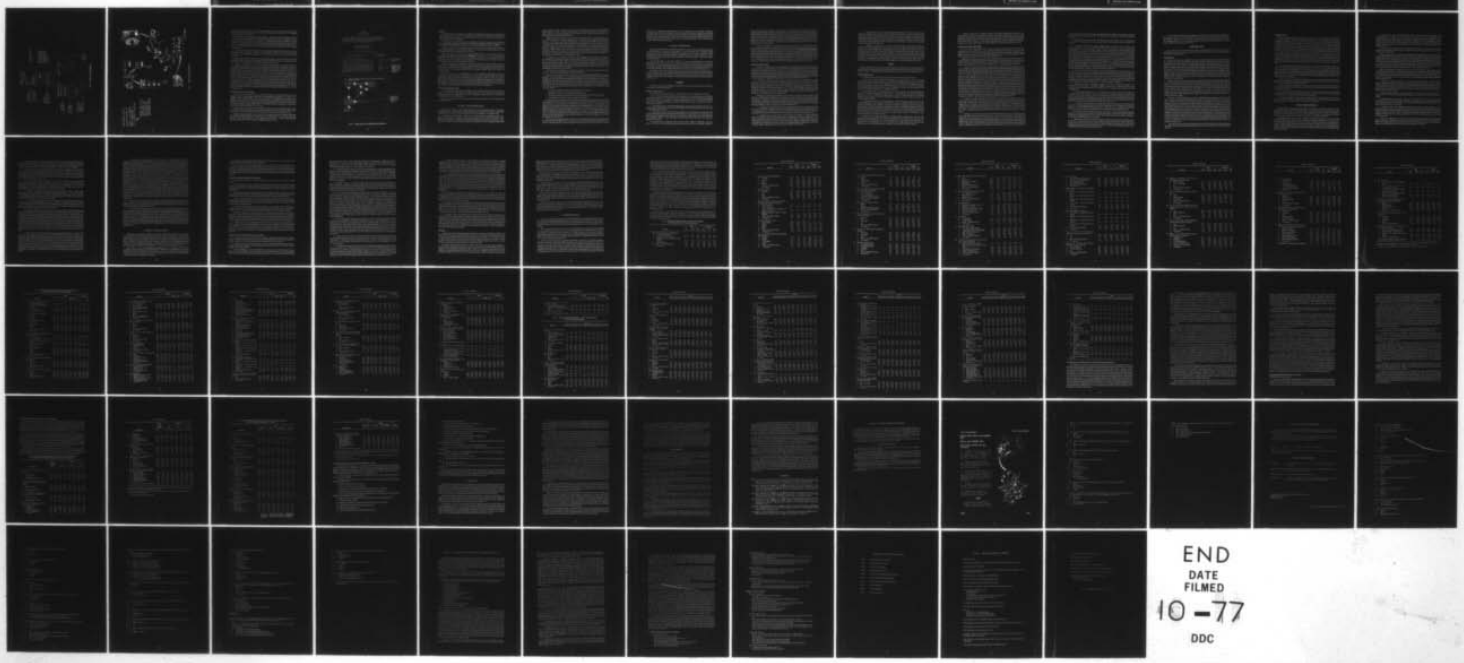
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USER ACCEPTANCE AND USABILITY OF THE C-141 JOB GUIDE TECHNICAL ORDER SYSTEM

By

Robert C. Johnson
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ADVANCED SYSTEMS DIVISION
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June 1977
Final Report for Period June 1975 – February 1977

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This final report was submitted by Advanced Systems Division, Air Force Human Resources Laboratory, Wright-Patterson Air Force Base, Ohio 45433, under project 1710, with HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235. Mr. John J. K. Klesch was the task scientist, Mr. Robert C. Johnson was the principal investigator.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report documents a study of the user acceptance and usability of the technical data developed under the C-141 Job Guide Technical Order (TO) Program. Step-by-step, illustrated technical orders, called job guides, were developed to replace the original TOs on the C-141 aircraft. Job guides are characterized by detailed, fully proceduralized task instruction which are keyed to illustrations which identify each component and its location. Other features include a small handbook size, standardized verb usage, simplified writing style, job preparation instructions, identification of tools and parts required, and little or no referencing to other TOs.

In this first large-scale application of the job guide concept, the following positive and negative factors affecting usability and user acceptance were identified using questionnaires, interviews and observation.

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Positive Factors included: small size; ease of reading and understanding; good illustrations keyed to procedures; job preparation information; and information acceptable to both experienced and inexperienced technicians.

Negative Factors included: too many volumes required for some task sequences; errors in the data; inability to locate information quickly; storage problems; and torn and lost pages.

Although problems existed, the C-141 job guides are considered to be very usable and well-accepted. It is obvious that the development of the data and the implementation of the data are two very critical factors in the success of the job guide concept.

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SUMMARY

Problem

As part of its technical order improvement program, the Air Force recently procured an improved system of technical data for maintenance of the C-141 aircraft. The data include job guide manuals (JGM), logic tree troubleshooting aids (LTTA), and supporting data for the on-equipment maintenance of the aircraft. This represents the first application of this type of data on a large scale, operational basis. It had been established that the use of JGMs and LTTAs could improve maintenance efficiency. However, it was not known how well the new proceduralized data would be accepted by the users or what problems would be encountered in implementing and using the data in an operational environment. The study described in this report was designed to obtain answers to these questions.

Approach

Interviews, observation and questionnaires were used to evaluate the acceptance and usability of the new technical data. Data were collected in three phases, before implementation of the new data, shortly after implementation, and approximately six to eight months after implementation. In Phase I (approximately three months before implementation), interviews, observation and a short questionnaire were used to obtain a measure of the attitudes of technicians toward the use of proceduralized technical data and how well they expected to like to use the JGMs and LTTAs. In Phase II (six to eight weeks after implementation), observations and interviews were used to identify problems encountered in the implementation of the data and to obtain an indication of initial attitudes toward use of the new technical data. In Phase III (six to eight months after implementation), interviews, observation, and a 37-item questionnaire were used to measure user attitudes toward the data and to evaluate progress in overcoming problems encountered in the implementation of the data.

Results

The results of the interviews, observations, and questionnaires indicate that the program has been successful. The JGMs and LTTAs generally have been well accepted, although some resistance to change was encountered. The new technical data have generally been considered to be superior to the technical orders that they replaced.

Several factors were identified which had either a positive or a negative effect on the acceptability and usability of the data. Factors which had a positive effect on acceptance and usability included: size of the JGMs, clarity of the instruction, organization of materials, use of illustrations, and dual-level presentation of instructions. Negative factors affecting acceptance and usability included: resistance to change, errors in the data, requirements to use more than one volume for some jobs, inadequate provisions for storing the data, easily torn pages, difficulty in locating procedures, and implementation problems.

A number of problems were encountered in implementing the data, resulting in a negative impact on the acceptance of the data. These problems resulted primarily from poor communication regarding when and how the data are to be used and inadequate training on how to use the data. A number of recommendations are made in the report to facilitate the implementation of data for future programs.

Recommendations

The following recommendations should be considered by Air Force and other DOD agencies when job guide type technical data are being procured.

1. A thorough task analysis should be accomplished to provide the data base for the development of the technical data.

2. The contractor developing the data should be given free access to the subject equipment throughout the development process.

3. A thorough verification of the data should be accomplished.

4. Consideration should be given to use of the dual-level approach for presenting instructions.

5. More durable paper and binders should be utilized.

6. Training should be provided for all users on the use of the data.

7. A comprehensive implementation plan should be developed and utilized to insure a smooth introduction of the data.

8. Special provisions should be made to insure rapid correction of errors in the data.

PREFACE

This study was planned and conducted by personnel from the Personnel and Training Requirements Branch, Advanced Systems Division of the Air Force Human Resources Laboratory, Wright-Patterson AFB, Ohio.

Special acknowledgement is due SMSgt Padgett and SMSgt Humphries of Military Airlift Command Headquarters. Their initial support and Headquarters assistance made this study possible. The support provided by Mr. Les Hall of Charleston AFB, South Carolina and Mr. Sol Para of Norton AFB, California is greatly appreciated. Their assistance in arranging for interviews and scheduling technicians for sessions to complete the questionnaires made the study feasible under the limited time and manpower constraints.

The authors would also like to express their appreciation to the C-141 Technical Order Manager, Mr. James Ogburn of the Warner Robins Air Logistic Center, Robins AFB, Georgia for his support throughout the project. The information and support provided by Mr. Robert Middleton, the C-141 Job Guide Manager for Westinghouse Corporation, Hunt Valley, Maryland, is also appreciated.

Finally, special recognition is due to Mr. John W. Seifert (MSgt Ret) who provided leadership and able assistance as the AFHRL Technical Data Development NCOIC for the Job Performance Aids Research Program. Mr. Seifert has generously continued to provide support for this program as a member of Westinghouse Corporation.

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USER ACCEPTANCE AND USABILITY OF THE C-141 JOB GUIDE TECHNICAL ORDER SYSTEM

I. INTRODUCTION

It is generally acknowledged among maintenance technicians and personnel engaged in technical order research that the present Air Force technical orders are hard to use. Technicians complain that it is difficult to locate required information and that the information provided often is difficult to understand. Many believe that significant improvements in Air Force maintenance can result from the development and application of improved types of technical orders.

For several years various research projects have been conducted by the Air Force and other DOD agencies to develop improved technical orders (TO). Several types of improved technical data have been developed as a result of this reasearch. One new type of technical data has recently been adopted for use by the Air Force in the Air Force Technical Order Improvement Program. This type of data, called job guide manuals, is designed with the maintenance technician in mind. Emphasis is placed on providing all of the information that the technician needs to do the job in one place and insuring that it is written in a clear and easily understood manner. The job guide manuals are actually part of a complete system of technical data. The system is composed of job guide manuals (JGMs), logic tree troubleshooting aids (LTTA), wiring diagram manuals (WDM), general aircraft manuals (GAM) which provide general aircraft information on theory of operation, and maintenance support information manuals (MSIM) which provide miscellaneous information required to maintain the system. For convenience the entire system has come to be called the job guide system, or simply job guides.

This study was accomplished to answer questions about the usability and user acceptance of the new fully proceduralized type of technical manuals purchased for on-equipment maintenance of the C-141 aircraft. Many years of study and research have been devoted to the development of this improved type of technical data. Very little information exists, however, concerning the users' attitudes toward the new data, or whether it is, in fact, easier for them to read and use. The purchase of job guides for the C-141 aircraft offered the first opportunity to study the user acceptance and usability aspects of the new proceduralized data in a large-scale operational environment.

Purpose

The information contained herein is intended to provide guidance to other Air Force and Department of Defense agencies as they prepare to purchase and implement job guide-type technical manuals.

The specific purpose of this project was to obtain data relative to the following questions:

1. How well are the job guides accepted by using personnel? What characteristics do the technicians like? What characteristics do they dislike?

2. Are the job guides usable? What characteristics make them easier to use? What characteristics hinder their use?

3. What problems are encountered in implementing the job guides? How can problems encountered be corrected and avoided in future job guide program?

Background

The development of proceduralized data resulted from the recognition that traditional Air Force manuals often did not adequately support the user in the work situation. Complaints from the users about the difficulty of finding and understanding specific information in technical manuals are long standing. A study by Losee, Allen, Stroud, and Ver Hulst (1962) identified specific problems with Air Force technical manuals, such as incomplete data, information hard to find, information too difficult to read and understand, and lack of specific instructions.

The first major effort in the development of proceduralized data was the Presentation of Information for Maintenance and Operations (PIMO) project (Serendipity, Inc., 1969). PIMO was an Air Force project conducted by Serendipity, Inc., from 1964 to 1969. Under the PIMO project, fully proceduralized instructions for non-troubleshooting tasks (similar to job guide manuals) and simplified maintenance dependency charts (MDC) for troubleshooting tasks on the C-141 aircraft were developed and tested. The proceduralized data were characterized by short, easy-to-read instructions, contained in a small, pocket-sized book, that gave step-by-step directions on how to do a job. A large-scale field evaluation was conducted. The results indicated that inexperienced mechanics could do non-troubleshooting tasks with no errors with the PIMO data. Experienced mechanics worked at a slightly faster pace, also with no errors.

Further studies by the Air Force Human Resources Laboratory (AFHRL) refined the format for presenting proceduralized instructions and extended the proceduralized concept to include coverage of troubleshooting tasks. In addition, refinements were made to the procedures used to develop proceduralized technical data. The refinements include procedures for task identification and analysis, matching training and technical data requirements, and assuring that instructions are written at a level of detail that is appropriate for the intended user. These requirements and procedures are specified in Joyce, Chenzoff, Mulligan, and Mallory (1973a). For a description of AFHRL research in this area, see Foley (1973).

In 1972, the Air Force Logistics Command (AFLC) initiated its Technical Order Improvement Program to replace the traditional TOs on selected older aircraft. Under this program proceduralized job guide technical orders for the C-141, B-52, KC-135, and F-106 aircraft are being or have been procured. The C-141 job guides were the first produced under this program. Recently, the Air Force has directed that proceduralized job guides will be procured for organizational maintenance for all new weapon systems. Job guides will be procured for the F-16, A-10, the B-1, and the advanced medium short take-off and landing transport (AMST).

Description of C-141 Job Guides

The C-141 job guide TO system constitutes a family of technical data for all on-equipment maintenance of the C-141 aircraft. Technical orders supporting in-shop work were not changed.

Although the complete family of TOs is commonly called job guides, in actuality the job guide is just one of five distinctive types of manual provided. All of the manuals are presented in the 8 1/4″ by 10 3/4″ format, except for the job guide itself, which is presented in the 4″ by 8″ format.

Job guide TOs are generally characterized by clear, concise information, specific illustrations located near the text, and the use of standardized verbs to prevent confusion. All information required to do a task, such as procedures, tools, test equipment, personnel, safety, etc. are given to reduce or eliminate referencing to other TOs. A special effort generally is made to present instruction at the level of detail required by the projected user.

The job guide family of TOs consists of the following five kinds of data.

Job Guide Manual (JGM). Job guide manuals provide step-by-step instructions for all commonly performed tasks except troubleshooting. A job guide is provided for each job. The job guide consists of a preliminary information page, one or more pages of step-by-step instructions, and a fold-out page of illustrations showing the components referenced in the instructions. (See Figures 1 and 2 for sample pages.) The preliminary information page (called Input Conditions) provides the technician with information that he needs to begin the job. This includes parts and supplies requirements, personnel requirements, and safety information. The input conditions page is followed by step-by-step instructions telling exactly how to do the job. The instructions are written at two levels of detail. The general instruction (e.g., remove the gear box) is given in bold-face print. Detailed instructions for accomplishing the sub-task follow the bold-face instruction. If the technician is experienced and fully qualified on the task, he may follow the bold-face instructions only. If he does not know how to do the task, the detailed instructions are there to guide him. The step-by-step procedures are followed by the fold-out illustration page. All components referred to in

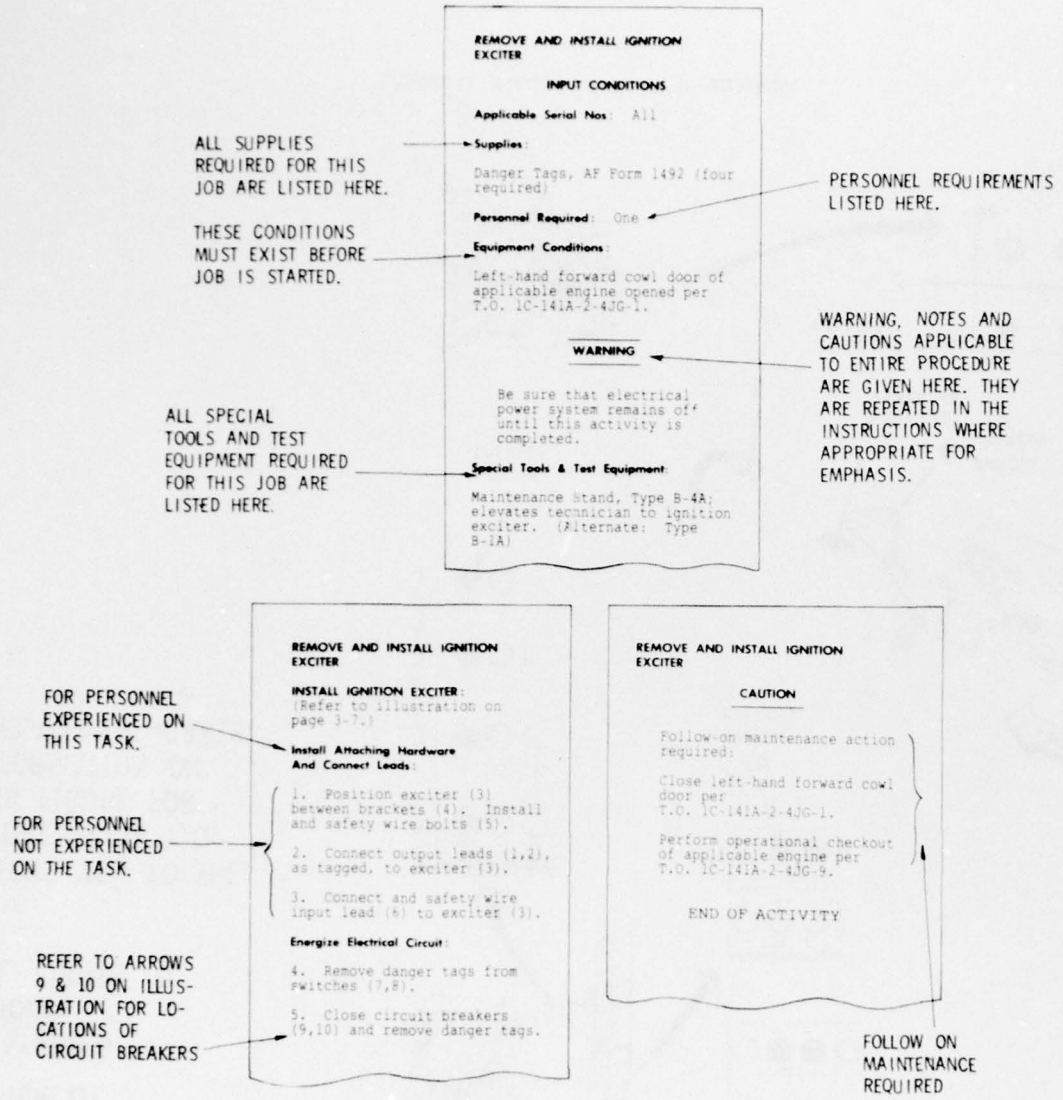


Figure 1. **Sample Job Guide Materials.**

REPLACEMENT PARTS:

IGNITION EXCITER (3)

REFER TO ILLUSTRATED
PARTS BREAKDOWN,
T.O. 2J-TF33-14, FIGURE 60.

REFERS YOU TO THE APPROPRIATE T.O. AND FIGURE FOR INFORMATION ON REPLACEMENT PARTS.

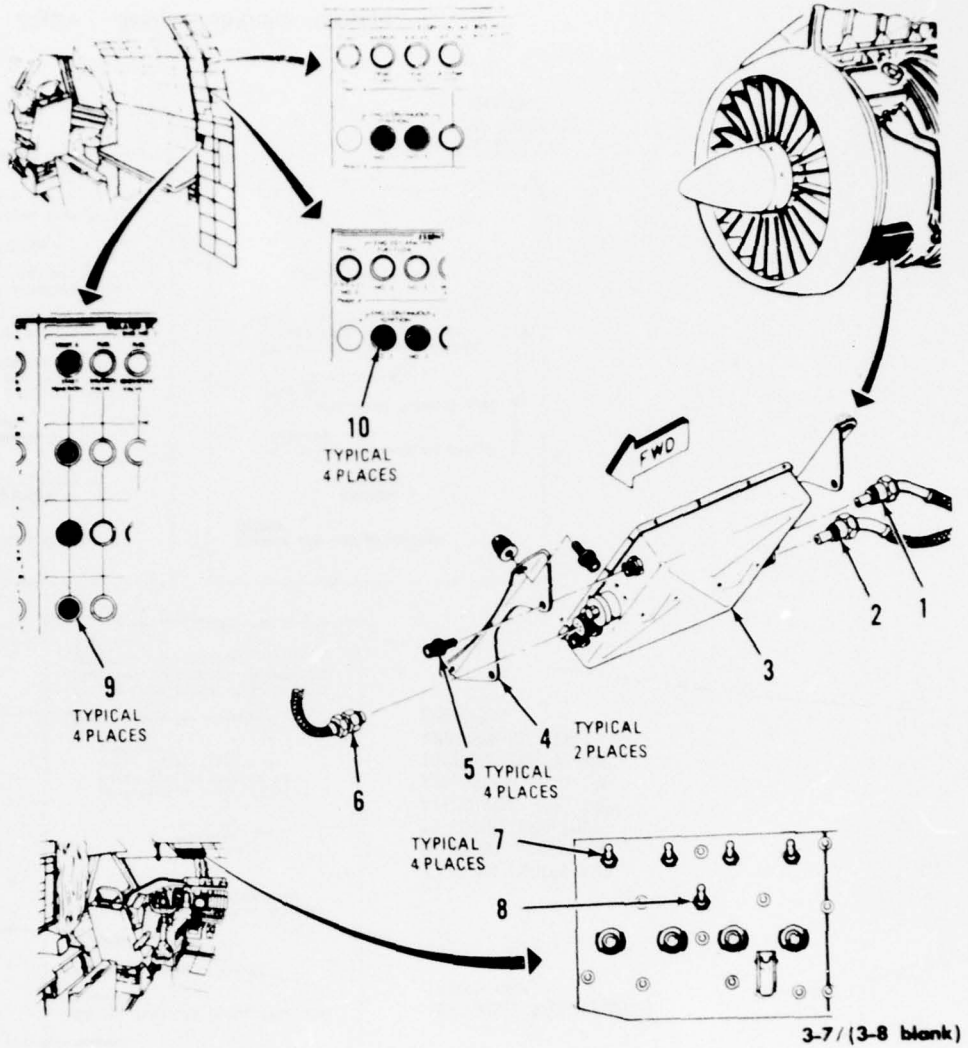


Figure 2. **Sample Job Guide Illustrations.**

the instructions and their location on the aircraft are illustrated on this page. Numbered arrows are used to key the illustration to the instruction. For convenience, job guides are printed on 4″ by 8″ paper and packaged in small, looseleaf binders.

Maintenance Support Information Manual (MSIM). A maintenance support information manual is used to present information which may be required by the technician but which is infrequently used or is not appropriate for presentation in the job guide or troubleshooting manuals. It includes lists of special tools and test equipment, required charts, graphs, tables and statistical data which cannot be included in a job guide, and precedures for tasks which are infrequently accomplished. If the MSIM is required for use on a job, the job guide will (in most cases) include it in the special tools and equipment section of the Input Conditions page.

General Aircraft Manual (GAM). The general aircraft manual provides general information about the aircraft which may be required by technicians or other specialists. It includes a description of the aircraft (including general arrangements, dimensions, station diagrams, walkways, etc.) and system functional descriptions.

Wiring Diagrams Manual (WDM). This manual provides diagrams of all aircraft wiring and drawings showing the location of connectors, ground points, terminal boards, and splice areas. A coordinate system is used with the C-141 wiring diagrams to facilitate location of specified wiring.

Logic Tree Troubleshooting Aids (LTTA). Troubleshooting information is presented in a logic tree format. When troubleshooting a system, the technician first identifies the malfunction symptom by performing a system checkout using the checkout procedure in the job guide manual. He then refers to a listing of malfunction symptoms. The listing of malfunction symptoms can be found in two places – a troubleshooting index volume and at the front of the section of troubleshooting procedures for each symptom. The listing either specifies the corrective action or refers the technician to a troubleshooting procedure called an action tree. The action tree gives step-by-step instructions for isolating the fault. The instructions are presented in a logic tree format. The outcome at each check (step) determines the next step to be taken. The tree is followed until the cause of the malfunction is identified. The logic tree troubleshooting aids are supported by illustrations similar to those provided with the job guide manuals. Numbered arrows are used to key the illustrations to the instructions. For easy reference, the illustrations are printed on fold-out pages. For the more complex systems, functional wiring diagrams are also included with the troubleshooting procedures. These diagrams follow the illustration page. (See Figure 3 for sample LTTA materials.)

Development of the C-141 Job Guides

The C-141 job guide TOs were procured by the AFLC as part of its Technical Order Improvement Program. The data were produced under contract by Westinghouse Corporation in accordance with a modified version of MIL-M-38800A. The military specification, MIL-M-38800A, was modified by the addition of the requirement for a task analysis. This requirement was included to insure that all tasks were identified and that the procedures developed were accurate and effective. The requirement was included at the request of the using command, Military Airlift Command (MAC), with the concurrence of the procuring agency, Warner Robins Air Logistics Center, Georgia.

Other features of the job guide contract included a warranty on the data, complete contractor access to the aircraft, and 100% "hands-on" validation and verification of the data. It is felt that these features, together with a thorough task analysis, had a positive influence on the quality of the data produced.

In addition to a task analysis, contractor access to the equipment and 100% "hands-on" verification and validation, AFHRL believes that a trade-off between training and the job guide coverage and a user assessment process add significantly to the completeness and accuracy of the data. Recommended procedures may be found in Joyce, Chenzoff, Mulligan, and Mallory (1973b).

SECTION V

HYDRAULIC SYSTEM NO. 3

5-1. This section contains troubleshooting information for the No. 3 Hydraulic System. Malfunction symptoms that may be observed during operational checkout of the system are listed in table 5-1, together with a reference to the appropriate troubleshooting action tree or directly replaceable component as applicable. Refer to figure 5-1 for location of system components and troubleshooting test points. Refer to T.O. 1C-141A-2-1GA-2 for No. 3 Hydraulic System Fluid Flow Schematic.

NOTE

Lighted panel indicators have two bulbs. If any indicator is half lit prior to start of troubleshooting, replace defective bulb.

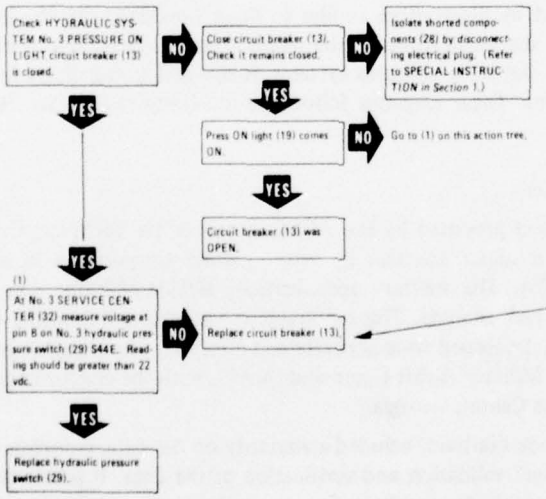
Table 5-1. No. 3 Hydraulic System Index of Malfunction Symptoms

MALFUNCTION SYMPTOM	ACTION TREE NO. OR FAULTY COMPONENT
No. 1 Pump Does Not Run With Switch At Flight Station	AT 5-1
Emergency Brake Pressure Reads More Than 1500 PSI But Pressure On Light Is Not On	AT 5-2
Press On Light Is On But Emergency Brake Pressure Reads Less Than 1500 PSI	AT 5-3
No. 3 Hydraulic System Pressure Gage Does Not Indicate Pressure	AT 5-4
Emergency Brake Pressure Reads Less Than 2850 PSIG Or More Than 3150 PSIG	AT 5-5
Emergency Brake Pressure Gage Fluctuates More Than 75 PSI When Tapped	Gage (17)
No. 3 Hydraulic System Pressure Gage Fluctuates More Than 75 PSI When Tapped	Gage (22)
Emergency Brake Pressure Drops Off Rapidly When Brakes Are Actuated With No. 1 Pump Off	AT 5-6

GO TO ACTION TREE 5-2.

REPLACE GUAGE (IDENTIFIED BY ARROW 17 ON ILLUSTRATION *FOLDOUT*)

AT 5-2. HYDRAULIC SYSTEM NO. 3 EMERGENCY BRAKE PRESSURE READS MORE THAN 1500 PSIG BUT PRESS ON LIGHT IS NOT ON



IDENTIFIED BY ARROW 13 ON ILLUSTRATION FOLDOUT.

Figure 3. **Sample Logic Tree Troubleshooting Aid Materials.**

Approach

Information about the acceptance and usability of job guides was desired in order to guide future efforts to develop and use such improved technical data for maintenance. This type of information is not available elsewhere in the studies of proceduralized data, yet it is very critical to the ultimate success of such a drastically different TO program.

A plan calling for a three-phase approach was developed. Support for the study was provided by the Office of the Assistance Secretary of Defense for Installations and Logistics (OASD I&L), Headquarters Air Force (HQUSAF/LGYE/RDPS), Air Force Systems Command (AFSC), AFLC, MAC, and AFHRL.

The three phases of the study required data to be collected before job guides were implemented, during the implementation of the job guides, and eight to ten months after the implementation of the new job guides. Specifically, the three phases of the study were:

Phase I. The purpose of this phase was to collect attitudinal data from the user population before the job guides were implemented at their base. A questionaire was developed to collect the attitude data. The questionnaire contained a sample page out of the job guide series, along with a brief explanation about how they were to be used. A series of questions followed the sample page and the explanatory material. Interviews were also conducted with supervisory personnel.

Phase II. The purpose of this phase was to collect attitudinal data and identify problems encountered at the time of implementation. This was accomplished by the use of interviews, questionnaires, and observation shortly after the week of implementation at the bases. Implementation problems and schedule conflicts forced a delay of this phase. Phase II data were actually collected eight to ten weeks after implementation.

Phase III. The purpose of the third phase was to collect attitudinal data and observe progress on resolution of problems after the data had been in use for several months. This phase was conducted approximately eight months after implementation of the job guides. This time period was selected to permit data to be collected after the job guide program had stabilized. It was felt that early administrative and usage problems would be corrected by the time Phase III started. User attitudes were also expected to have stabilized by this time period. Questionnaires, interviews, and job observation were used to determine user acceptance of the job guides and to identify problems resulting from their daily use.

C-141 Job Guide Implementation

The job guides were implemented at two MAC locations, Charleston AFB, SC, and Norton AFB, CA, prior to the MAC-wide implementation in March and April 1976. The purpose of the two-phase implementation was to identify and correct errors and usage problems before the job guides were implemented at the remaining MAC bases.

The data contained in this study were gathered at Charleston AFB and Norton AFB between June 1975 and June 1976.

II. PHASE I – BEFORE IMPLEMENTATION

The objective of Phase I was to gather baseline data concerning attitudes toward proceduralized technical data before job guides were introduced at the two bases. These data would then be compared with Phase III data to be collected after the manuals had been in use at the bases for six to eight months.

A questionnaire was developed to collect the data on the technicians' anticipated reactions to the JGMs. The questionnaire contained a typical page of instructions and a page of illustrations which supported the instructions. Explanatory material was provided to inform the readers about the origin, purpose, and expected use of the job guides. Eight questions followed the sample job guide materials. These

questions asked the reader to consider the features of job guides, and then to project how he might feel about using them every day on his job. The questionnaire is contained in Appendix A. The questions were also incorporated in a second questionnaire to provide a basis for a direct before and after comparison. This questionnaire was administered during Phase III.

AFHRL personnel administered the questionnaire at Charleston AFB, SC and Norton AFB, CA, in June 1975. An introductory briefing explaining the project and the assistance required from each base was presented to the Deputy Commander for Maintenance at each base. The AFHRL representatives then coordinated with the Maintenance Superintendent and the Superintendent of each maintenance squadron to provide personnel to complete the questionnaires. Approximately 40 technicians who regularly used flight line technical orders on the C-141 aircraft were requested from each maintenance squadron at Charlestown AFB and Norton AFB. It was requested that the personnel selected from each of the three squadrons at each base be representative of the grade, skill level, and Air Force specialty codes (AFSC) of that squadron. Each shift was to be represented also. In accordance with instructions from HQ MAC, the participation of the personnel was on a noninterference basis.

A training room or conference room was made available in each squadron to permit the questionnaires to be administered in a semi-controlled environment. The maintenance personnel reported to the room as scheduled by their squadron. A short introductory briefing was given to each group. The briefing identified the AFHRL personnel, and presented introductory material about the job guide program. The origin and purpose of the questionnaire was also explained. Instructions were then given for completing the questionnaires. Participants were instructed that names were not to be put on the questionnaire, and that there was no time limit.

The results of the questionnaire are presented in Section V. They are presented and discussed in relation to the results of the questionnaire administered in Phase III.

Interviews were conducted with most shop chiefs and many flight line supervisors to obtain an indication of their feelings about the existing technical orders and the proposed job guide system. Interviews were also held with several experienced technicians encountered at random in the shops or on the flight line. The interviews and informal discussions with the technicians and supervisors revealed that, although they were able to get the job done with the old TOs, they considered them to be relatively poor TOs. Many of those who have had experience with the TOs for other aircraft systems indicated that the C-141 TOs were among the poorest that they had used. Several complaints were made against the existing TOs. These included:

1. It is often very difficult to locate required information or procedures.
2. Required information or procedures are sometimes missing.
3. Information and procedures in the TOs are sometimes unclear and difficult to understand.
4. Troubleshooting information is often incomplete or inadequate.

Sample job guide manuals were shown to those interviewed and the job guide program was described. Although only three months remained until implementation at Charleston AFB and only four months unitl implementation at Norton AFB, few of the supervisors and officers had very much knowledge of the program. (Those at Charleston AFB were somewhat more knowledgeable since the job guides had been validated there.) Many misconceptions existed about who was to use the data and how. The content and format of the data were not well understood and many were not aware of the planned implementation dates. The Field Training Detachment (FTD) personnel, who use TOs to teach C-141 maintenance classes, were not aware that the official data would change in the next few months until AFHRL personnel briefed the units at both bases. No plans existed to provide training on the use of the job guides or to base their classes on the new job guide TOs.

When shown the sample job guides, most supervisors and technicians expressed positive responses to the data. They generally liked the size, the extensive use of illustrations, and the proceduralized format used for presenting instructions. Several supervisors indicated that they felt that the job guides would be

very good for inexperienced personnel. However, some expressed concern that highly experienced technicians may resist using such detailed step-by-step procedures. Experienced technicians also expressed this concern. This concern was usually relieved when the dual level feature was explained. Supervisors also expressed concern that the small size of the job guide manuals would make them easily lost and that there would probably be a problem with torn pages unless the job guides are printed on much better paper and placed in a better binder than the sample.

III. PHASE II – IMPLEMENTATION

The purpose of Phase II was to collect data on initial user reactions to the job guides during the week of implementation at each base. Unfortunately, so many problems were encountered during implementation week at Charleston AFB that the job guides were not used very much. (See Special Problem Areas for a discussion of implementation problems.) It was felt that sufficient, valid data could not be collected at this time. An alternate Phase II data collection period was selected – that of 6 to 8 weeks after implementation.

The alternate Phase II data were collected at each base approximately six weeks after implementation. These data then represent the early learning period after the initial exposure to the job guide family of TOs. The base personnel at this time were emphasizing using the job guides and identifying as many errors as possible. The following observations and user comments represent this intensive search for user problems. The many positive observations and user comments also are summarized in this section.

The findings are presented under the headings of user acceptance and usability. As defined in Section I, user acceptance refers to the attitude of the users toward the data. This will be discussed in sections identifying positive and negative acceptance factors and the impact each has on the use of the data. Usability is a related term used to identify factors which encourage or discourage the normal use of the new data on the job.

Acceptance

Several factors influence the willingness of technicians to accept the new technical data. These factors are discussed in the following paragraphs.

Positive Acceptance Factors

The following factors were found to have a positive influence on the acceptance of the new data.

1. *Size of Job Guide Manuals.* With very few exceptions, the technicians indicated that they liked the size of the manuals very much. They are easier to carry and easier to use. Some supervisors suggested that technicians may be more willing to use technical data because it is more convenient. Other saw the small size as a potential disadvantage in that the size will make it too easy for the books to be lost or inadvertently carried away.

2. *Procedures are easy to read and understand.* Many technicians indicated that they liked the clear, concise manner in which the books are written. The writing is clearer than the old TOs, and in many cases, more thorough than the old TOs.

3. *Presentation of instructions.* Most technicians liked the way the instructions are presented in the job guides. They liked the input conditions page which tells them how to prepare for a job, the step-by-step instructions which tell them exactly what to do, references which tell them where to look in the illustrated parts breakdown (IPB) for parts information, and instructions which tell what, if any, follow-on maintenance is required.

4. *Illustrations.* Most technicians liked the job guide's fold-out illustrations which are keyed to the procedures. The illustrations show the technician exactly where the component is located on

the aircraft. Also, where appropriate, exploded views of the components are provided. The job guide manuals provide illustrations of all components referenced in the procedure. The old TO system did not provide illustrations of all components. Consequently, it was not uncommon for time to be lost attempting to locate a given component. Time is also saved by locating the illustraions very near the procedure they support. In the old TO system, illustrations were scattered throughout the manual and time was lost flipping back and forth. The quality of the illustrations in the JGMs and LTTAs was considered by most technicians to be very good. Some poor illustrations were also identified. The poor quality of most of these appeared to be due to poor printing.

5. *Dual-Level Presentation*. A concern in the use of the job guide approach was that the high level of detail would offend experienced technicians. To avoid this reaction, a dual-level presentation format was used. The format provides a general instruction printed in bold face (e.g., **Remove Connector Assembly**) which is followed by detailed instructions (e.g., how to remove the connector assembly). To satisfy TO use requirements (as interpreted by MAC) the experienced technicians (fully qualified on that task) need follow only the general instructions. If the technician does not know how to do the job, the detailed instructions are there to guide him step-by-step. The experienced technicians like the dual-level presentation. If it were not for this feature, there probably would be significant resistence to the job guides on the part of these technicians. It is likely that they would not accept the job guide manuals without excessive coercion.

Negative Acceptance Factors

1. Resistance to Change. There is a natural tendency to resist anything new that alters one's normal everyday way of doing things. This tendency was evident among maintenance personnel at both Charleston AFB and Norton AFB. As would be expected, it was most evident among the more experienced technicians, especially the civilians. These personnel were thoroughly familiar with the old TOs and knew exactly where to find what they needed. The new data were just something else to get used to. A surprising number of those who expressed dislike or indifference to the data indicated that the problem was primarily a matter of resistance to change and that they will probably like the data after they used to it.

2. *Errors in the Data*. Errors and omissions in the data created a serious problem in gaining acceptance of the data. For those who were inclined to resist the new data, errors provided a convenient excuse not to use it. There were many errors in the data. However, the error rate did not appear to be any greater than would be expected for any new TO. Procedures for identifying and correcting the errors through the AFTO Form 22 system appeared to be working. The prevailing attitude among most technicians seemed to be that there are errors, errors are to be expected, and that they will have to work around them until they are corrected. AFLC and MAC personnel were doing an outstanding job of identifying errors and getting the corrections authorized.

3. *Problems in Implementation*. Problems encountered in introducing the data at Charleston AFB and Norton AFB may have contributed to the reluctance of some to accept the data. As expected, many problems were encountered in introducing the data at the two bases since this represented the first large scale attempt to implement this type of data in an operational unit. A major goal of introducing the data at these test bases was to identify problems so that they could be avoided at other bases. Some of the major problems which had an impact on acceptance are discussed briefly below:

a. A significant communication problem was encountered. The chain of command was relied upon as the major means of getting information to the working technicians. This approach did not prove to be completely effective. Technicians were found at Charleston AFB several days after the data were implemented who did not know that they were to be using them (one did not know what they were).

b. Adequate instruction on the use of the data was not provided. At Charleston AFB the primary training given was a roll call briefing given by a Westinghouse Corporation representative. The training provided basic information, but was not sufficient to give an adequate understanding of the system. The job guides themselves are not difficult to use. The problem was that the technicians did not adequately understand what is contained in the other volumes (LTTA, MSIM, WDM and GAM) and how to find the information. Many technicians were not aware of the other volumes or their content.

c. The policies for use of the job guide manuals (primarily the dual level feature) were not adequately explained to the technicians. Some technicians were reluctant to apply the dual level aspect because they were afraid that they would be written up by quality control inspectors. Several questions regarding the general policies for the use of job guides were identified during the early phases of the implementation. Policies had been developed for most of these. However, it could not be determined that these policies had been specifically stated in official documents from MAC. As a result, some uncertainties remained among maintenance personnel.

d. Adequate provisions were not made for storing the JGMs on the aircraft. Initially, at Charleston AFB, the job guide manuals were placed on the aircraft in a large cardboard box. This procedure proved to be entirely unsatisfactory. The manuals soon became jumbled and it became a very time consuming task to find a specific manual. This tended to discourage use of the job guide manuals. A rack for storing manuals on the aircraft has been designed. At the time the Phase II data were collected, installation was pending approval from MAC. The storage rack should alleviate the problem. Norton AFB was unable to obtain sufficient job guide binders to place them on the aircraft. The manuals were being kept on the various dispatch trucks. This approach was more effective than the boxes used at Charleston AFB. However, the manuals were still not as readily available as is essential to encourage maximum use.

Usability

Many of the factors which encourage use of the data also encourage the users to accept the data. The following five factors discussed here were also identified and discussed as positive acceptance factors. This discussion, however, will emphasize the impact these factors have on the use of the new data on the job.

Positive Usability Factors

The following were identified as factors which encouraged the technicians to use the data.

1. *Size of the Job Guide Manuals*. The physical size and characteristics of the 4" X 8" format encourage the worker to pick it up and carry it to the job site. The small size and the ability to lay flat and open also encourage its use in the often confining work area. The traditional TO was larger, heavier, more bulky, and hard to carry and use on the job. The technician is more likely to carry and use the smaller, more readily available job guide than he is to leave the immediate work area to go to the aircraft TO file to look up the necessary information in the old, larger format TO.

2. *Procedures are easy to read and understand*. The new data provides for quick understanding of what is to be done. The language uses verbs that have standard application throughout the data. This eliminates one source of confusion. The step-by-step instructions are intentionally kept to the minimum number of words required to convey the meaning. The technicians are able to read the step once and understand what is required.

3. *Presentation of Instructions*. The completeness of the information encourages use on the job. The job guide contains all of the information that should be required to complete a given task. The input conditions identify the tools, equipment, spare parts, personnel, and equipment conditions necessary for successful task completion. Step-by-step instructions are keyed to accompanying illustrations to provide detail and location information. Reference information to help locate any required parts in the illustrated parts breakdown is given on the illustration page. Any requirement for follow-on maintenance is specified and the appropriate reference given at the end of the task procedure. Almost no referencing to other manuals is required to accomplish a given task.

4. *Illustrations*. The quality and quantity of the illustrations encourage the use of the data. They provide location and detail views of referenced components and are fully keyed to the text. The illustrations are also located very close to the appropraite page of instructions, and the fold-out feature enables the use of the illustration as if it were located on the page facing the text. Generally, the illustrations seem to have the proper amount of detail to convey information without confusion.

5. *Dual-Level Presentation.* As described in Section I, the dual-level presentation provides a general task statement for use by the experienced technician, followed by detailed task steps for the less experienced individual. Each job guide, then, provides adequate instructions for both the experienced and inexperienced technician. This feature encourages the experienced man to use the technical data for a quick review of the steps of the job, or of the accompanying illustrations. The less experienced technician is encouraged to use the job guide because it provides virtually all of the information required to do a job.

Negative Factors Influencing Usability

The new C-141 technical data is, for the most part, easier to use than the old C-141 TOs. The instructions are clearer, procedures are more complete, and illustrations are easier to use and of better quality. The size of the job guide manuals makes them easy to use and increases the likelihood that technicians will use technical data. The dual-level presentation feature, as it was being applied by MAC, makes it easier for technicians to satisfy technical data requirements.

Although the new data is much more "usable" than the old TOs, a number of problems have been identified which reduce their usability and hinder their acceptance by technicians. Most of the problems are fixable provided that sufficient resources are made available to make the necessary modifications. The negative factors identified in visits to Charleston and Norton Air Force Bases are discussed as follows:

1. *Number of Volumes Required.* The original job guide concept was that all information required for a job would be provided in one job guide and that job guides would be packaged to keep the number of volumes required for related tasks at a minimum. This concept has not been completely satisfied in the new C-141 data. The most frequently heard complaint at both bases was that too many books are required to do a job. For example, a brake repair requires one volume to bleed and refill the system, a second volume to repair the brake, and a third volume to operationally check the repaired brake. In some instances, an additional volume (MSIM) may be required for tolerances and specifications. A troubleshooting task requires as a minimum a job guide volume for the checkout procedure and a troubleshooting volume. If the logic tree troubleshooting aid does not isolate the problem, the wiring diagram volume and the general aircraft manual may be required. Some tasks in the engine area require use of tables and charts specifying allowable nicks and required pressures and temperatures. Thus, these tasks require the MSIM in addition to the job guide. The requirement for using several books has proven to be quite frustrating to technicians in specialties such as hydraulics and aero repair which work on the entire aircraft. This can be a problem when the requirement for an additional book is not discovered until the technician is in the middle of the job. It may be that the job guide volumes are organized in the most efficient manner possible. However, the frequency of complaints makes this an area worthy of examination. This problem should be given special consideration by Air Force agencies procuring job guide manuals for other weapon systems.

2. *Storage of the Data.* Although the small volumes are convenient to use, the size and type of binder present several problems. The size limitations on the job guide manuals resulted in production of a large number of volumes (63). The number of volumes increases storage requirements and makes the job of keeping track of the volumes and preventing loss of the manuals a difficult one. The storage problem is compounded by the inadequate binder used to bind the job guides. The binders are of the loose-leaf type with soft covers. The soft covers make it difficult to stack the volumes on their side or stack them on end. As a result, a compartmentalized storage rack will be necessary to keep the volumes in a neat, orderly manner.

3. *Durability.* A problem has been encountered with the pages tearing out of the job guide manuals. This problem will become very serious as the books are used more and pages become lost. The page tearing problem seems to be the result of two primary factors, poor paper and the binder. The job guides are printed on poor quality paper which tears easily. This weakness is compounded by the rough edges on the binding rings of the notebook-type binder. These rough edges tend to tear the paper when the pages are turned. It appears that torn pages will be an even greater problem with the fold-out illustration pages which are not as well protected when in use. An additional contributing factor is that most of the pages have the

holes punched at the very edge of the page. Any slight pressure is enough to tear the page out. Also, the gummed page reinforcements cannot always be used to repair a torn page because the hole is at the edge of the paper.

4. *Illustrations.* The overall quality of the illustrations is good. However, some poor illustrations were found. These illustrations were poor, primarily because of the printing quality, not because of the content.

5. *Locating Procedures.* Serious indexing problems existed in the new technical data system. These problems appeared to be from two causes – inadequate indexes and tables of contents, and inadequate understanding of the system by technicians. Many technicians and supervisors reported spending several hours looking for a procedure – sometimes with success, sometimes without success. Part of the problem is due to the fact that the index volume covers only the job guide manuals. Many technicians were unaware of this and incorrectly concluded that a procedure does not exist when in fact it does exist but is in the MSIM. Others failed to find a procedure because the component involved was listed under a name other than the name by which it is commonly known. Accessing information in the data would be greatly aided by expanding the index to include all procedures, charts, diagrams, etc., included in the entire system. (As a result of this recommendation, the index has been revised to cover the entire job guide system.) Although the index itself was inadequate, it is believed that the major obstacles to locating information in the new data was that the technicians did not understand the system and use of the index. Training on locating the information should be an integral part of the data implementation program.

6. *Errors in the Procedures.* As indicated in an earlier section, there were a number of errors in the data. Some of the errors were serious enough that if the procedure was followed exactly, the job could not be done, or damage to equipment or personnel could result. Fortunately most of the personnel using the data were sufficiently experienced to recognize and work around such problems. Heavy emphasis on identifying errors and excellent cooperation by MAC, AFLC and the contractor resulted in relatively quick correction of serious errors in the data. The first corrections were in the field within the first three months of the program. This compares with the normal 12 to 18 months required for updates.

7. *Ineffective Procedures.* Technicians complained that some procedures were ineffective or inefficient. The authors were not technically qualified to evaluate these complaints. However, it was recommended that consideration be given to identifying and correcting any such procedures. Common complaints were:

a. The checkout procedures are too long. Technicians say that they frequently do not have time to complete the lengthy procedures. They also complain that in some instances they are required to go through the entire checkout when only a portion of the checkout would be adequate. They ask, "why check out the entire system after replacing a component when a few quick checks will tell if the component is functioning properly?" The technicians also complain that many of the quick checks used with the old TOs were not included, but were replaced with the new, longer checkouts.

b. The procedures require use of too many danger tags. The technicians say that the procedures require use of far more danger tags than the old TOs. They believe that many of the tags are not needed and that some are actually redundant. Since danger tags are a controlled item, any unnecessary use of the tags presents an unnecessary administrative requirement and a substantial increase in maintenance time.

8. *Omitted Procedures.* Although the new data cover many more tasks than the old TOs, technicians report that some tasks have been omitted. The authors did not attempt to locate all of these procedures. It is likely that some procedures were in fact omitted. Other missing procedures are probably somewhere in the job guides or MSIM and simply were not found.

9. *Manpower Requirements.* Procedures sometimes require more men than are normally used or available. For example, the aircraft recovery procedures require three technicians. Frequently, when several aircraft come in at the same time, there are not enough men available to assign three men to each aircraft. Supervisors stated that two men can handle the job. They were concerned about possible write-ups for not complying with the requirements of the technical data.

10. *Incomplete Troubleshooting Data*. Many common malfunction indications were not included in the malfunction indexes or covered by troubleshooting trees. As a result, the troubleshooting data were not fully capable of serving their intended purpose. It appeared that very little use was being made of the logic tree troubleshooting data. It was considered essential that these aids be given sufficient use to at least identify missing symptoms and errors in the data.

Special Problem Areas

Two problems were apparent during the Phase II data gathering period. The first concerned implementation procedures, and the second concerned the degree of utilization of the new data, especially the logic tree troubleshooting aids.

Implementation

Numerous problems were identified during the first week of implementation at Charleston AFB. Much could be said about the problems of this first week. Many classic problems common to any new program were present. The difficulty of transitioning a large group of experienced people from one type of technical data to another type was obviously underestimated. The simplified procedures encouraged everyone to assume that the data system would be easily understood. This perhaps could have been true if a short introductory training session had been provided to explain the format, contents, and use of the new data. This was not done. The informal briefings held at shift roll calls proved to be inadequate. Many problems seemed to center around the fact that the user did not know what kind of manuals (e.g., JGM, MSIM, or GAM) contained what kind of information. Many did not know that any type of manual but the job guide was even available. The lack of an index to the whole set of TOs further confused the legitimate attempts to locate information.

Another problem was that many people were not adequately informed about the program. Although the officers and senior NCOs generally were well informed about the project, the working level technicians often were confused. Many of the workers had very little knowledge about the new data, the test period and procedures, and the expected procedures for utilization of the data. This perhaps reflects the difficulty the shop supervisor has in getting all of his people together at one time for any intensive briefing while trying to support aircraft maintenance on a 24 hours a day, 7 days a week basis. Because of job requirements, extra duties, personal affairs, and administrative requirements, there will always be some who "didn't get the word." This observation further supports the requirement for a separate, short program to provide introductory training.

The lack of an overall guiding policy or plan for implementation was apparent in several ways. The project monitor at Charleston AFB was assigned shortly before implementation and did not have adequate time to organize the implementation. Command leadership was available in some areas, such as project briefings to staffs, but was not available in other areas, such as written policies for using the new data. The Field Training Detachment (FTD) of Air Training Command (ATC), which uses the official TO to provide system-specific training, was not aware that the TO was being changed. Many people at base level thought that the program was a test of the new data, rather than a replacement of the old data. This led people to retain the old TOs and use them instead of the new TOs. A comprehensive plan developed by the Command Headquarters personnel and coordinated by the bases could have foreseen some of these problems. Project monitors could have been identified and trained in advance of implementation. A training program could have been developed to familiarize users with the data. Command policies and program requirements could have been provided in written form to prevent misunderstanding. With advance planning, the training could have been provided by the FTD. This would have both provided the training and involved FTD in the program at an early point.

As previously noted, these implementation problems hindered the actual use of the data during the first week. Some of the problems were solved early in the week; others lingered to hinder usage weeks afterward.

Utilization of Data

The second problem observed early in Phase II was a general lack of use of the new data. It is felt that the problems discussed previously had considerable impact on the actual utilization of the data. For example, the availability of the old, familiar TOs, coupled with the lack of knowledge about the new TOs discouraged the use of the job guides during the first week of implementation. This situation was improved somewhat by the removal of the old TOs from all shops, aircraft and vehicles. The difficulty the users experienced in locating information discouraged the use of the job guides, as did the confusion over how the data was to be used. Early in the implementation period, a heavy emphasis was placed on identifying the errors in the data so that they could be corrected quickly. This emphasis encouraged the users to read the job guides carefully and identify the errors. This same emphasis, however, was not given to the logic tree troubleshooting aids. Very little attempt was made to use the logic trees during the confusion of the first week of implementation. Again, no training had been given, and very few people understood how they should be used. Also, some of the lack of use of logic trees can be explained by the fact that most of the troubleshooting assignments go to experienced people. Rather than use data they were not familiar with, many technicians worked without TOs whenever possible, using the logic trees only when everything else failed.

At the time Phase II information was actually collected, some six weeks after implementation at both bases, a noticeable improvement had been made in the use of the new data on the job. An extensive survey of jobs in progress on the flight line and in the docks revealed that most of the people used no technical data at all. However, several technicians were found using the data, including the logic trees. This increased utilization, although not ideal, represented the increased emphasis by management and acceptance of the data by the users. Use of the logic trees still lagged behind the use of the job guides. Several reasons existed for this situation. These included:

1. The technicians who generally were called upon to do the troubleshooting had a high degree of experience and confidence in their ability. Their approach seemed to be to use technical data only when their own experience had failed to locate the problem.

2. Many technicians condemned the logic trees as being poor data without having used them. Apparently most technicians had not used good troubleshooting data, and therefore had little confidence in any troubleshooting data.

3. In many cases, the troubleshooting procedure was much longer (in steps and time required) than the technician's own procedures—based on his own experience. The logic tree, therefore, generally was used more when time was not critical, or when all other sources had failed.

4. Officers and supervisors seemed generally unfamiliar with them, and apparently did not encourage their use to solve troubleshooting problems. The resulting problem was that the troubleshooting data was not being adequately reviewed in all shops to identify errors and omissions.

Discussion and Recommendations

Although Phase II identified several problems with both the data itself and with the initial implementation at Charleston AFB and Norton AFB, it was determined that the initial development and utilization of C-141 job guides were successful. Errors certainly were present in the data, but probably to no greater extent than would be found in any conventional TO development. Considering the very detailed step-by-step nature of the job guides and logic trees, the error rate probably is satisfactory.

The implementation of the new data at Charleston AFB and Norton AFB was not as smooth as all would have wished it to be. However, it was not unusual for unanticipated problems to occur since this was the first large scale application of the job guide concept in a MAC operational unit. It simply was not possible for MAC to anticipate and avoid all of the problems. Considering the time constraints and the resources available, MAC personnel did an excellent job of introducing the new data. The lessons learned at Charleston AFB and Norton AFB did improve the implementation of the data at the remaining MAC bases and enroute locations.

It should also be noted that AFLC, MAC, and the contractor responded favorably to the recommendations made available to them in December 1975, and contained in this report. Many of the recommendations were adopted; others were reviewed and changes were made where possible. The most important change was the development of a new index, in accordance with the recommendation contained in the report. Also, the storage of the job guides on the aircraft was improved with the development of a specially designed storage box. Several procedures were reviewed for manpower requirements and procedural efficiency.

The special program established by AFLC and MAC did an excellent job of identifying and correcting problems in the job guides. MAC also began to emphasize the use of the logic trees so that errors could be located and corrected in them.

The people most concerned with the C-141 job guide project such as the officers and senior NCOs at the bases, MAC Headquarters personnel, AFLC TO personnel, and AFHRL personnel, felt that the initial implementation was an overall success, despite the obvious problems. It is doubtful that any new TO program could have survived the intentional scrutiny of so many individuals and groups any better than the C-141 program did in its first implementation period. The general attitude of the users and their supervisors and managers at the bases remained positive and optimistic about the program. They were also encouraged by the improvements in the program authorized by MAC, AFLC, and the contractor. All signs indicated that the job guide program would have a positive impact on C-141 equipment maintenance.

Based on observations at Charleston and Norton Air Force Bases and the above analysis, several recommendations were made. The recommendations were presented as general recommendations applicable to any job guide procurement. It was recognized that application of some of the recommendations to the C-141 data would not be practical at the time. However, it was hoped that as many recommendations as possible would be applied to the C-141 program. These recommendations were made available to MAC and AFLC in December 1975.

1. *Indexing.* An effective indexing system was needed which indexes the entire data system, including job guides, maintenance support information manual, wiring diagrams, and general aircraft manual. Indexing should be by both systems and individual components or line replaceable units. When a component or system is known by more than one name, it should be listed under all names by which it is known. Other categorizations should be used as appropriate. Examples of the latter would be listings of tables of tolerances or specifications.

2. *Storage.* Suitable facilities are needed for storage of the data. The facilities should provide convenient access to the data to encourage use. Development of an adequate aircraft G file storage system is essential.

3. *Improved Binder.* A better type of binder for job guides should be found or developed. The present binder has a soft back which makes it difficult to stand upright for storage. Also, the rough edges on the binding ring tend to tear the pages. A binder is needed that lays flat when open, does not tear the pages, and has a hard back for easy storage.

4. *Grouping of Tasks.* Special consideration is needed to insure that job guides are grouped so that a minimum number of volumes are required for a task or series of related tasks. Consideration should be given to grouping checkout and troubleshooting information for a system in the same volume. In most cases in which a checkout procedure is used, a troubleshooting procedure will also be required. Grouping the checkout procedure, logic trees, and wiring diagrams in one volume would eliminate the need for using more than one book.

5. *Paper.* It is essential that at least the frequently used job guide manuals be printed on high quality, tear-resistant, waterproof paper. Experience at Charleston and Norton Air Force Bases clearly shows that lost pages will be a problem. The use of the more expensive paper may prove to be cost-effective since loss of a page invalidates the entire manual. Individual pages are not replaced.

6. *Manpower Requirements*. The job guides specify the number of personnel required for each task. Since it is not always possible to assign the specified number of personnel, supervisors are faced with a possible write up even though the task can be satisfactorily accomplished with the available personnel. A method needs to be developed to provide sufficient flexibility to accommodate these contingencies.

7. *Implementation*. The techniques used to implement the data at an installation are very important. It is essential that an effective plan be developed and implemented. (See Appendix E for guidance for developing implementation plans). The following specific recommendations are based on observed problems at Charleston and Norton Air Force Bases. They were made to improve the implementation of job guides at the remaining MAC bases. The recommendations, however, should remain valid for any command which plans to replace existing TOs with job guides:

a. Project monitors should be assigned at each base and enroute location long before implementation. Base project monitors should select squadron, branch, and work center representatives to assist them. It is crucial that the Maintenance Superintendent be knowledgeable of and actively participating in the local implementation. The project monitor from each base should meet with knowledgeable project leaders to gain firsthand information about the project.

b. Orientation materials should be prepared and made available to the project monitors. These materials should briefly explain what the job guide concept is, what it consists of, how to use the materials, and a suggested approach to base and squadron level implementation. Several short exercises to provide practice in finding specific information should also be included. These exercises could then be used by shop and shift chiefs to familiarize their people with the new TOs.

c. The Director of Logistics and the Chief of Maintenance at each base should be informed of the position of the Command Headquarter's Director of Logistics on the implementation, support and use of the job guides in the operational environment. This should be done by official correspondence from the Director of Logistics or in a meeting chaired by him. This action would insure solid support of the job guides at base level and would also answer key usage questions.

d. Greater use should be made of the base level training capability. Command Headquarters training group should prepare a short training class on the contents, uses, and advantages of job guides. This course should then be taught to all incoming maintenance personnel at the bases. It should be required of all maintenance personnel (including officers and senior enlisted personnel) prior to implementation. This should be done in addition to the shop level emphasis discussed in paragraph 7b. In all training situations the user should actually perform several exercises which require him to look up certain information in the job guides, the maintenance information support manual, the general aircraft manual, the troubleshooting manual, and the wiring diagram manual. Training should also emphasize the official command policies for the use of the data. The concepts behind the new type of data should also be discussed to reassure the technicians that the Air Force does not consider them to be too dumb to read and learn, but rather that it is critical for the less experienced people to be able to perform more and better maintenance earlier in their careers.

e. Base level project monitors should insure that all organizations impacted by the change in TOs are aware of the implementation plans. The Field Training Detachment (FTD), the Technical Order Distribution Office (TODO), and Supply should be kept informed from the beginning. Quality Control personnel should be involved and knowledgeable. Quality Control Inspectors must be fully knowledgeable of the job guide concept, contents, and usage policies. They can be very instrumental in encouraging the proper use of the job guides. The project monitor should insure that proper planning is done and that satisfactory arrangements are made for storing the job guides in the shops, in the maintenance vehicles where appropriate, in the aircraft, and in the docks. Storage which permits easy accessibility and quick identification of the right manual is conducive to greater use. Monitors should also be alert to problems with binders, with missing or incomplete manuals, and with the bunching of several manuals into one binder.

f. The first day of implementation is critical. The actual day of implementation should be a Tuesday and should be announced well in advance. Chief of maintenance, squadron, branch, and shop staff meetings should emphasize the day of implementation the previous week. Chief of maintenance, commander, officer, superintendent, and shop chief emphasis is necessary for a successful implementation. Usage policies should be clearly defined and discussed at all levels. The project monitor should check to insure that all locations have the new TOs in place. On the Monday prior to implementation, all levels of maintenance should insure that all personnel on all shifts are aware of the new day's events. On the day of implementation, all of the old – 2 series TOs should be removed from all locations. It is necessary for all supervisors to insure that the new TOs are used in all cases. Hopefully, a headquarter's team or representative will be on hand during the week of implementation to help encourage use of the data and to help answer questions. Each shop chief and line and dock supervisor must be actively involved to encourage use during this period. It is important to expect some problems to occur despite the careful preparations. Difficulties will occur as a technician tries to find a particular illustration and set of instructions, or in getting to the proper checkout or troubleshooting procedure. Supervisory personnel should be aware of these potential problems and be alert to assist as necessary. If headquarter's personnel are at the base they should be readily available in the work areas to observe the use of the TOs and to assist as required. At least one meeting should be held at the end of the week of implementation. The base project monitor should chair the meeting and all levels of base project personnel should attend and be prepared to discuss the problems which were encountered. Headquarter's representatives, if available, should attend and share relevant items of experience gained at other bases. Problem areas should be identified and solutions recommended. Continued officer and supervisor emphasis is required during the first several weeks of implementation.

8. *Policies for Use.* It is essential that the policies for using job guide manuals be clearly specified in official documents. This is especially important with regard to the dual-level presentation concept. Prior to further implementation of job guide manuals, policies should be clearly specified at the Command or Air Force level and published in official documentation.

9. *Logic Tree Troubleshooting Aids.* The development of logic tree troubleshooting aids is perhaps the most difficult process in preparing the new data. Due to the nature and purpose of these aids, it is very difficult to adequately validate and verify them. Therefore, it is essential that very thorough quality control procedures be used in the the development of the data to insure complete coverage of malfunctions and accuracy of the data. It is essential that the aids be as thorough and accurate as possible before they are placed in the field. If not, they will be tried once or twice and, if they do not work, tossed into the corner. Thus, it is important that the aids be given as thorough a "shake out" as possible before implementation. A special program directed at identifying all missing malfunctions and insuring that the procedures isolate the faults may be required to insure that the troubleshooting aids are good before Command-wide implementation.

IV. PHASE III – POST IMPLEMENTATION

Phase III data were gathered by questionnaire, interview, and observation eight to nine months after the implementation of job guides at Charleston and Norton AFBs. The purpose was to determine user attitudes and problems after considerable experience had been gained with the new data. A week each was spent at Charleston and Norton AFBs to observe the work in progress on the flightline and in the docks. Where ever possible, observations were made of technicians using the data on a job. Individual and group interviews were conducted with approximately 150 technicians to determine how they liked using the job guides, what kinds of problems they had using them, or, if they did not normally use them, why not.

Also during this week, a questionnaire was administered to 314 technicians from the three maintenance squadrons at both bases. As during Phase I, the Maintenance Superintendent, the Job Guide Project Monitor, and the Superintendent of each squadron were tasked to provide the personnel. In keeping with the noninterference agreement, no specific mix of experience, grade, skills was requested. Instead, a "representative group" of technicians was requested.

The results of the interviews and job observation are reported in this section. The results of the analysis of the questionnaire data are contained in Section V.

The data collected during Phase III proved to be very difficult to categorize according to user acceptance or usability factors. This finding probably reflects that the degree of acceptability of the new data to the user is generally determined by the initial experiences each user has with the data. Beyond the early implementation period the user's emphasis shifts to how well the data meets his needs on the job. Accordingly, the Phase III data are discussed in terms of positive and negative factors affecting usability and acceptance.

Positive Factors Affecting Usability and Acceptance

The following factors were most commonly identified by the users as positive aspects of the job guide program.

1. *Size.* The small size of the job guides makes them handy to carry and to use. They are small enough to be carried with a tool bag and parts, and can be taken into small, tight working areas. They will also lie flat and open for use. Some books have been misplaced because of size, but overall, size is a very positive factor.

2. *Illustrations.* Virtually everyone, experienced and inexperienced, liked the illustrations. They apparently support the procedures very well. The less experienced people need the detailed illustrations and the experienced often use them to refresh themselves with a complex or unusual assembly or repair.

3. *Format.* Most users liked the way the information is presented. The detailed procedures supported by good illustrations keyed to task steps, the completeness of data, and the input conditions page are all positive factors. Most users agreed that the format makes the TO easier to read, understand, and use, especially for the inexperienced.

4. *Input Conditions Page.* This feature was approved by all experience levels. It simplifies the preparation for the job by specifying tools, test equipment, spares, expendables, people, and equipment conditions required for the start of the task. This is especially valuable to the inexperienced technician.

5. *Dual Level.* Although not completely known or well understood by the technician, the dual-level approach is a positive acceptance factor. The experienced technicians used the dual level by reviewing the bold-faced headings prior to starting the job. Generally, the more experienced technicians prefer this review to being required to follow each step in sequence. The more experienced military and civilian technicians probably would have been more negative toward the job guides if the dual-level feature was not available.

6. *Reading Level.* Almost no complaints were made about the reading level of the job guides. By far, the predominant opinion was that the job guides are very easy to read, to understand, and to follow. This is more important to the less experienced people, but even the experienced people seemed to appreciate the ease of reading and understanding. With all of the unnecessary information out of the way, some technicians with many years of experience reported learning things about the aircraft that they did not know before.

Negative Factors Affecting Usability and User Acceptance

The following were the negative factors most frequently identified by the users in the interview sessions. As with the positive factors, there seems to be very little difference between user acceptance and usability factors in the operational environment after the initial exposure to the new data.

The findings of the interviews and observation of jobs in progress in Phase III indicated that many of the same problems that had been previously identified in Phase II were still present. The major problems identified are discussed as follows:

1. *Lack of Familiarity with the Job Guide Series.* Far too many users were still not aware of or very familiar with the GAM, MSIM, or LTTAs. In several cases the technicians did not know that the manuals even existed. Most technicians did not know what kind of information is contained in these manuals. This is

unfortunate for two reasons: (a) they cannot take advantage of the information contained there, and (b) since they cannot locate some information that they need in a job guide, they complain that it is not available when, in fact, it may be in the MSIM or GAM. This problem stems from the inadequate implementation training and impacts both user acceptance and usability.

2. *Confusion Over Proper Usage of Job Guides.* There appeared to be no clear understanding of how HQ MAC or the local Quality Control inspectors expected the Job Guides to be used. Opinions varied from "Everyone has to follow every step," to "The book just has to be in the immediate work area." HQ MAC had recently made some additional efforts to clarify this issue. Hopefully, the most recent messages have clarified the MAC policy on usage requirements and procedures. The new index, which was just being distributed, has a section on how to use the job guides. This should help inform all of the users about the proper use of job guides.

3. *Inadequate Storage of Job Guides on Aircraft.* This item was noted as a major problem area in Phase II. It was still a problem area in Phase III, although much progress had been made. Since Phase II, a storage shelf had been designed, approved, and installed in the first aircraft at Charleston AFB. Additional shelves were being made as quickly as the material became available. This shelf is designed to hold all of the job guide manual series, and should alleviate this problem.

4. *Lost or Misplaced Job Guides.* Several complaints were received about not being able to locate the required job guide on the aircraft. Sometimes these books were later found in an unlikely or inaccessible area of the aircraft, in another aircraft, in individual tool boxes, or in a maintenance vehicle. One job was observed being done without the TO because the particular job guide required was missing from the aircraft. This problem creates hardships for the home station specialists and transient aircraft maintenance crews who must work on the aircraft. It also creates an additional workload for the Organizational Maintenance Squadron Technical Order Monitor, who is responsible for keeping the aircraft files current and complete. HQ MAC is currently considering the future status of the aircraft TO file. Several suggestions have been made, including: (a) delete the aircraft TO file entirely, (b) eliminate all but the servicing and ground handling TOs, and (c) remove the specialist job guides when the aircraft returns to the home station. The authors understand the desire to remove the job guide file wholly or in part from the aircraft. It is likely, however, that utilization of the TOs will be reduced if the entire file is not readily available on the aircraft. Whatever the eventual solution is, some way must be found to provide more control over the aircraft job guide file.

5. *Use of Danger Tags.* Danger tags are required to be hung in conspicuous locations whenever certain jobs are accomplished on the aircraft. The danger tags are to inform specialists that work is in progress on a given system, and to protect the worker from unexpected dangers, such as power on, moving control surfaces, etc. The job guides specify when and where tags should be used. In some cases, as many as 18 danger tags must be hung before work can begin. Danger tags are controlled items, and must be obtained and filled out, then hung in the proper locations. This adds considerable time and irritation to the job. Supervisors say that so many danger tags are not really necessary for safe maintenance in most cases. They did not use as many danger tags with the old TOs which were not as specific in stating danger tag requirements.

6. *Lengthy Checkout Procedures.* Technicians complained that most of the checkout procedures are too long, and that they check out more of the system than is necessary in some cases (such as following replacement of a component). They also said that the old short, or "quick" checks previously in the old TOs are not in the job guides. They feel that the long checkouts are too time-consuming to use in a time-critical situation.

7. *Troubleshooting Data is Often Incomplete.* The troubleshooting data appeared to be used more frequently than at the time of the Phase II data collection in November 1975. Many technicians, however, were found who had used the troubleshooting data very little, or not at all. The most common complaint was that the data does not contain all of the possible malfunctions. A few minor complaints indicated some problems with understanding and following specific troubleshooting steps. Supervisors were encouraging technicians to use the troubleshooting data so that problems could be found and the data improved.

8. *Locating Specific Information is Often Difficult*. Users still reported difficulty in locating specific information or task data. This is compounded when the desired data are located in the GAM or MSIM (books with which most technicians are not familiar). A new index had been developed and was just being made available in the field. This new index contains all data that is in the new TOs, including the GAM and MSIM. The new index also contains an introduction section which discusses the content and usage of the complete job guide series TOs. The new index should eliminate the problem of locating data, and hopefully, it will also reduce the confusion concerning content and usage of the new job guides.

9. *Too Many Books are Required to do a Job*. This remained the most common complaint about the job guides. Although this complaint was heard most often in the hydraulic and aero repair shops, other shops also voiced the same opinion. Apparently, up to three books may be required for troubleshooting, repair, and checkout of some systems (e.g., brakes). This necessity to get the additional books irritates the users, even if the books are on the aircraft. If the user must return to the shop or wait for the maintenance truck to come around, much time and patience are lost. Most users say they would like everything in one book. This would, however, result in a large and bulky book in some cases. The size, weight, and failure to lie flat and open for use would probably result in more disadvantages than advantages. A review of the hydraulic and aero repair job guides was recommended to insure that they are organized in the most efficient way.

10. *Errors*. Many complaints were received about errors in the books. Many errors had been identified and turned in for correction and update. As the changes are incorporated in the books, the complaints about errors will diminish. The successful MAC and AFLC emphasis on locating the errors in books made everyone very aware of errors. The books and the errors have been scrutinized so closely that the number of errors is probably overemphasized.

11. *Resistance to Change*. More technicians were slowly becoming accustomed to the job guides and therefore liked them better. Others still said that they expect to like them better when they become more familiar with them. Again, it seemed to be the civilian force that most strongly opposed the job guides. They were so familiar with the old TOs that they resented having to learn the new system. Even in this group, however, there was a noticeable improvement in the general acceptance of the job guides. Young airmen who have worked only with the job guides generally liked them very well.

12. *Durability*. As a result of Phase II, it was reported that there was a problem of pages tearing out. This problem increased with the additional usage. The ring binder used with the job guides deteriorates with the heavy and often rough use that they get on the flight line. In time the rings become out of line and catch and tear the pages as they are turned. This is compounded by the fact that the holes are punched close to the edge of the paper, and the paper tears easily. As the binders continue to deteriorate, the maintenance and update of the job guides will increase the work load of the TO monitors. At the same time, the missing pages will force technicians to waste valuable time looking for a complete job guide or to do the job without proper technical data.

Discussion

It may appear that very little progress was made in the seven-month interval between Phase II and Phase III. Many of the same problems identified in Phase II were still present in Phase III. This is true because most of the problem areas are such that additional money, personnel, or time would be required for solution. Such problems as the ring binder, paper quality, lengthy procedures, etc., would be very costly to correct. Some of the others, such as the need for greater familiarity with the data, could be corrected. However, a long lead time would be required to correct most problems.

Some very important improvements were made, however. The new index was just beginning to become available. This improved index was a result of user problems identified in Phase II, and is very similar to the recommendations developed and given at that time. An increase in data usage was noted in Phase III as compared with Phase II. This was true for both dock and flightline environments, and for both job guides and logic trees. The extent of TO usage still remains a problem, however, in that the more

proceduralized data are used, the greater impact it should have on the accuracy, thoroughness, and safety of maintenance. The reluctance of technicians to use any kind of TO voluntarily is not a problem which is unique to MAC or to proceduralized data. The remaining confusion over content, location, storage, and use of the manuals undoubtedly contributes significantly to the less-than-optimum use of the new data. While storage of the data on the aircraft still remained a problem at the time of Phase III, this problem should be solved by the new storage rack which was just beginning to be installed on the C-141.

MAC and AFLC have put greater emphasis on improving the accuracy of the logic trees. Most shops had an active program to thoroughly review and use the logic trees so that errors could be found and corrected. This emphasis should have the same positive effect on the long-term accuracy of the logic trees as it has had on the job guides. Greater utilization of the logic trees can be expected when their accuracy and completeness is improved.

A greater degree of acceptance of the new data was found in Phase III, particularly among the civilian workers. This was apparently due to an increased familiarity with the data, and an increased use of the dual-level feature. This feature allows the qualified technician to review the major task headings in the job guide, and to continue the task without following the detailed task steps. This feature seemingly encouraged the highly experienced civilian workers to use the data to a greater extent.

Most of the shop supervisors interviewed spoke well of the concept and potential of the job guides. They recognized the problems, especially the errors and sometimes lengthy checkout procedures, but overall they indicated that the job guides were much better than the original TOs. The officers and senior NCOs, almost without exception were optimistic about the long-range impact of the job guides upon C-141 aircraft maintenance.

Many recommendations made as a result of the Phase II findings had already been, or were in the process of being implemented. Although some discontent with the data certainly was present, the majority of those interviewed preferred the new data to the old. The potential of the C-141 job guides to impact maintenance favorably probably is limited more by administrative policies for its use on the job than by any known problem with the data itself.

V. QUESTIONNAIRE RESULTS

In order to supplement the information obtained through informal observation and interviews, the Job Guide Questionnaire (Appendix B) was administered to technicians at Charleston and at Norton AFBs. The questionnaire provided a standardized means of collecting data anonymously from a large sample of technicians. It was hoped that the anonymity would encourage freer, more candid responses to the questions.

The questionnaire consisted of 37 questions (36 multiple-choice and one open-ended essay) designed to measure attitudes and opinions relative to the acceptance and usability of JGMs and LTTAs. Included in the multiple-choice questions were eight questions from a different questionnaire (Appendix A: Technical Order Questionnaire) which had been administered to technicians before implementation of the JGMs and LTTAs. These questions were used to provide a basis for comparison of attitudes toward JGMs and LTTAs before and after the guides were implemented.

The Job Guide Questionnaire was designed specifically for this study to determine technicians' attitudes after they had worked with JGMs and LTTAs. It was administered approximately eight months after the job aids were implemented. The Technical Order Questionnaire was designed primarily for a replication of an earlier study to measure technicians' attitudes toward conventional TOs and to identify attitudinal changes since 1963. The eight questions pertaining to JGMs and LTTAs were included in that questionnaire to provide data on the technicians' attitudes toward the job guide type of data. A description and sample pages of the new job guides were included in the TO questionnaire preceding the job guide

questions. The questions asked the technicians to indicate how they thought they would feel about the new guides, based upon the information provided. The Technical Order Questionnaire was administered to technicians approximately four months before implementation of the JGMs and LTTAs. Only the results for the eight questions pertaining to JGMs and LTTAs are discussed in this report. The results for the remainder of the TO questionnaire will be summarized in another report.

Both questionnaires were administered to technicians at Norton and at Charleston AFBs according to the same procedures. Because personnel could participate in the study only on a noninterference basis, it was not possible to obtain completely stratified samples of technicians. However, it was believed that the samples obtained were approximately representative of the maintenance population of both bases. Each maintenance squadron was asked to provide approximately 40 to 50 technicians representative of the squadron in terms of AFSCs, grade levels, and experience levels to complete each questionnaire. The questionnaires were administered in training classrooms under semicontrolled conditions. Before responding, the technicians were briefed on the purpose of the questionnaire. They were also encouraged to respond with written comments in addition to the multiple-choice responses provided on the questionnaire. No collaboration on answers was permitted among technicians. No time limit was imposed during the administration of the questionnaires.

The data obtained with the questionnaires was summarized by determination of the percentage of technicians who selected each response alternative to each multiple-choice question. It was observed that there were some significant differences in attitudes between specific categories of maintenance personnel. Therefore, the results were tabulated and grouped by technician's grade, squadron, skill level and AFSC, as well as by each base and by the total sample from both bases. The results for each category of technicians are presented in Tables 1 through 3. Table 1 presents the results for questions 1 through 36 by base and squadron, Table 2 presents the results for the questions by grade and skill level, and Table 3 presents the results by AFSC. Due to the nature of the essay question, it was not possible to summarize the results by percentages. Therefore, the essay responses are discussed separately after the discussion of the multiple-choice results.

The main purpose of the study was to answer two basic questions: (a) "To what degree were the JGMs and LTTAs accepted by maintenance personnel?", and (b) "To what degree did maintenance personnel consider the JGMs and LTTAs to be usable?" The report primarily discusses the results obtained from the total sample of technicians. However, significant variations from those results by specific groups of technicians are also discussed.

Table 1. **Percentage of Subject Responses, by Base and by Squadron, to Each Question of the Job Guide Questionnaire**

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
1. How do you like the Job Guide Manuals?						
a. Completely satisfactory	11.1	8.1	9.6	5.9	8.3	14.3
b. Good, but could be improved	68.0	70.2	69.1	70.3	77.8	59.1
c. Satisfactory, but no better than the old TOs	15.7	13.7	14.7	15.8	8.3	20.0
d. Unsatisfactory	4.6	6.8	5.7	7.9	3.7	5.7
e. Other, or multiple response	0.0	0.6	0.3	0.0	0.9	0.0
f. No response	0.7	0.6	0.6	0.0	0.9	1.0

Table 1 (*Continued*)

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
2. The size of the Job Guide Manual is						
a. Too small	10.5	10.6	10.5	7.9	13.0	10.5
b. Too big	1.3	2.5	1.9	3.0	1.0	1.9
c. Okay	62.8	53.4	58.0	64.4	50.9	59.1
d. Just right	25.5	33.5	29.6	24.8	35.2	28.6
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0
3. The illustrations are						
a. Excellent	22.9	22.4	22.6	25.7	24.1	18.1
b. Poor	13.7	14.9	14.3	9.9	20.4	12.4
c. Okay	63.4	62.1	62.7	64.4	55.6	68.6
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	0.0	0.6	0.3	0.0	0.0	1.0
4. Do the job guide procedures contain all the information you need to do the job?						
a. Yes, for all jobs	5.2	3.7	4.5	4.0	5.6	3.8
b. Yes, for most jobs	37.9	31.1	34.4	31.7	41.7	29.5
c. Some information is missing, but guides are still useful	48.4	54.0	51.3	54.5	41.7	58.1
d. Missing information makes job guides unusable	7.8	11.2	9.6	9.9	10.2	8.6
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.7	0.0	0.3	0.0	0.9	0.0
5. Are the procedures correct?						
a. Almost always	36.6	32.3	34.4	33.7	33.3	36.2
b. Mostly	58.2	64.6	61.5	61.4	63.0	60.0
c. Seldom	5.2	2.5	3.8	5.0	2.8	3.8
d. Never	0.0	0.0	0.0	0.0	0.0	0.0
e. Other, or multiple response	0.0	0.6	0.3	0.0	0.9	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0
6. Do you have any difficulty in understanding the procedures?						
a. Always	0.0	1.2	0.6	1.0	0.9	0.0
b. Mostly	1.3	3.1	2.2	4.0	1.9	1.0
c. Occasionally	60.8	61.5	61.2	49.5	62.0	71.4
d. Never	37.3	33.5	35.4	45.5	33.3	27.6
e. Other, or multiple response	0.7	0.0	0.3	0.0	0.9	0.0
f. No response	0.0	0.6	0.3	0.0	0.9	0.0

Table 1 (*Continued*)

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
7. Are too many books required to do one job?						
a. Always	5.2	5.0	5.1	5.9	7.4	1.9
b. Mostly	3.9	12.4	8.3	6.9	9.3	8.6
c. Occasionally	56.2	48.5	52.2	49.5	44.4	62.9
d. Never	34.6	34.2	34.4	37.6	38.9	26.7
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0
8. Do you find the procedures in the job guides to be too simple (too detailed)?						
a. Yes, for most jobs	19.0	11.8	15.3	20.8	10.2	15.2
b. Yes, for some jobs	32.7	28.6	30.6	30.7	23.2	38.1
c. No, about right for most jobs	47.7	58.4	53.2	46.5	65.7	46.7
d. Other, or multiple response	0.0	1.2	0.6	2.0	0.0	0.0
e. No response	0.7	0.0	0.3	0.0	0.9	0.0
9. Do you use the dual-level feature?						
a. Mostly	11.1	8.7	9.9	7.9	11.1	10.5
b. Seldom	15.7	14.3	15.0	19.8	10.2	15.2
c. What is the dual-level feature?	72.6	75.2	73.9	70.3	77.8	73.3
d. Other, or multiple response	0.0	0.6	0.3	0.0	0.0	1.0
e. No response	0.7	1.2	1.0	2.0	0.9	0.0
10. Have you had any problems with lost, torn, or dirty T.O. pages?						
a. Yes, a lot	15.7	32.9	24.5	26.7	15.7	31.4
b. Some	37.3	26.7	31.9	22.8	35.2	37.1
c. Very little	26.1	16.2	21.0	25.7	26.9	10.5
d. No	20.9	24.2	22.6	24.8	22.2	21.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0
11. Do you use the procedure headings as a checklist?						
a. Frequently	24.2	29.8	27.1	14.9	32.4	33.3
b. Sometimes	59.5	45.3	52.2	60.4	50.0	46.7
c. Never	16.3	22.4	19.4	22.8	15.7	20.0
d. Other, or multiple response	0.0	0.6	0.3	0.0	0.9	0.0
e. No response	0.0	1.9	1.0	2.0	0.9	0.0
12. Would you prefer to use						
a. Traditional-style TOs	21.6	18.6	20.1	20.8	22.2	17.1
b. Job Guide-style TOs	58.8	48.5	53.5	43.6	64.8	51.4
c. Checklists	12.4	22.4	17.5	22.8	7.4	22.9
d. No TOs	6.5	5.6	6.1	6.9	5.6	5.7
e. Other, or multiple response	0.7	4.4	2.6	5.0	0.0	2.9
f. No response	0.0	0.6	0.3	1.0	0.0	0.0

Table 1 (*Continued*)

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
13. What is the best feature of the Job Guides?						
a. Size	27.5	30.4	29.0	23.8	23.2	40.0
b. Simplicity	20.3	15.5	17.8	27.7	16.7	9.5
c. Step-by-step procedures	28.8	29.2	29.0	27.7	35.2	23.8
d. Illustrations	10.5	4.4	7.3	6.9	6.5	8.6
e. Dual-level of instructions	0.7	1.9	1.3	1.0	0.9	1.9
f. Other or multiple response	12.4	18.0	15.3	12.9	16.7	16.2
g. No response	0.0	0.6	0.3	0.0	0.9	0.0
14. Do fold-out pages make the illustrations?						
a. Very convenient to use	22.2	25.5	23.9	20.8	24.1	26.7
b. No problem to use	58.2	55.9	57.0	63.4	59.3	48.6
c. Difficult to use	17.7	17.4	17.5	14.9	14.8	22.9
d. Other, or multiple response	1.3	0.6	1.0	1.0	0.9	1.0
e. No response	0.7	0.6	0.6	0.0	0.9	1.0
15. The illustrations are:						
a. Necessary to complete most jobs	9.2	8.1	8.6	10.9	7.4	7.6
b. Helpful for most jobs	58.2	59.6	58.9	33.7	72.2	69.5
c. Helpful but usually not necessary	32.0	31.1	31.5	55.5	18.5	21.9
d. Not needed for any job	0.0	0.6	0.3	0.0	0.9	0.0
e. Other, or multiple response	0.7	0.6	0.6	0.0	0.9	1.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0
16. The index is:						
a. Very helpful	47.7	47.2	47.5	34.7	57.4	49.5
b. Usually helpful	47.1	50.3	48.7	64.4	38.9	43.8
c. Other, or multiple response	3.3	1.9	2.6	1.0	1.9	4.8
d. No response	2.0	0.6	1.3	0.0	1.9	1.9
17. How useful is the GAM?						
a. Very useful. Used frequently	7.2	9.9	8.6	6.9	10.2	8.6
b. Somewhat useful. Used occasionally	37.9	29.2	33.4	29.7	35.2	35.2
c. Seldom useful. Rarely used	14.4	14.9	14.7	18.8	11.1	14.3
d. Have never used it	36.6	43.5	40.1	42.6	39.8	38.1
e. Other, or multiple response	0.0	0.6	0.3	1.0	0.0	0.0
f. No response	3.9	1.9	2.9	1.0	3.7	3.8
18. As a source of information for your job, the new job guide manuals are:						
a. Much better than the old TOs	16.3	11.8	14.0	9.9	14.8	17.1
b. Better than the old TOs, but can be refined	53.6	57.1	55.4	57.4	59.3	49.5
c. No better than the old TOs	18.3	18.6	18.5	16.8	15.7	22.9
d. Worse than the old TOs	10.5	11.8	11.2	15.8	8.3	9.5
e. Other, or multiple response	0.7	0.0	0.3	0.0	0.9	0.0
f. No response	0.7	0.6	0.6	0.0	0.9	1.0

Table 1 (*Continued*)

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
19. Do you feel that:						
a. You use JGMs more than the TOs?	33.3	37.3	35.4	23.8	48.2	33.3
b. About the same as the old TOs?	51.6	44.7	48.1	58.4	42.6	43.8
c. Less than the old TOs?	13.7	16.8	15.3	16.8	7.4	21.9
d. Other, or multiple response	0.0	0.6	0.3	1.0	0.0	0.0
e. No response	1.3	0.6	1.0	0.0	1.9	1.0
20. How valuable do you think the Job Guides are to OJT?						
a. Valuable – much better than the old TOs	52.9	47.2	50.0	59.4	47.2	43.8
b. Valuable – about the same as the old TOs	25.5	35.4	30.6	23.8	33.3	34.3
c. Of little value – about the same as the old TOs	13.1	13.0	13.1	10.9	13.0	15.2
d. Of no value – much worse than the old TOs	6.5	3.7	5.1	5.9	4.6	4.8
e. Other, or multiple response	0.7	0.0	0.3	0.0	0.0	1.0
f. No response	1.3	0.6	1.0	0.0	1.9	1.0
21. As an OJT trainer, Job Guides are:						
a. Very valuable – much better than the old TOs	44.4	41.0	42.7	51.5	44.4	32.4
b. Valuable – about the same as the old TOs	33.3	33.5	33.4	26.7	32.4	41.0
c. Of little value – about the same as the old TOs	11.1	12.4	11.8	13.9	9.3	12.4
d. Of no value – much worse than the old TOs	6.5	3.1	4.8	4.0	5.6	4.8
e. Other, or multiple response	0.7	0.0	0.3	0.0	0.0	1.0
f. No response	3.9	9.9	7.0	4.0	8.3	8.6
22. Does use of Job Guides allow less experienced technicians to do more jobs?						
a. Yes	43.8	44.7	44.3	44.6	46.3	41.9
b. No	51.0	49.1	50.0	53.5	47.2	49.5
c. Other, or multiple response	1.3	1.2	1.3	1.0	0.0	2.9
d. No response	3.9	5.0	4.5	1.0	6.5	5.7
23. Would you recommend that JGMs be purchased for use in your shop?						
a. Yes, for all tasks	32.0	34.2	33.1	29.7	40.7	28.6
b. Yes, for some tasks	50.3	53.4	51.9	56.4	45.4	54.3
c. No	14.4	11.8	13.1	13.9	12.0	13.3
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	3.3	0.6	1.9	0.0	1.9	3.8

Table 1 (*Continued*)

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
24. Would you recommend that LTTAs be purchased for use in your shop?						
a. Yes, for all tasks	25.5	31.7	28.7	29.7	31.5	24.8
b. Yes, for some tasks	54.3	53.4	53.8	53.5	50.0	58.1
c. No	15.7	12.4	14.0	16.8	13.0	12.4
d. Other, or multiple response	0.7	0.0	0.3	0.0	0.0	1.0
e. No response	3.9	2.5	3.2	0.0	5.6	3.8
25. The new JGMs and LTTAs help you do your job?						
a. Better	47.1	45.3	46.2	47.5	49.1	41.9
b. About the same	46.4	48.5	47.5	43.6	44.4	54.3
c. Not as well	4.6	5.0	4.8	8.9	3.7	1.9
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	2.0	1.2	1.6	0.0	2.8	1.9
26. Do you like having detailed step-by-step instructions such as those found in the JGMs?						
a. Yes	60.8	69.6	65.3	58.4	74.1	62.9
b. Makes no difference	29.4	25.5	27.4	29.7	21.3	31.4
c. No	7.8	2.5	5.1	10.9	2.8	1.9
d. Other, or multiple response	0.0	1.2	0.6	1.0	0.0	1.0
e. No response	2.0	1.2	1.6	0.0	1.9	2.9
27. Do you like having detailed illustrations keyed to the step-by-step procedures?						
a. Yes	65.4	75.2	70.4	65.4	77.8	67.6
b. Makes no difference	27.5	22.4	24.8	29.7	17.6	27.6
c. No	5.2	0.6	2.9	5.0	2.8	1.0
d. Other, or multiple response	0.0	0.6	0.3	0.0	0.0	1.0
e. No response	2.0	1.2	1.6	0.0	1.9	2.9
28. Which type of technical data would you prefer to use? For routine jobs:						
a. Traditional TO	11.8	14.3	13.1	13.9	13.0	12.4
b. Checklist	30.7	36.0	33.4	34.7	26.9	39.1
c. Job Guide Manuals	39.2	34.8	36.9	31.7	46.3	32.4
d. Very general procedures	14.4	7.5	10.8	12.9	11.1	8.6
e. Other, or multiple response	2.0	6.2	4.1	6.9	0.9	4.8
f. No response	2.0	1.2	1.6	0.0	1.9	2.9

Table 1 (*Continued*)

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
29. For non-routine jobs:						
a. Traditional TO	18.3	26.1	22.3	28.7	21.3	17.1
b. Checklist	9.8	10.6	10.2	7.9	5.6	17.1
c. Job Guide Manual	61.4	54.7	58.0	56.4	65.7	51.4
d. Very general instructions	5.2	6.2	5.7	4.0	6.5	6.7
e. Other, or multiple response	2.6	1.9	2.2	3.0	0.0	3.8
f. No response	2.6	0.6	1.6	0.0	0.9	3.8
30. How do you feel about being required to use JGMs for every job?						
a. Pleased	11.8	14.3	13.1	7.9	18.5	12.4
b. Mostly pleased	28.1	39.1	33.8	29.7	44.4	26.7
c. Somewhat irritated	40.5	34.2	37.3	37.6	29.6	44.8
d. Irritated	15.7	10.6	13.1	22.8	5.6	11.4
e. Other, or multiple response	0.7	0.6	0.6	1.0	0.9	0.0
f. No response	3.3	1.2	2.2	1.0	0.9	4.8
31. Which would be the most helpful to you in transferring to a new aircraft?						
a. ATC school	0.7	3.1	1.9	1.0	1.9	2.9
b. FTD school	26.1	31.1	28.7	22.8	33.3	29.5
c. OJT	37.3	39.8	38.5	44.6	33.3	38.1
d. JGMs and LTTAs	15.0	6.8	10.8	13.9	11.1	7.6
e. Conventional TO	5.2	2.5	3.8	5.9	3.7	1.9
f. Other, or multiple response	12.4	14.3	13.4	9.9	14.8	15.2
g. No response	3.3	2.5	2.9	2.0	1.9	4.8
32. Which do you believe would most improve the efficiency of maintenance operations?						
a. More ATC training	3.9	6.2	5.1	5.0	3.7	6.7
b. Better ATC training	9.2	8.1	8.6	7.9	5.6	12.4
c. Better conventional TOs	9.8	9.3	9.6	8.9	9.3	10.5
d. JGMs and LTTAs	30.1	13.7	21.7	22.8	25.9	16.2
e. More qualified personnel	27.5	28.6	28.0	30.7	22.2	31.4
f. Better supply support	7.8	19.3	13.7	11.9	21.3	7.6
g. Other, or multiple response	9.2	13.0	11.2	11.9	10.2	11.4
h. No response	2.6	1.9	2.2	1.0	1.9	3.8
Total Number of Respondents Per Category =	153	161	314	101	108	105

Table 1 (*Continued*)

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
33. Do you prefer to:						
a. Use LTTAs for all troubleshooting tasks	15.5	22.7	19.2	14.9	21.3	28.0
b. Use LTTAs for infrequent troubleshooting tasks only	28.2	26.7	27.4	27.0	31.9	20.0
c. Use LTTAs for the most difficult troubleshooting tasks only	32.4	34.7	33.6	29.7	36.2	40.0
d. Develop own troubleshooting strategy and not use LTTAs at all	22.5	13.3	17.8	25.7	8.5	12.0
e. Other, or multiple response	1.4	2.7	2.1	2.7	2.1	0.0
34. How do you feel about being required to use LTTAs for all troubleshooting jobs?						
a. Pleased	14.1	16.0	15.1	9.5	17.0	28.0
b. Mostly pleased	25.4	36.0	30.8	20.3	44.7	36.0
c. Somewhat irritated	35.2	34.7	34.9	37.8	29.8	36.0
d. Irritated	25.4	13.3	19.2	32.4	8.5	0.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
35. Do LTTAs lead to correct isolation of the problem?						
a. Yes, always	4.2	6.7	5.5	2.7	6.4	12.0
b. Usually	46.5	52.0	49.3	41.9	63.8	44.0
c. Sometimes	40.8	33.3	37.0	41.9	25.5	44.0
d. Seldom	8.5	8.0	8.2	13.4	4.3	0.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
36. Do LTTAs require more or less time to troubleshoot a problem?						
a. Less time is required using LTTAs.	19.7	32.0	26.0	20.3	29.8	36.0
b. About the same amount of time	45.1	37.3	41.1	40.5	44.7	36.0
c. More time is required when using LTTAs	32.4	29.3	30.8	39.2	25.5	16.0
d. Other, or multiple response	2.8	1.3	2.1	0.0	0.0	12.0
Total Number of Respondents Per Category =	71	75	146	74	47	25

Note. — Due to space limitations, the questions presented in the tables have been abbreviated. The questions are presented in their complete original form in the questionnaires in the appendix.

Questions 33–36 were answered only by those technicians surveyed who had used LTTAs.

Table 2. **Percentage of Subject Responses, by Grade and by Skill Level, to Each Question of the Job Guide Questionnaire**

Questions	Grade						Skill Level		
	2	3	4	5	6&7&8	10&11	3	5	7&9
1. How do you like the Job Guide Manuals?									
a. Completely satisfactory	16.7	12.1	9.9	8.3	0.0	7.3	9.1	11.2	6.1
b. Good, but could be improved	75.0	68.2	70.3	66.7	64.3	68.3	72.7	69.3	67.1
c. Satisfactory, but no better than the old TOs	8.3	15.2	13.2	16.7	28.6	14.6	13.6	13.7	17.1
d. Unsatisfactory	0.0	4.6	4.4	5.6	7.1	9.8	4.6	4.9	8.5
e. Other, or multiple response	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.5	0.0
f. No response	0.0	0.0	1.1	2.8	0.0	0.0	0.0	0.5	1.2
2. The size of the Job Guide Manual is									
a. Too small	0.0	9.1	8.8	8.3	14.3	17.1	0.0	10.2	13.4
b. Too big	4.2	1.5	3.3	0.0	7.1	0.0	4.6	2.0	1.2
c. Okay	45.8	65.2	53.9	55.6	64.3	59.8	50.0	57.1	63.4
d. Just right	50.0	24.2	34.1	36.1	14.3	23.2	45.5	30.7	22.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3. The illustrations are									
a. Excellent	12.5	24.2	20.9	33.3	14.3	23.2	22.7	22.4	24.4
b. Poor	12.5	13.6	13.2	11.1	14.3	18.3	18.2	12.7	17.1
c. Okay	75.0	62.1	64.8	55.6	71.4	58.5	59.1	64.4	58.5
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.5	0.0
4. Do the job guide procedures contain all the information you need to do the job?									
a. Yes, for all jobs	4.2	6.1	5.5	5.6	7.1	1.2	4.6	4.4	4.9
b. Yes, for most jobs	50.0	27.3	40.7	30.6	28.6	30.5	40.9	33.2	35.4
c. Some information is missing, but guides are still useful	41.7	56.1	46.2	50.0	64.3	54.9	50.0	51.7	51.2
d. Missing information makes job guides unusable	4.2	10.6	7.7	13.9	0.0	12.2	4.6	10.7	7.3
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	1.2
5. Are the procedures correct?									
a. Almost always	45.8	30.3	31.9	36.1	50.0	34.2	45.5	34.2	32.9
b. Mostly	50.0	65.2	64.8	61.1	50.0	59.8	50.0	62.0	62.2
c. Seldom	4.2	4.6	2.2	2.8	0.0	6.1	4.6	3.4	4.9
d. Never	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. Other, or multiple response	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.5	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. Do you have any difficulty in understanding the procedures?									
a. Always	0.0	0.0	2.2	0.0	0.0	0.0	0.0	1.0	0.0
b. Mostly	4.2	6.1	2.2	0.0	0.0	0.0	9.1	2.4	0.0
c. Occasionally	83.3	63.6	55.0	55.6	42.9	64.6	72.7	61.0	57.3
d. Never	12.5	30.3	40.7	44.4	57.1	32.9	18.2	35.1	41.5
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	1.2
f. No response	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.5	0.0
7. Are too many books required to do one job?									
a. Always	0.0	3.0	5.5	5.6	7.1	7.3	0.0	5.4	6.1
b. Mostly	0.0	6.1	8.8	2.8	7.1	14.6	0.0	7.8	11.0
c. Occasionally	70.8	48.5	49.5	58.3	64.3	47.6	63.6	49.8	54.9
d. Never	29.2	42.4	36.3	33.3	21.4	30.5	36.4	37.1	28.1
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2 (*Continued*)

Questions	Grade						Skill Level		
	2	3	4	5	6&7&8	10&11	3	5	7&9
8. Do you find the procedures in the job guides to be too simple (too detailed)?									
a. Yes, for most jobs	0.0	21.2	12.1	19.4	14.3	17.1	9.1	15.1	15.9
b. Yes, for some jobs	41.7	28.8	25.3	30.6	35.7	32.9	36.4	27.8	36.6
c. No, about right for most jobs	58.3	48.5	61.5	50.0	50.0	48.8	54.6	56.1	46.3
d. Other, or multiple response	0.0	1.5	1.1	0.0	0.0	0.0	0.0	1.0	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	1.2
9. Do you use the dual-level feature?									
a. Mostly	0.0	3.0	11.0	5.6	7.1	19.5	0.0	9.3	13.4
b. Seldom	8.3	7.6	14.3	16.7	42.9	17.1	13.6	11.7	23.2
c. What is the dual-level feature?	91.7	87.9	74.7	77.8	50.0	59.8	86.4	78.5	59.8
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	1.2
e. No response	0.0	1.5	0.0	0.0	0.0	2.4	0.0	0.5	2.4
10. Have you had any problems with lost, torn, or dirty T.O. pages?									
a. Yes, a lot	20.8	19.7	20.9	36.1	28.6	28.1	22.7	20.0	37.8
b. Some	20.8	33.3	30.8	25.0	35.7	37.8	22.7	33.2	31.7
c. Very little	37.5	15.2	26.4	11.1	14.3	19.5	31.8	22.4	12.2
d. No	20.8	31.8	22.0	27.8	21.4	14.6	22.7	24.4	18.3
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11. Do you use the procedure headings as a checklist?									
a. Frequently	20.8	16.7	26.4	33.3	14.3	37.8	13.6	25.9	34.2
b. Sometimes	58.3	57.6	49.5	50.0	57.1	48.8	63.6	52.2	48.8
c. Never	20.8	24.2	24.2	13.9	28.6	11.0	22.7	21.5	14.6
d. Other, or multiple response	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	1.2
e. No response	0.0	1.5	0.0	0.0	0.0	2.4	0.0	0.5	1.2
12. Would you prefer to use									
a. Traditional-style TOs	4.2	16.7	20.9	22.2	28.6	24.4	13.6	20.0	22.0
b. Job Guide-style TOs	58.3	48.5	59.3	52.8	42.9	52.4	40.9	55.1	53.7
c. Checklists	37.5	18.2	14.3	19.4	14.3	14.6	40.9	16.1	14.6
d. No TOs	0.0	12.1	5.5	2.8	7.1	3.7	4.6	6.8	3.7
e. Other, or multiple response	0.0	3.0	0.0	2.8	7.1	4.9	0.0	1.5	6.1
f. No response	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
13. What is the best feature of the Job Guides?									
a. Size	29.2	27.3	29.7	30.6	21.4	30.5	40.9	27.8	28.1
b. Simplicity	12.5	19.7	22.0	25.0	14.3	11.0	13.6	20.0	14.6
c. Step-by-step procedures	41.7	28.8	25.3	25.0	28.6	31.7	27.3	30.2	26.8
d. Illustrations	0.0	13.6	4.4	2.8	7.1	8.5	4.6	6.8	8.5
e. Dual-level of instructions	4.2	1.5	0.0	0.0	0.0	2.4	0.0	1.0	2.4
f. Other or multiple response	12.5	9.1	18.7	16.7	28.6	14.6	13.6	13.7	19.5
g. No response	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.5	0.0
14. Do fold-out pages make the illustrations?									
a. Very convenient to use	20.8	30.3	29.7	13.9	7.1	20.7	22.7	25.9	19.5
b. No problem to use	54.2	56.1	48.4	66.7	85.7	58.5	54.6	56.1	59.8
c. Difficult to use	25.0	12.1	19.8	16.7	7.1	19.5	22.7	15.6	20.7
d. Other, or multiple response	0.0	1.5	1.1	2.8	0.0	0.0	0.0	1.5	0.0
e. No response	0.0	0.0	1.1	0.0	0.0	1.2	0.0	1.0	0.0
15. The illustrations are:									
a. Necessary to complete most jobs	8.3	9.1	7.7	5.6	21.4	8.5	0.0	9.3	8.5
b. Helpful for most jobs	75.0	53.0	57.1	61.1	57.1	59.8	72.7	57.1	61.0
c. Helpful but usually not necessary	16.7	34.9	34.1	33.3	21.4	31.7	27.3	32.2	30.5
d. Not needed for any job	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
e. Other, or multiple response	0.0	1.5	1.1	0.0	0.0	0.0	0.0	1.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2 (*Continued*)

Questions	Grade						Skill Level		
	2	3	4	5	6&7&8	10&11	3	5	7&9
16. The index is:									
a. Very helpful	58.3	47.0	47.3	41.7	57.1	46.3	31.8	49.3	46.3
b. Usually helpful	37.5	51.5	51.7	52.8	42.9	45.1	63.6	47.3	48.8
c. Other, or multiple response	0.0	1.5	1.1	2.8	0.0	6.1	0.0	2.4	3.7
d. No response	4.2	0.0	0.0	2.8	0.0	2.4	4.6	1.0	1.2
17. How useful is the GAM?									
a. Very useful. Used frequently	4.2	7.6	6.6	5.6	28.6	11.0	0.0	6.8	15.9
b. Somewhat useful. Used occasionally	41.7	27.3	28.6	50.0	14.3	36.6	31.8	32.7	34.2
c. Seldom useful. Rarely used	16.7	15.2	17.6	5.6	28.6	12.2	18.2	15.1	12.2
d. Have never used it	37.5	47.0	44.0	38.9	28.6	34.2	50.0	42.0	34.2
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.5	0.0
f. No response	0.0	3.0	3.3	0.0	0.0	4.8	0.0	2.9	3.7
18. As a source of information for your job, the new job guide manuals are:									
a. Much better than the old TOs	25.0	12.1	13.2	11.1	21.4	12.2	18.2	14.2	12.2
b. Better than the old TOs, but can be refined	70.8	53.0	58.2	52.8	50.0	52.4	72.7	54.2	54.9
c. No better than the old TOs	4.2	27.3	17.6	16.7	28.6	15.9	9.1	20.0	17.1
d. Worse than the old TOs	0.0	6.1	8.8	19.4	0.0	19.5	0.0	10.2	15.9
e. Other, or multiple response	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.5	0.0
f. No response	0.0	1.5	1.1	0.0	0.0	0.0	0.0	1.0	0.0
19. Do you feel that:									
a. You use JGMs more than the TOs?	54.2	31.8	37.4	22.2	21.4	37.8	59.1	35.6	26.8
b. About the same as the old TOs?	37.5	51.5	42.9	55.6	78.6	46.3	31.8	47.8	54.9
c. Less than the old TOs?	4.2	15.2	17.6	22.2	0.0	15.9	4.6	15.1	18.3
d. Other, or multiple response	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.5	0.0
e. No response	4.2	1.5	1.1	0.0	0.0	0.0	4.6	1.0	0.0
20. How valuable do you think the Job Guides are to OJT?									
a. Valuable – much better than the old TOs	45.8	45.5	57.1	50.0	50.0	46.3	45.5	50.7	48.8
b. Valuable – about the same as the old TOs	33.3	33.3	28.6	19.4	35.7	34.2	31.8	31.7	28.1
c. Of little value – about the same as the old TOs	20.8	10.6	9.9	19.4	14.3	13.4	18.2	11.2	15.9
d. Of no value – much worse than the old TOs	0.0	9.1	3.3	8.3	0.0	4.9	4.6	4.9	6.1
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
f. No response	0.0	1.5	1.1	2.8	0.0	1.2	0.0	1.0	1.2
21. As an OJT trainer, Job Guides are:									
a. Very valuable – much better than the old TOs	37.5	39.4	47.3	47.2	50.0	39.0	40.9	42.9	43.9
b. Valuable – about the same as the old TOs	20.8	27.3	33.0	27.8	42.9	42.7	18.2	32.7	37.8
c. Of little value – about the same as the old TOs	12.5	15.2	10.0	13.9	7.1	11.0	9.1	12.2	11.0
d. Of no value – much worse than the old TOs	0.0	6.1	4.4	8.3	0.0	4.9	0.0	4.9	6.1
e. Other, or multiple response	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.5	0.0
f. No response	29.2	12.1	5.5	0.0	0.0	2.4	31.8	6.8	1.2
22 Does use of Job Guides allow less experienced technicians to do more jobs?									
a. Yes	54.2	50.0	48.4	36.1	35.7	37.8	50.0	49.8	31.7
b. No	25.0	47.0	46.2	63.9	64.3	54.9	36.4	44.9	63.4
c. Other, or multiple response	0.0	1.5	2.2	0.0	0.0	1.2	0.0	1.5	1.2
d. No response	20.8	1.5	3.3	0.0	0.0	6.1	13.6	3.9	3.7

Table 2 (*Continued*)

Questions	Grade						Skill Level		
	2	3	4	5	6&7&8	10&11	3	5	7&9
23. Would you recommend that JGMs be purchased for use in your shop?									
a. Yes, for all tasks	37.5	27.3	34.1	33.3	42.9	34.2	36.4	32.7	32.9
b. Yes, for some tasks	54.2	62.1	52.8	47.2	50.0	43.9	54.6	52.2	51.2
c. No	4.2	9.1	11.0	19.4	7.1	19.5	4.6	13.7	13.4
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	4.2	1.5	2.2	0.0	0.0	2.4	4.5	1.5	2.4
24. Would you recommend that LTTAs be purchased for use in your shop?									
a. Yes, for all tasks	45.8	27.3	23.1	33.3	64.3	23.2	45.5	26.3	30.5
b. Yes, for some tasks	45.8	56.1	59.3	41.7	28.6	57.3	45.5	56.6	48.8
c. No	8.3	13.6	12.1	25.0	7.1	14.6	9.1	13.7	15.9
d. Other, or multiple response	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0
e. No response	0.0	1.5	5.5	0.0	0.0	4.9	0.0	2.9	4.9
25. The new JGMs and LTTAs help you do your job?									
a. Better	75.0	42.4	48.4	41.7	28.6	43.9	63.6	47.3	40.2
b. About the same	25.0	54.6	46.2	47.2	71.4	45.1	31.8	46.8	51.2
c. Not as well	0.0	3.0	3.3	11.1	0.0	7.3	4.6	4.4	6.1
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	0.0	0.0	2.2	0.0	0.0	3.7	0.0	1.5	2.4
26. Do you like having detailed step-by-step instructions such as those found in the JGMs?									
a. Yes	79.2	68.2	60.4	63.9	78.6	63.4	72.7	65.4	64.6
b. Makes no difference	20.8	31.8	31.9	22.2	21.4	23.2	27.3	27.8	24.4
c. No	0.0	0.0	5.5	13.9	0.0	7.3	0.0	5.4	6.1
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.5	1.2
e. No response	0.0	0.0	2.2	0.0	0.0	3.7	0.0	1.0	3.7
27. Do you like having detailed illustrations keyed to the step-by-step procedures?									
a. Yes	79.2	77.3	58.2	69.4	71.4	75.6	77.3	69.3	70.7
b. Makes no difference	20.8	21.2	36.3	25.0	28.6	15.9	18.2	26.8	22.0
c. No	0.0	1.5	3.3	5.6	0.0	3.7	4.6	2.9	2.4
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	1.2
e. No response	0.0	0.0	2.2	0.0	0.0	3.7	0.0	1.0	3.7
28. Which type of technical data would you prefer to use? For routine jobs:									
a. Traditional TO	4.2	10.6	12.1	22.2	7.1	15.9	13.6	12.7	13.4
b. Checklist	37.5	39.4	29.7	36.1	50.0	26.8	45.5	31.2	34.2
c. Job Guide Manuals	45.8	37.9	41.8	25.0	35.7	34.2	27.3	40.5	31.7
d. Very general procedures	12.5	9.1	12.1	13.9	7.1	9.8	13.6	11.2	9.8
e. Other, or multiple response	0.0	3.0	2.2	2.8	0.0	9.8	0.0	3.4	7.3
f. No response	0.0	0.0	2.2	0.0	0.0	3.7	0.0	1.0	3.7
29. For non-routine jobs:									
a. Traditional TO	8.3	22.7	19.8	27.8	28.6	25.6	22.7	22.0	23.2
b. Checklist	8.3	4.6	13.2	8.3	0.0	13.4	9.1	10.7	8.5
c. Job Guide Manual	79.2	62.1	57.1	61.1	57.1	48.8	68.2	56.6	58.5
d. Very general instructions	0.0	7.6	7.7	2.8	14.3	3.7	0.0	7.3	3.7
e. Other, or multiple response	4.2	1.5	1.1	0.0	0.0	4.9	0.0	2.4	2.4
f. No response	0.0	1.5	1.1	0.0	0.0	3.7	0.0	1.0	3.7

Table 2 (*Continued*)

Questions	Grade						Skill Level		
	2	3	4	5	6&7&8	10&11	3	5	7&9
30. How do you feel about being required to use JGMs for every job?									
a. Pleased	8.3	10.6	12.1	19.4	21.4	13.4	9.1	11.7	17.1
b. Mostly pleased	45.8	25.8	34.1	25.0	28.6	40.2	40.9	34.6	28.1
c. Somewhat irritated	41.7	45.5	35.2	36.1	42.9	31.7	50.0	36.6	37.8
d. Irritated	4.2	16.7	13.2	19.4	7.1	11.0	0.0	14.2	13.4
e. Other, or multiple response	0.0	0.0	2.2	0.0	0.0	0.0	0.0	1.0	0.0
f. No response	0.0	1.5	3.3	0.0	0.0	3.7	0.0	2.0	3.7
31. Which would be the most helpful to you in transferring to a new aircraft?									
a. ATC school	8.3	1.5	2.2	0.0	0.0	1.2	4.6	2.4	0.0
b. FTD school	33.3	22.7	19.8	36.1	57.1	34.2	36.4	23.9	37.8
c. OJT	41.7	45.5	41.8	22.2	28.6	37.8	45.5	41.5	29.3
d. JGMs and LTTAs	8.3	10.6	11.0	16.7	7.1	8.5	0.0	11.2	12.2
e. Conventional TO	0.0	4.6	4.4	5.6	0.0	3.7	4.6	5.4	0.0
f. Other, or multiple response	4.2	12.1	18.7	16.7	7.1	11.0	4.6	13.7	15.9
g. No response	4.2	3.0	2.2	2.8	0.0	3.7	4.6	2.0	4.9
32. Which do you believe would most improve the efficiency of maintenance operations?									
a. More ATC training	8.3	3.0	3.3	2.8	0.0	9.8	9.1	4.9	4.9
b. Better ATC training	29.2	4.6	8.8	13.9	14.3	2.4	27.3	6.3	9.8
c. Better conventional TOs	8.3	10.6	8.8	19.4	0.0	7.3	13.6	9.3	8.5
d. JGMs and LTTAs	25.0	22.7	28.6	13.9	21.4	14.6	13.6	24.9	14.6
e. More qualified personnel	20.8	22.7	25.3	33.3	35.7	34.2	22.7	24.4	37.8
f. Better supply support	4.2	18.2	14.3	5.6	21.4	14.6	9.1	16.6	8.5
g. Other, or multiple response	4.2	16.7	9.9	8.3	0.0	13.4	4.6	12.7	9.8
h. No response	0.0	1.5	1.1	2.8	7.1	3.7	0.0	1.0	6.1
Total Number of Respondents Per Category =	24	66	91	36	14	82	22	205	82
33. Do you prefer to:									
a. Use LTTAs for all troubleshooting tasks	10.0	20.8	20.0	10.5	44.4	17.9	10.0	17.2	25.6
b. Use LTTAs for infrequent troubleshooting tasks only	50.0	20.8	22.2	31.6	22.2	30.8	30.0	24.7	32.5
c. Use LTTAs for the most difficult troubleshooting tasks only	30.0	37.5	42.2	26.3	22.2	28.2	40.0	38.7	20.0
d. Develop own troubleshooting strategy and not use LTTAs at all	10.0	16.7	13.3	26.3	11.1	23.1	20.0	16.1	22.5
e. Other, or multiple response		4.2	2.2	5.3	0.0	0.0	0.0	3.2	0.0
34. How do you feel about being required to use LTTAs for all troubleshooting jobs?									
a. Pleased	0.0	20.8	11.1	5.3	33.3	20.5	0.0	14.0	20.0
b. Mostly pleased	40.0	12.5	40.0	36.8	11.1	30.8	30.0	31.2	30.0
c. Somewhat irritated	60.0	50.0	24.4	31.6	33.3	33.3	60.0	33.3	32.5
d. Irritated	0.0	16.7	24.4	26.3	22.2	15.4	10.0	21.5	17.5
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35. Do LTTAs lead to correct isolation of the problem?									
a. Yes, always	0.0	0.0	11.1	0.0	0.0	7.7	0.0	6.5	5.0
b. Usually	60.0	45.8	48.9	36.8	55.6	53.8	50.0	47.3	52.5
c. Sometimes	40.0	41.7	37.8	52.6	33.3	25.6	50.0	38.7	30.0
d. Seldom	0.0	12.5	2.2	10.5	11.1	12.8	0.0	7.5	12.5
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2 (*Continued*)

Questions	Grade						Skill Level		
	2	3	4	5	6&7&8	10&11	3	5	7&9
36. Do LTTAs require more or less time to troubleshoot a problem?									
a. Less time is required using LTTAs.	20.0	16.7	33.3	36.8	11.1	23.1	20.0	26.9	27.5
b. About the same amount of time	40.0	50.0	37.8	21.1	44.4	48.7	60.0	41.9	35.0
c. More time is required when using LTTAs	40.0	33.3	26.7	36.8	44.4	25.6	20.0	29.0	35.0
d. Other, or multiple response	0.0	0.0	2.2	5.3	0.0	2.6	0.0	2.2	2.5
Total Number of Respondents Per Category =	10	24	45	19	9	39	10	93	40

Table 3. **Percentage of Subject Responses, by AFSC, to Each Question of the Job Guide Questionnaire**

Questions	AFSC									
	325X0	325X1	328X0	328X1	328X4	423X6	423X1	423X3	431X1	426X2
1. How do you like the Job Guide Manuals?										
a. Completely satisfactory	0.0	0.0	10.5	18.2	0.0	0.0	4.2	16.7	12.1	15.4
b. Good, but could be improved	91.7	77.8	52.6	77.3	57.1	70.6	79.2	83.3	61.7	84.6
c. Satisfactory, but no better than the old TOs	8.3	0.0	31.6	4.6	35.7	17.7	8.3	0.0	18.4	0.0
d. Unsatisfactory	0.0	22.2	5.3	0.0	7.1	11.8	8.3	0.0	5.7	0.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0
2. The size of the Job Guide Manual is										
a. Too small	8.3	16.7	5.3	4.6	0.0	11.8	4.2	8.3	14.2	7.7
b. Too big	0.0	0.0	0.0	9.1	7.1	0.0	0.0	8.3	1.4	0.0
c. Okay	66.7	44.4	84.2	54.6	71.4	70.6	62.5	41.7	56.0	50.0
d. Just right	25.0	38.9	10.5	31.8	21.4	17.7	33.3	41.7	28.4	42.3
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3. The illustrations are										
a. Excellent	33.3	27.8	10.5	27.3	35.7	29.4	16.7	41.7	19.2	26.9
b. Poor	0.0	22.2	5.3	4.6	7.1	23.5	25.0	8.3	16.3	11.5
c. Okay	66.7	50.0	84.2	68.2	57.1	47.1	58.3	50.0	63.8	61.5
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
4. Do the job guide procedures contain all the information you need to do the job?										
a. Yes, for all jobs	0.0	5.6	10.5	0.0	7.1	0.0	0.0	0.0	5.0	11.5
b. Yes, for most jobs	16.7	11.1	36.8	59.1	28.6	17.7	45.8	41.7	31.2	50.0
c. Some information is missing, but guides are still useful	58.3	66.7	36.8	40.9	64.3	76.5	37.5	50.0	53.9	38.5
d. Missing information makes job guides unusable	25.0	16.7	15.8	0.0	0.0	5.9	16.7	8.3	9.2	0.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
5. Are the procedures correct?										
a. Almost always	8.3	22.2	52.6	45.5	35.7	35.3	25.0	50.0	34.8	30.8
b. Mostly	75.0	72.2	42.1	54.6	64.3	58.8	70.8	50.0	60.3	69.2
c. Seldom	16.7	5.6	5.3	0.0	0.0	5.9	4.2	0.0	4.3	0.0
d. Never	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3 (*Continued*)

Questions	AFSC									
	325X0	325X1	328X0	328X1	328X4	423X6	423X1	423X3	431X1	426X2
6. Do you have any difficulty in understanding the procedures?										
a. Always	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
b. Mostly	8.3	5.6	5.3	0.0	0.0	5.9	4.2	0.0	1.4	0.0
c. Occasionally	41.7	61.1	26.3	45.5	57.1	58.8	66.7	50.0	70.9	53.9
d. Never	50.0	27.8	68.4	54.6	42.9	35.3	25.0	50.0	26.2	46.2
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.0
7. Are too many books required to do one job?										
a. Always	8.3	5.6	5.3	0.0	0.0	17.7	0.0	0.0	5.7	0.0
b. Mostly	8.3	11.1	0.0	9.1	0.0	17.7	8.3	8.3	10.6	0.0
c. Occasionally	75.0	55.6	52.6	31.8	35.7	47.1	45.8	25.0	58.9	50.0
d. Never	8.3	27.8	42.1	59.1	64.3	17.7	45.8	66.7	24.8	50.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8. Do you find the procedures in the job guides to be too simple (too detailed)?										
a. Yes, for most jobs	25.0	0.0	42.1	18.2	21.4	17.7	20.8	0.0	12.1	7.7
b. Yes, for some jobs	33.3	27.8	31.6	18.2	42.9	29.4	12.5	41.7	36.9	19.2
c. No, about right for most jobs	41.7	66.7	26.3	63.7	35.7	47.1	66.7	58.3	50.4	73.1
d. Other, or multiple response	0.0	5.6	0.0	0.0	0.0	5.9	0.0	0.0	0.0	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
9. Do you use the dual-level feature?										
a. Mostly	8.3	0.0	0.0	22.7	7.1	11.8	0.0	8.3	12.8	7.7
b. Seldom	0.0	5.6	15.8	31.8	28.6	23.5	12.5	0.0	14.9	11.5
c. What is the dual-level feature?	91.7	88.9	84.2	45.5	57.1	64.7	87.5	91.7	70.9	80.8
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
e. No response	0.0	5.6	0.0	0.0	7.1	0.0	0.0	0.0	0.7	0.0
10. Have you had any problems with lost, torn, or dirty T.O. pages?										
a. Yes, a lot	33.3	22.2	21.1	22.7	14.3	47.1	4.2	8.3	31.2	11.5
b. Some	33.3	22.2	15.8	9.1	50.0	23.5	37.5	25.0	37.6	38.5
c. Very little	8.3	27.8	31.6	36.4	21.4	17.7	25.0	8.3	12.1	34.6
d. No	25.0	27.8	31.6	31.8	14.3	11.8	33.3	58.3	19.2	15.4
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11. Do you use the procedure headings as a checklist?										
a. Frequently	0.0	5.6	10.5	4.6	21.4	52.9	29.2	25.0	33.3	46.2
b. Sometimes	75.0	72.2	47.4	72.7	50.0	35.3	58.3	66.7	46.1	38.5
c. Never	25.0	11.1	42.1	22.7	28.6	11.8	12.5	8.3	19.9	15.4
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
e. No response	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12. Would you prefer to use										
a. Traditional-style TOs	16.7	22.2	21.1	13.6	7.1	41.2	29.2	16.7	18.4	15.4
b. Job Guide-style TOs	41.7	50.0	26.3	63.6	35.7	47.1	54.2	83.3	52.5	80.8
c. Checklists	16.7	11.1	31.6	18.2	57.1	5.9	8.3	0.0	20.6	0.0
d. No TOs	16.7	5.6	15.8	0.0	0.0	0.0	8.3	0.0	6.4	3.9
e. Other, or multiple response	8.3	5.6	5.3	4.6	0.0	5.9	0.0	0.0	2.1	0.0
f. No response	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3 (*Continued*)

Questions	AFSC									
	325X0	325X1	328X0	328X1	328X4	423X6	423X1	423X3	431X1	426X2
13. What is the best feature of the Job Guides?										
a. Size	50.0	11.1	26.3	27.3	28.6	5.9	37.5	8.3	34.8	15.4
b. Simplicity	16.7	33.3	36.8	31.8	28.6	17.7	16.7	25.0	9.2	23.1
c. Step-by-step procedures	16.7	27.8	21.1	18.2	28.6	58.8	33.3	33.3	28.4	30.8
d. Illustrations	8.3	5.6	10.5	4.6	7.1	0.0	4.2	8.3	8.5	3.9
e. Dual-level of instructions	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	2.1	0.0
f. Other or multiple response	8.3	22.2	5.3	18.2	7.1	11.8	4.2	25.0	17.0	26.9
g. No response	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.0
14. Do fold-out pages make the illustrations?										
a. Very convenient to use	41.7	33.3	5.3	13.6	14.3	23.5	37.5	33.3	25.5	15.4
b. No problem to use	33.3	55.6	73.7	72.7	64.3	70.6	45.8	66.7	50.4	73.1
c. Difficult to use	25.0	5.6	21.1	13.6	21.4	5.9	12.5	0.0	22.0	11.5
d. Other, or multiple response	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.7	0.0
15. The illustrations are:										
a. Necessary to complete most jobs	0.0	5.6	5.3	9.1	21.4	29.4	4.2	8.3	8.5	0.0
b. Helpful for most jobs	16.7	50.0	10.5	31.8	35.7	52.9	70.8	83.3	69.5	84.6
c. Helpful but usually not necessary	83.3	44.4	84.2	59.1	42.9	17.7	25.0	8.3	20.6	11.5
d. Not needed for any job	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	3.9
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16. The index is:										
a. Very helpful	41.7	33.3	42.1	27.3	21.4	52.9	45.8	58.3	50.4	73.1
b. Usually helpful	58.3	66.7	57.9	68.2	78.6	47.1	45.8	41.7	44.7	19.2
c. Other, or multiple response	0.0	0.0	0.0	4.6	0.0	0.0	8.3	0.0	3.6	0.0
d. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	7.7
17. How useful is the GAM?										
a. Very useful. Used frequently	8.3	5.6	0.0	9.1	7.1	11.8	4.2	25.0	9.2	7.7
b. Somewhat useful. Used occasionally	41.7	16.7	10.5	40.9	35.7	41.2	33.3	50.0	34.8	23.1
c. Seldom useful. Rarely used	25.0	27.8	21.1	9.1	14.3	17.7	20.8	0.0	13.5	7.7
d. Have never used it	25.0	50.0	68.4	31.8	42.9	29.4	41.7	25.0	37.6	57.7
e. Other, or multiple response	0.0	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	4.6	0.0	0.0	0.0	0.0	5.0	3.9
18. As a source of information for your job, the new job guide manuals are:										
a. Much better than the old TOs	0.0	5.6	10.5	18.2	0.0	11.8	4.2	16.7	15.6	26.9
b. Better than the old TOs, but can be refined	66.7	44.4	52.6	68.2	64.3	58.8	70.8	66.7	51.1	57.7
c. No better than the old TOs	8.3	33.3	15.8	13.6	14.3	11.8	12.5	0.0	23.4	11.5
d. Worse than the old TOs	25.0	16.7	21.1	0.0	21.4	17.7	8.3	8.3	9.2	3.9
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.7	0.0
19. Do you feel that:										
a. You use JGMs more than the TOs?	41.7	11.1	15.8	31.8	14.3	35.3	41.7	66.7	36.2	53.9
b. About the same as the old TOs?	41.7	72.2	63.2	68.2	50.0	41.2	45.8	25.0	44.0	46.2
c. Less than the old TOs?	16.7	16.7	21.1	0.0	28.6	23.5	8.3	0.0	19.2	0.0
d. Other, or multiple response	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	4.2	8.3	0.7	0.0

Table 3 (*Continued*)

Questions	AFSC									
	325X0	325X1	328X0	328X1	328X4	423X6	423X1	423X3	431X1	426X2
20. How valuable do you think the Job Guides are to OJT?										
a. Valuable – much better than the old TOs	50.0	61.1	52.6	86.4	50.0	47.1	37.5	66.7	44.0	50.0
b. Valuable – about the same as the old TOs	33.3	16.7	21.1	13.6	35.7	29.4	37.5	25.0	32.6	38.5
c. Of little value – about the same as the old TOs	8.3	16.7	26.3	0.0	0.0	11.8	20.8	0.0	15.6	7.7
d. Of no value – much worse than the old TOs	8.3	5.6	0.0	0.0	14.3	11.8	4.2	0.0	5.7	3.9
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	1.4	0.0
21. As an OJT trainer, Job Guides are:										
a. Very valuable – much better than the old TOs	41.7	44.4	52.6	77.3	42.9	47.1	29.2	66.7	35.5	46.2
b. Valuable – about the same as the old TOs	33.3	27.8	15.8	18.2	28.6	35.3	37.5	25.0	37.6	38.5
c. Of little value – about the same as the old TOs	8.3	27.8	26.3	4.6	0.0	11.8	8.3	0.0	12.1	7.7
d. Of no value – much worse than the old TOs	8.3	0.0	0.0	0.0	14.3	5.9	8.3	0.0	5.0	7.7
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
f. No response	8.3	0.0	5.3	0.0	14.3	0.0	16.7	8.3	9.2	0.0
22. Does use of Job Guides allow less experienced technicians to do more jobs?										
a. Yes	33.3	27.8	42.1	59.1	50.0	47.1	37.5	58.3	44.0	57.7
b. No	66.7	66.7	57.9	40.9	42.9	52.9	50.0	25.0	48.2	42.3
c. Other, or multiple response	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	2.1	0.0
d. No response	0.0	5.6	0.0	0.0	0.0	0.0	12.5	16.7	5.7	0.0
23. Would you recommend that JGMs be purchased for use in your shop?										
a. Yes, for all tasks	16.7	38.9	10.5	54.6	35.7	23.5	25.0	25.0	30.5	61.5
b. Yes, for some tasks	66.7	50.0	68.4	45.5	35.7	64.7	62.5	58.3	51.8	34.6
c. No	16.7	11.1	21.1	0.0	28.6	11.8	12.5	8.3	14.2	3.9
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	3.6	0.0
24. Would you recommend that LTTAs be purchased for use in your shop?										
a. Yes, for all tasks	41.7	38.9	10.5	31.8	50.0	17.7	33.3	8.3	25.5	42.3
b. Yes, for some tasks	41.7	50.0	47.4	68.2	21.4	70.6	45.8	66.7	57.5	50.0
c. No	16.7	11.1	42.1	0.0	28.6	11.8	12.5	8.3	12.8	3.9
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	8.3	16.7	3.6	3.9
25. The new JGMs and LTTAs help you do your job?										
a. Better	50.0	50.0	21.1	68.2	57.1	41.2	33.3	58.3	41.8	69.2
b. About the same	33.3	44.4	68.4	31.8	28.6	47.1	58.3	33.3	53.2	30.8
c. Not as well	16.7	5.6	10.5	0.0	14.3	11.8	4.2	0.0	2.8	0.0
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	4.2	8.3	2.1	0.0
26. Do you like having detailed step-by-step instructions such as those found in the JGMs?										
a. Yes	50.0	66.7	42.1	68.2	50.0	76.5	62.5	75.0	65.3	88.5
b. Makes no difference	33.3	33.3	36.8	9.1	42.9	23.5	37.5	16.7	27.7	11.5
c. No	16.7	0.0	21.1	18.2	7.1	0.0	0.0	0.0	3.6	0.0
d. Other, or multiple response	0.0	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.7	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	2.8	0.0

Table 3 (*Continued*)

Questions	AFSC									
	325X0	325X1	328X0	328X1	328X4	423X6	423X1	423X3	431X1	426X2
27. Do you like having detailed illustrations keyed to the step-by-step procedures?										
a. Yes	58.3	66.7	47.7	68.2	71.4	82.4	58.3	91.7	70.9	88.5
b. Makes no difference	25.0	33.3	42.1	31.8	28.6	11.8	41.7	0.0	23.4	7.7
c. No	16.7	0.0	10.5	0.0	0.0	5.9	0.0	0.0	2.1	3.9
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
e. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	2.8	0.0
28. Which type of technical data would you prefer to use? For routine jobs:										
a. Traditional TO	0.0	27.8	10.5	4.6	7.1	29.4	12.5	8.3	13.5	7.7
b. Checklist	66.7	22.2	47.4	13.6	57.1	11.8	25.0	0.0	39.7	19.2
c. Job Guide Manuals	25.0	38.9	26.3	36.4	21.4	47.1	37.5	75.0	31.9	65.4
d. Very general procedures	8.3	5.6	15.8	27.3	14.3	0.0	25.0	8.3	7.8	7.7
e. Other, or multiple response	0.0	5.6	0.0	18.2	0.0	11.8	0.0	0.0	4.3	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	2.8	0.0
29. For non-routine jobs:										
a. Traditional TO	25.0	33.3	26.3	22.7	28.6	35.3	16.7	25.0	20.6	7.7
b. Checklist	16.7	11.1	5.3	0.0	14.3	0.0	4.2	8.3	15.6	0.0
c. Job Guide Manual	58.3	55.6	52.6	63.6	57.1	58.8	75.0	66.7	51.8	76.9
d. Very general instructions	0.0	0.0	15.8	4.6	0.0	0.0	4.2	0.0	5.7	15.4
e. Other, or multiple response	0.0	0.0	0.0	9.1	0.0	5.9	0.0	0.0	2.8	0.0
f. No response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0
30. How do you feel about being required to use JGMs for every job?										
a. Pleased	0.0	0.0	10.5	9.1	28.6	11.8	16.7	25.0	12.8	19.2
b. Mostly pleased	50.0	33.3	10.5	27.3	28.6	29.4	41.7	58.3	32.6	46.2
c. Somewhat irritated	8.3	44.4	31.6	50.0	21.4	52.9	41.7	16.7	40.4	30.8
d. Irritated	41.7	16.7	47.4	13.6	14.3	5.9	0.0	0.0	9.9	0.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	3.9
f. No response	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0
31. Which would be the most helpful to you in transferring to a new aircraft?										
a. ATC school	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	3.6	0.0
b. FTD school	16.7	16.7	15.8	18.2	28.6	47.1	33.3	41.7	29.1	34.6
c. OJT	16.7	55.6	63.2	54.6	35.7	23.5	41.7	16.7	38.3	30.8
d. JGMs and LTTAs	16.7	11.1	5.3	18.2	14.3	17.7	4.2	25.0	7.1	19.2
e. Conventional TO	25.0	5.6	0.0	0.0	7.1	5.9	8.3	8.3	2.1	0.0
f. Other, or multiple response	16.7	11.1	10.5	9.1	7.1	5.9	12.5	8.3	14.9	15.4
g. No response	8.3	0.0	5.3	0.0	0.0	0.0	0.0	0.0	5.0	0.0
32. Which do you believe would most improve the efficiency of maintenance operations?										
a. More ATC training	8.3	0.0	5.3	9.1	7.1	0.0	8.3	0.0	5.7	3.9
b. Better ATC training	8.3	11.1	5.3	9.1	7.1	5.9	4.2	0.0	9.9	15.4
c. Better conventional TOs	8.3	5.6	0.0	9.1	14.3	17.7	4.2	25.0	10.6	3.9
d. JGMs and LTTAs	16.7	16.7	10.5	27.3	35.7	35.3	20.8	33.3	17.0	23.1
e. More qualified personnel	25.0	16.7	52.6	27.3	35.7	23.5	20.8	16.7	29.1	23.1
f. Better supply support	8.3	22.2	21.1	13.6	0.0	0.0	29.2	16.7	11.4	23.1
g. Other, or multiple response	25.0	27.8	0.0	4.6	0.0	17.7	12.5	8.3	12.1	7.7
h. No response	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	4.3	0.0
Total Number of Respondents Per Category =	12	18	19	22	14	17	24	12	141	26

Table 3 (*Continued*)

Questions	AFSC									
	325X0	325X1	328X0	328X1	328X4	423X6	423X1	423X3	431X1	426X2
33. Do you prefer to:										
a. Use LTTAs for all troubleshooting tasks	27.3	6.3	9.1	14.3	30.0	15.4	28.6	12.5	21.6	28.6
b. Use LTTAs for infrequent troubleshooting tasks only	18.2	18.8	27.3	42.9	20.0	30.8	42.9	25.0	18.9	42.9
c. Use LTTAs for the most difficult troubleshooting tasks only	18.2	43.8	9.1	35.7	10.0	46.2	21.4	50.0	43.2	28.6
d. Develop own troubleshooting strategy and not use LTTAs at all	36.4	18.8	54.5	7.1	40.0	7.7	7.1	12.5	13.5	0.0
e. Other, or multiple response	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0
34. How do you feel about being required to use LTTAs for all troubleshooting jobs?										
a. Pleased	27.3	6.3	0.0	7.1	10.0	15.4	7.1	25.0	21.6	28.6
b. Mostly pleased	27.3	12.5	0.0	21.4	30.0	30.8	42.9	50.0	43.2	42.9
c. Somewhat irritated	9.1	43.8	36.4	50.0	40.0	38.5	42.9	25.0	29.7	14.3
d. Irritated	36.4	37.5	63.6	21.4	20.0	15.4	7.1	0.0	5.4	14.3
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35. Do LTTAs lead to correct isolation of the problem?										
a. Yes, always	9.1	0.0	0.0	7.1	0.0	0.0	7.1	0.0	8.1	14.3
b. Usually	36.4	37.5	27.3	71.4	30.0	46.2	71.4	50.0	45.9	85.7
c. Sometimes	27.3	50.0	36.4	21.4	70.0	46.2	21.4	50.0	40.5	0.0
d. Seldom	27.3	12.5	36.4	0.0	0.0	7.7	0.0	0.0	5.4	0.0
e. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36. Do LTTAs require more or less time to troubleshoot a problem?										
a. Less time is required using LTTAs.	45.5	12.5	9.1	28.6	20.0	15.4	35.7	12.5	32.4	42.9
b. About the same amount of time	27.3	62.5	27.3	42.9	30.0	38.5	28.6	87.5	40.5	42.9
c. More time is required when using LTTAs	27.3	25.0	63.6	28.6	50.0	46.2	35.7	0.0	18.9	14.3
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	0.0
Total Number of Respondents Per Category	11	16	11	14	10	13	14	8	37	7

To What Degree were JGMs and LTTAs Accepted by Maintenance Personnel?

The questionnaire results indicate that the technicians' attitudes toward the JGMs and LTTAs were generally favorable. Acceptance of the new job aids by maintenance personnel is evidenced by the responses to several questions designed specifically to elicit such information. The results to questions 1 and 12 indicate that the technicians not only liked the JGMs, they preferred them over the traditional-style TOs and checklists. In response to question 1, 93.4% of all technicians surveyed indicated that the new guides were satisfactory – at least as good as the old TOs, while 78.7% actually indicated that they liked the JGMs more than the old TOs. These results were relatively consistent for all groups of technicians. The results of question 12 indicate that 53.5% of all the respondents preferred to use JGMs rather than traditional-style TOs or checklists. The percentage that chose JGMs was more than twice the percentage that chose either of the other response alternatives. Although an examination of the results by AFSC shows a significantly wide range in percentage of responses (26.3% to 83.3%), all but two of the groups (AFSCs 328X0 and 328X4) chose JGMs as their first preference. The two remaining groups chose JGMs as their second preference. (See Appendix D for a listing of AFSC titles).

The technicians surveyed further indicated their preference for JGMs when 85% responded that they would ". . . . recommend that JGMs be purchased for use in their shop "(question 23) for at least some tasks. Thirty-three percent of these responded that they would recommend JGMs for all of their shop tasks. The technicians' responses to question 24 show a similar attitude of acceptance toward LTTAs. Approximately 83% responded that they would recommend the purchase of LTTAs for at least some of their shop troubleshooting tasks, while 28.7% of these responded that they would recommend LTTAs for all troubleshooting tasks. In consideration of the poor condition of the LTTAs (in terms of errors, incompleteness, etc.) and the relatively little use they had received at the time the Job Guide Questionnaire was administered, the strongly favorable attitude toward LTTAs is somewhat surprising. It is considered that these results probably indicate the technicians' acceptance of the general logic tree concept for troubleshooting data rather than their acceptance of the C-141 LTTAs specifically.

Additional evidence of maintenance personnel's acceptance of the new job aids is found in the results to question 19. The results indicate that 83.5% of all respondents felt they used JGMs at least as much as they used the old TOs, and 35.4% of all the respondents felt they actually used the JGMs more. Only 15.3% felt they used the JGMs less than they used the old TOs. These results indicate that JGMs are making a favorable contribution to the solution to the persistent maintenance problem of getting technicians to use technical data.

It is interesting to note that significant differences are observed among the results to question 19 for specific categories of maintenance personnel. While 66.7% of the technicians in AFSC group 423X3 felt they used JGMs more than they used the old TOs, only 11.1 of the AFSC group 325X1 felt they used JGMs more and 16.7% of the same group felt they used JGMs less than they used the old TOs. It is also interesting to note the range and distribution of the results for the Skill level groups. The 3-level group has the highest percentage (59.1%) and the 7- and 9-level group has the lowest percentage (26.8%) of technicians who felt they used the JGMs more than they used the old TOs. This distribution of results lends support to the belief that the JGMs are most appropriate for inexperienced personnel. However, caution must be exercised in interpreting this result since it may be influenced by the fact that the old TOs may have been withdrawn before many of the 3-level technicians had acquired much experience with them.

The technicians further indicated a favorable attitude toward JGMs through their responses to questions 28 and 29. Of all the technicians surveyed, 36.9% preferred to use JGMs for routine jobs (question 28), rather than traditional TOs (13.1%), checklists (33.4%) of very general procedures (10.8%). The results for nonroutine jobs (question 29) show an even stronger preference for JGMs (58%) than for the other job aids, with the second highest percentage (22.3%) showing a preference for traditional TOs. An examination of the results to question 28 by AFSC shows some significant differences between groups. The percentage of respondents who preferred JGMs for routine jobs ranges from 21.4% (AFSC 328X4) to 75% (AFSC 423X3). There is relatively little variation among the AFSC group results to question 29. The JGMs were preferred for nonroutine jobs by the majority of all the AFSC groups. It is interesting to note that, as a total group and when grouped by AFSC, the majority of the technicians preferred to use JGMs for the jobs with which they were not familiar.

The most negative responses toward JGMs were obtained in answer to question 30 which asks, "How do you feel about being required to use JGMs for every job?" Just over 50% of all the technicians surveyed indicated that they would be irritated or somewhat irritated by such a requirement. However, in interpreting these results, it should be noted that a significant number of technicians resist using technical data of any kind. Thus, the results obtained may reflect the resistance to any requirement to use any technical data, rather than resistance to or dislike of JGMs. In fact, in considering this natural resistance, the 46.9% of the technicians who indicated that they would be pleased or mostly pleased by the requirement to use JGMs for every job may be surprisingly high.

More indication of the technicians' acceptance of JGMs and LTTAs is found in the results to question 32. When asked which of six specific alternatives they believed would most improve the efficiency of maintenance operations, the technicians' most frequent response was "More qualified personnel." Their

second most frequent response (by only 6.3% fewer response) was "JGMs and LTTAs." The margin between the percentage for the second choice and the percentages for the remaining four alternatives was more than twice the margin between the first and second choices. When the results to question 32 are examined according to AFSC, considerable variation is noted. The response percentages for "More qualified personnel" range from 16.7% to 52.6%, and the percentages for "JGMs and LTTAs" range from 10.5% to 35.7%. However, both alternatives were chosen by the highest or second highest percentage of technicians for most of the AFSC groups.

Several questions were specifically designed to determine which characteristics of the JGMs and LTTAs would influence their acceptance by maintenance personnel. Questions 2, 7, 9, 13, 15, 26 and 27 all deal with specific characteristics of the manuals.

1. *Size*. The results for question 2 show that 87.6% of the technicians surveyed indicated that the size of the JGMs was satisfactory or just right. Also, as shown by the results of question 13, size was one of the two characteristics which were most frequently chosen by technicians as the best feature of the JGMs.

2. *Step-by-Step Instructions*. As indicated by the results for question 25, the majority of all the technicians (65.3%) liked the step-by-step instructions. Of the remaining technicians, 27.4% were indifferent and only 5.1% indicated an actual dislike for the instructions. The step-by-step procedures feature was also one of the two characteristics which were most frequently chosen by technicians as the best feature of the JGMs (question 13).

3. *Illustrations*. Most of the technicians surveyed (70.4%) also liked having detailed illustrations keyed to the step-by-step procedures (question 27). Only 2.9% actually disliked the illustrations and 24.8% responded indifferently. In response to question 15, 99% of all the technicians indicated that the illustrations were helpful, even though 31.5% of them did not think the illustrations were usually necessary.

4. *Dual-Level Feature*. Attempts to measure responses to the dual-level feature of the guide (question 9) were hindered by the fact that most of the technicians surveyed did not know what the feature was. However, some measure of maintenance personnel's reaction to the dual-level feature can be obtained from the results to question 11. Those results indicate that 79.3% of the technicians, at least some of the time, used the procedure headings as check lists. Since such usage is the intent of the dual-level feature, it appears that the technicians did accept and use the feature, even if they did not know what it was. This finding also is supported by the results of the interviews and observations, which indicate that the dual-level concept was received very well and may have contributed significantly to the acceptance of the JGMs.

5. *Number of Books*. One characteristic of the JGMs which had a negative influence on their acceptance by maintenance personnel was the fact that, for many of the jobs, more than one book (or volume) is required. This negative influence was identified through the results to the interviews and observations, as well as through the results to question 7 of the Job Guide Questionnaire. In responding to question 7, 52.2% of all the technicians indicated that, occasionally, too many books were required for one job. An additional 13.4% of the technicians responded that, most of the time or always, too many books were required for one job. Considerable variation is noted among the results for the AFSC groups, with the percentages ranging from 33.3% of the AFSC 423X3 group to 91.5% of the AFSC 325X0 group who responded that, occasionally or always, too many books were required for one job. However, it appears that most of the AFSC groups with a large percentage of respondents indicating that too many books are required are the AFSCs which involve performing maintenance on several subsystems of the aircraft.

To What Degree Did Maintenance Personnel Consider the JGMs and LTTAs to be Usable?

The Job Guide Questionnaire results indicate that most of the technicians surveyed felt the JGMs and LTTAs were usable and generally considered them to be better than the tradiational TOs. The results for question 18 show that 59.4% of all the technicians considered the JGMs to be a better source of job information than were the old TOs. Although the results for specific categories of maintenance personnel

show a wide range of percentages, at least 50% of the personnel in each group considered the JGMs to be better than the traditional TOs. It is most interesting to note the range and distribution of the results by skill level. The percentage of respondents who considered the JGMs to be a better job information source than were the old TOs increased as the experience level of the technicians decreased. This trend supports the contention that JGMs are especially suitable for use by relatively inexperienced technicians.

Further evidence of the usability of JGMs is provided by the results of question 25. Of the respondents, only 4.8% indicated that the JGMs and LTTAs did not help them do their jobs at least as well as did the traditional TOs. Of those who responded that the JGMs and LTTAs did help them, 46.2% indicated that the JGMs and LTTAs actually helped them do a better job than did the old TOs. When the results for question 25 are examined according to AFSC, it is noted that the percentages of technicians who indicated that the JGMs and LTTAs helped them do their job at least as well as did the old TOs are relatively the same for all groups. However, there are significant differences between the percentages who indicated that the new job aids helped them do their job better. It is also interesting to note that an examination by skill level of the results for question 25 reveals a trend similar to the trend in the skill level group results for question 18. The percentage of technicians who responded that the JGMs and LTTAs helped them do their job better than did the old TOs increased as the experience level of the technicians decreased. Again, this trend supports the contention that JGMs and LTTAs are especially suitable for relatively inexperienced technicians.

There are several characteristics of the JGMs and LTTAs which directly or indirectly affect their usability. Questions 3, 4, 5 and 6 were designed specifically to deal with those characteristics.

1. *Adequacy and Accuracy of Inforamtion*. The results of question 4 show that 90.2% of the technicians surveyed felt the job guide procedures contained at least enough information to be useful. Thirty-nine percent of those technicians actually felt the procedures contained most or all of the information needed to do their job. About 96% of all the technicians also felt that most or all of the JGM procedures were correct (question 5).

Accuracy is especially essential in LTTAs, since they must lead to the solution of almost all troubleshooting problems to be effective. The results for question 35 show that 54.8% of the technicians surveyed felt the LTTAs always or usually led to correct solution of the problem. An examination of the results by AFSC shows a range of percentages of technicians who responded as above from 27.3% (AFSC 328X0) to 78.5% (AFSCs 328X1 and 423X1). These results clearly indicate that, at the time of this study, the LTTAs did not adequately satisfy the criteria for effective isolation of malfunctions. This finding is not surprising since the LTTAs had not been adequately verified or tested before they were implemented. (Complete verification of proceduralized troubleshooting data is not feasible). In addition, information obtained during the interviews and observations indicated that the LTTAs had not been used extensively during the early stages of implementation. Consequently, many of the errors had not been identified or corrected.

2. *Illustrations*. One of the key elements of the JGM concept is the extensive use of good illustrations. Question 3 dealt with the quality of the illustrations in the C-141 Job Guide Manual. The results of this question show that 85.3% of all the technicians felt the illustrations were okay or excellent (22.5% of them felt the illustrations were excellent).

3. *Clarity*. Of the technicians surveyed, 35.4% indicated they never experienced difficulty in understanding the procedures in the JGMs (question 5). However, 61.2% indicated that they occasionally experienced difficulty and 2.8% indicated that they experienced difficulty most or all of the time. It cannot be determined from the available information how serious the clarity problem may be, but the general acceptance of the new job guides and their indicated usability suggest that the problem may not be too serious. However, the results do indicate that, at the time of this study, the goal of 100% clarity in writing had not been obtained.

Comparison of Results from Before and After Implementation

Another purpose of the study was to determine if the JGMs and LTTAs fulfilled the expectations expressed by the technicians before the new aids had been implemented. Tables 4 and 5 provide a comparison of the results for the eight questions included in the Technical Order Questionnaire (Appendix A) before implementation and in the Job Guide Questionnaire (Appendix B) after implementation of the JGMs and LTTAs. The results are presented in Table 4 by squadron, grade level, and as the combined total of respondents from Charleston and Norton AFBs. They are presented in Table 5 by grade level.

The results for the pre-implementation questionnaire indicate that the technicians liked the new job guide concept and expected to like the JGMs and LTTAs. However, the results for the same questions on the post-implementation questionnaire indicate that, although the JGMs and LTTAs were generally well accepted, they did not fully meet the technicians' expectations. The results for all eight questions show a decrease in the percentage of favorable responses to JGMs and LTTAs after implementation. For example, before implementation, 78.1% of all the technicians surveyed expected the JGMs and LTTAs to help them do their job better than did the traditional TOs (question 25). After implementation, only 46.2% of all the technicians felt that the JGMs and LTTAs had indeed helped them do their job better.

Although the cause of the decrease in favorable attitudes toward the new job guides is not obvious, it could have been due to implementation problems or the uncorrected errors in the manuals. Other causes may be indicated by some of the changes recommended by the technicians in their responses to question 37 and by their miscellaneous comments made as additional responses to the multiple-choice questions.

Table 4. **Percentage of Subject Responses to Selected Questions Administered Before and After Job Guide Implementation (by Base and by Squadron)**

Questions[a] & [b]	Base		Squadron					
	CAFB & NAFB		AMS		FMS		OMS	
	B	A	B[c]	A	B	A	B	A
25. The new JGMs and LTTAs help you do your job?								
a. Better	78.1	46.2	74.1	47.5	78.2	49.1	80.5	41.9
b. About the same	18.9	47.5	23.5	43.6	16.7	44.4	16.9	54.3
c. Not as well	2.0	4.8	2.5	8.9	3.9	3.7	0.0	1.9
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	1.2	1.6	0.0	0.0	1.3	2.8	2.6	1.9
26. Do you like having detailed step-by-step instructions such as those found in the JGMs?								
a. Yes	86.2	65.3	77.8	58.4	91.0	74.1	88.3	62.9
b. Makes no difference	9.4	27.4	16.1	29.7	5.1	21.3	7.8	31.4
c. No	4.1	5.1	6.2	10.9	3.9	2.8	2.6	1.9
d. Other, or multiple response	0.0	0.6	0.0	1.0	0.0	0.0	0.0	1.0
e. No response	0.4	1.6	0.0	0.0	0.0	1.9	1.3	2.9
27. Do you like having detailed illustrations keyed to the step-by-step procedures?								
a. Yes	90.7	70.4	86.4	65.4	94.9	77.8	89.6	67.6
b. Makes no difference	7.3	24.8	11.1	29.7	2.6	17.6	9.1	27.6
c. No	1.2	2.9	2.5	5.0	1.3	2.8	0.0	1.0
d. Other, or multiple response	0.0	0.3	0.0	0.0	0.0	0.0	0.0	1.0
e. No responses	0.8	1.6	0.0	0.0	1.3	1.9	1.3	2.9
28. Which type of technical data would you prefer to use? For routine jobs:								
a. Traditional TO	7.7	13.1	12.4	13.9	7.7	13.0	3.9	12.4
b. Checklist	32.9	33.4	46.9	34.7	16.7	26.9	35.1	39.1
c. Job Guide Manuals	50.0	36.9	28.4	31.7	71.8	46.3	49.4	32.4
d. Very general procedures	5.7	10.8	8.6	12.9	2.6	11.1	5.2	8.6
e. Other, or multiple response	2.0	4.1	3.7	6.9	0.0	0.9	2.6	4.8
f. No response	1.6	1.6	0.0	0.0	1.3	1.9	3.9	2.9

Table 4 (*Continued*)

Questions[a] & [b]	Base		Squadron					
	CAFB & NAFB		AMS		FMS		OMS	
	B	A	B[c]	A	B	A	B	A
29. For non-routine jobs:								
a. Traditional TO	16.3	22.3	17.3	28.7	18.0	21.3	13.0	17.1
b. Checklist	10.2	10.2	12.4	7.9	9.0	5.6	10.4	17.1
c. Job Guide Manual	66.3	58.0	63.0	56.4	64.1	65.7	70.1	51.4
d. Very general instructions	4.1	5.7	3.7	4.0	6.4	6.5	2.6	6.7
e. Other, or multiple response	1.6	2.2	2.5	3.0	2.6	0.0	0.0	3.8
f. No response	1.6	1.6	1.2	0.0	0.0	0.9	3.9	3.8
30. How do you feel about being required to use JGMs for every job?								
a. Pleased	35.4	13.1	21.0	7.9	44.9	18.5	39.0	12.4
b. Mostly pleased	41.1	33.8	46.9	29.7	38.5	44.4	37.7	26.7
c. Somewhat irritated	17.5	37.3	27.2	37.6	11.5	29.6	15.6	44.8
d. Irritated	4.5	13.1	3.7	22.8	3.9	5.6	5.2	11.4
e. Other, or multiple response	0.0	0.6	0.0	1.0	0.0	0.9	0.0	0.0
f. No response	1.6	2.2	1.2	1.0	1.3	0.9	2.6	4.8
31. Which would be *the most* helpful to you in transferring to a new aircraft?								
a. ATC school	0.4	1.9	0.0	1.0	1.3	1.9	0.0	2.9
b. FTD school	18.7	28.7	12.4	22.8	19.2	33.3	24.7	29.5
c. OJT	30.5	38.5	42.0	44.6	20.5	33.3	28.6	38.1
d. JGMs and LTTAs	24.8	10.8	25.9	13.9	37.2	11.1	13.0	7.6
e. Conventional TO	0.8	3.8	2.5	5.9	0.0	3.7	0.0	1.9
f. Other, or multiple response	23.6	13.4	16.1	9.9	20.5	14.8	32.5	15.2
g. No response	1.2	2.9	1.2	2.0	1.3	1.9	1.3	4.8
32. Which do you believe would most improve the efficiency of maintenance operations?								
a. More ATC training	1.6	5.1	2.5	5.0	0.0	3.7	1.3	6.7
b. Better ATC training	4.9	8.6	4.9	7.9	2.6	5.6	6.5	12.4
c. Better conventional TOs	6.5	9.6	7.4	8.9	6.4	9.3	6.5	10.5
d. JGMs and LTTAs	37.0	21.7	39.5	22.8	37.2	25.9	33.8	16.2
e. More qualified personnel	11.4	28.0	12.4	30.7	10.3	22.2	13.0	31.4
f. Better supply support	8.1	13.7	8.6	11.9	9.0	21.3	5.2	7.6
g. Other, or multiple response	29.3	11.2	24.7	11.9	33.3	10.2	31.2	11.4
h. No response	1.2	2.2	0.0	1.0	1.3	1.9	2.6	3.8
Total number of Respondents per Category =	246	314	81	101	78	108	77	105

[a]Due to space limitations, the questions presented in the tables have been abbreviated. The questions are presented in their complete original form in the questionnaire in the appendix.

[b]Some of the questions which are stated using present verb tenses in the tables, were stated using future verb tenses in the Technical Order Questionnaire.

[c]B respresents Before and A represents After.

Table 5. **Percentage of Subject Responses to Selected Questions Administered Before and After Job Guide Implementation (by Grade)**

Question[a] & [b]	Grade							
	1 & 2 & 3		4 & 5		6 & 7 & 8 & 9		10 & 11	
	B[c]	A	B	A	B	A	B	A
25. The new JGMs and LTTAs help you do your job?								
a. Better	75.3	51.1	79.5	46.5	79.0	28.6	76.2	43.9
b. About the same	20.8	46.7	18.0	46.5	15.8	71.4	23.8	45.1
c. Not as well	2.0	2.2	2.6	5.5	2.6	0.0	0.0	7.3
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	2.0	0.0	0.0	1.6	2.6	0.0	0.0	3.7
26. Do you like having detailed step-by-step instructions such as those found in the JGMs?								
a. Yes	82.2	71.1	85.9	61.4	92.1	78.6	90.5	63.4
b. Makes no difference	12.9	28.9	7.7	29.1	5.3	21.4	9.5	23.2
c. No	5.0	0.0	6.4	7.9	0.0	0.0	0.0	7.3
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4
e. No response	0.0	0.0	0.0	1.6	2.6	0.0	0.0	3.7
27. Do you like having detailed illustrations keyed to the step-by-step procedures?								
a. Yes	86.1	77.8	91.0	61.4	97.4	71.4	95.2	75.6
b. Makes no difference	10.9	21.1	7.7	33.1	0.0	28.6	4.8	15.9
c. No	3.0	1.1	0.0	3.9	0.0	0.0	0.0	3.7
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
e. No response	0.0	0.0	1.3	1.6	2.6	0.0	0.0	3.7
28. Which type of technical data would you prefer to use? For routine jobs:								
a. Traditional TO	6.9	8.9	7.7	15.0	5.3	7.1	14.3	15.9
b. Checklist	37.6	38.9	29.5	31.5	26.3	50.0	47.6	26.8
c. Job Guide Manuals	47.5	40.0	50.0	37.0	57.9	35.7	38.1	34.2
d. Very general procedures	5.0	10.0	9.0	12.6	5.3	7.1	0.0	9.8
e. Other, or multiple response	1.0	2.2	2.6	2.4	2.6	0.0	0.0	9.8
f. No response	2.0	0.0	1.3	1.6	2.6	0.0	0.0	3.7
29. For non-routine jobs:								
a. Traditional TO	9.9	18.9	23.1	22.1	21.1	28.6	14.3	25.6
b. Checklist	14.9	5.6	5.1	11.8	5.3	0.0	14.3	13.4
c. Job Guide Manual	67.3	66.7	66.7	58.3	63.2	57.1	61.9	48.8
d. Very general instructions	5.0	5.6	3.9	6.3	0.0	14.3	9.5	3.7
e. Other, or multiple response	0.0	2.2	1.3	0.8	7.9	0.0	0.0	4.9
f. No response	3.0	1.1	0.0	0.8	2.6	0.0	0.0	3.7
30. How do you feel about being required to use JGMs for every job?								
a. Pleased	25.7	10.0	41.0	14.2	50.0	21.4	28.6	13.4
b. Mostly pleased	45.5	31.1	41.0	31.5	29.0	28.6	47.6	40.2
c. Somewhat irritated	20.8	44.4	15.4	35.4	10.5	42.9	23.8	31.7
d. Irritated	5.9	13.3	1.3	15.0	8.0	7.1	0.0	11.0
e. Other, or multiple response	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
f. No response	2.0	1.1	1.3	2.4	2.6	0.0	0.0	3.7
31. Which would be the most helpful to you in transferring to a new aircraft?								
a. ATC school	0.0	3.3	0.0	1.6	2.6	0.0	0.0	1.2
b. FTD school	17.8	25.6	16.7	24.4	21.1	57.1	19.1	34.2
c. OJT	37.6	44.4	26.9	36.2	18.4	28.6	38.1	37.8
d. JGMs and LTTAs	17.8	10.0	30.8	12.6	31.6	7.1	23.8	8.5
e. Conventional TO	0.0	3.3	2.6	4.7	0.0	0.0	0.0	3.7
f. Other, or multiple response	25.7	10.0	21.8	18.1	23.7	7.1	19.1	11.0
g. No response	1.0	3.3	1.3	2.4	2.6	0.0	0.0	3.7

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Table 5 (*Continued*)

Question[a] & [b]	Grade							
	1 & 2 & 3		4 & 5		6 & 7 & 8 & 9		10 & 11	
	B[c]	A	B	A	B	A	B	A
32. Which do you believe would most improve the efficiency of maintenance operations?								
a. More ATC training	0.0	4.4	1.3	3.2	5.3	0.0	4.8	9.8
b. Better ATC training	7.9	11.1	1.3	10.2	5.3	14.3	0.0	2.4
c. Better conventional TOs	7.9	10.0	7.7	11.8	0.0	0.0	4.8	7.3
d. JGMs and LTTAs	35.6	23.3	41.0	24.4	34.2	21.4	33.3	14.6
e. More qualified personnel	7.9	22.2	15.4	27.6	10.5	35.7	23.8	34.2
f. Better supply support	8.9	14.4	7.7	11.8	7.9	21.4	9.5	14.6
g. Other, or multiple response	30.7	13.3	24.4	9.5	34.2	0.0	23.8	13.4
h. No response	1.0	1.1	1.3	1.6	2.6	7.1	0.0	3.7
Total Number of Respondents per Category =	101	90	78	127	38	14	21	82

[a] Due to space limitations, the questions presented in the tables have been abbreviated. The questions are presented in their complete original form in the questionnaires in the applendix.

[b] Some of the questions, which are stated using present verb tenses in the tables, were stated using future verb tenses in the Technical Order Questionnaire.

[c] B represents Before and A represents After.

Job Guide Manual Changes Recommended by Maintenance Personnel

The open-ended essay question, 37, was included in the Job Guide Questionnaire to obtain specific recommendations from the technicians on how to improve the new data. Question 37 asks, "If you could influence the purchase of job guide type manuals for a new aircraft, what changes would you recommend?" Although the specific recommendations were too numerous for a complete listing in this report, the following paraphrased responses represent the most typical suggestions.

1. Provide more theory, so an airman can understand how a system works, instead of just how it is taken apart and put together.

2. Job guides should explain why an item is being removed and replaced. They should also explain the primary use of an item.

3. Provide more information on the aircraft.

4. Provide more details on systems interface.

5. Decrease some of the step-by-step procedures. Some of them are not necessary.

6. Include the name and number of all test equipment, primary and alternate.

7. There are easier ways to accomplish some tasks than by the methods presented in the job guides. Suggest more research into methods for doing jobs.

8. Reduce the amount of operational check data on simple systems, such as ADF systems.

9. Word the guides more clearly.

10. Provide better alignment, if possible, between illustrations and particular steps.

11. Provide a more complete cross-referencing index system.

12. Require fewer manuals per job.

13. Incorporate all data related to a specific task in one section.

14. Decrease menial tasks included.

15. Decrease repetition of menial tasks (i.e., refuel, defuel, etc.)

16. Include troubleshooting trees within job guides.

17. Put repair (removal and replacement) in the same book with the operational checks.

18. Have one book per system which includes all information for the system.

19. Provide a checklist to supplement job guides.

20. Use checklists for quick operational checkout of certain systems.

21. Provide better storage places for the manuals.

22. Improve the numbering system so a specialist can locate his job guide without searching. Job guides should be numbered on the front.

23. Provide more detailed breakdowns in the troubleshooting manuals.

24. Provide more in-depth troubleshooting. The voltages checked still leave much uncovered for precise work.

25. LTTAs do not cover every job possibility. Therefore, they should be used as a supplement to TOs, rather than as a replacement of standard TOs.

26. The pages and binders need to be more durable.

27. The pages should be coated with plastic, so you can mark your spot without messing up the book.

28. Make the LTTAs more detailed.

29. Train individuals in the use of the job guides. Show them why they are better and how they can save time.

As was previously mentioned, many respondents wrote additional comments next to their responses to the multiple-choice questions. Samples of these comments are presented in Appendix E. It should be noted that the feelings expressed are not necessarily representative of the feelings of all respondents. They merely represent the feelings of those who took time to add written comments.

VI. DISCUSSION

Although many problems have been encountered in the C-141 job guide program, the program is considered to be very successful overall. The job guides have been well accepted by the technicians and are preferred over the old TO by many. In addition, the job guides have proven to be generally more effective than the conventional TOs that they replace. They are considered to be more usable than the TO both in terms of convenience for the user and the quality of the information provided for the technicians. Thus, the major goal of the program, to provide improved technical data for the C-141, has been achieved.

Most of the problems encountered in the program have been or are being overcome. Most of the serious errors in the data have been corrected. A new index has been developed to include the MSIM and GAM as well as the job guides. Policies for the use of job guide manuals have been clarified and implemented. And, finally, resistance to change is being overcome by time.

Other problems, however, remain unresolved or only partially resolved. The training problem was never satisfactorily resolved. It has become less of a problem simply because technicians have learned to use the data through trial and error. No progress has been made toward printing the job guides on more durable paper or binding them in more suitable binders. Consequently, the attendent problems (torn and missing pages, broken binders, etc.) remain. Considerable progress has been made in correcting errors in the data. However, errors remain (especially in the troubleshooting data) which must be corrected.

The C-141 job guide program has provided many valuable lessons for use in other programs to develop and implement job guides for other systems. A successful program is dependent upon two main factors, the development of accurate, effective data and the implementation of the data in an efficient manner which does not cause the technicians to be "turned off" by minor administrative problems before they are able to use it.

The development of the data is the most critical aspect of the program. If the job guides are not of good quality (effective procedures and relatively error free) when placed in the field, the program has little chance of success. The most critical step in the development of the data is the establishment of contract requirements and the selection of a contractor to develop the data. The contract for the development of the C-141 data contained three unique requirements which are believed to have contributed significantly to the success of the program. These were a requirement for a task analysis, unlimited access to the aircraft for the contractor for use in developing and testing procedures, and a guarantee requiring the contractor to correct any errors found in the data during the first year. It is believed that the guarantee clause encouraged the contractor to place greater emphasis on quality control in the development of the data.

Although a task analysis is not a contract requirement for most technical data procurements, it is considered to be an essential requirement for the development of job guide type data. The task analysis process provides a means of developing a complete data base from which the job guides can be developed. It includes procedures for identifying all tasks to be covered by the job guides, analyzing the tasks to develop the most efficient procedures for accomplishing each task, identifying tasks and special equipment required to complete each task, and determining the level of detail that should be used in writing the procedures. The data base, produced from the task analysis, establishes the final requirements for developing the job guides and provides most of the information required. Development of the job guides then becomes primarily a process of formating the data and providing the necessary illustrations and support information.

In developing job guide and LTTA type technical data it is highly desirable that the data developers have free access to the subject equipment. Although providing the required access may be expensive in some cases, it is believed that the improved quality of the data and reduction in requirements for revisions more than justify the cost. Permitting the task analyst and technical writer to have access to the equipment allows them to actually see how it works and try the procedures to insure that they are effective. This access also allows the writer to try several possible procedures to see which works best. Without this access, the analyst and writer are forced to rely on engineering drawings or photographs and their imaginations to develop the procedures. Inevitably, this process results in the development of some procedures which require revision.

Once the data have been developed, they must be verified by the procuring activity to insure accuracy and completeness. Since accuracy is essential for job guide type data, it is important that all procedures be given "hand-on" verification. Hands-on verification is the most effective way of insuring that the procedures are technically correct and effective. Verification of procedures should be accomplished by personnel with experience levels typical of the intended user.

Ideally, one hundred percent of the procedures should be verified. However, this is seldom feasible since some tasks cannot be verified without risk of damage to equipment, risk of injury to personnel, or excessive cost. This is especially true for LTTAs. Verification of LTTAs requires installation of faulty components which may cause an unsafe condition or damage other components of the system. Most job guides can and should be verified. The only exceptions should be in cases where there is risk of damage to the equipment or injury to personnel, or for infrequently performed tasks which will be very expensive to verify (e.g., removal of a wing). All other job guides should be verified. Procedures which are not vertified should be given a very thorough review by qualified technicians.

Even with a thorough verification, it is inevitable that some errors will be found when the data is implemented. It is important that special provisions be made to speed up the updating process until most of the errors are corrected. The procedures for identifying and correcting errors used in the C-141 program were especially effective. Similar procedures should be used for other job guide programs.

It is recognized that the task analysis procedures, provision of access to the equipment, and extensive verification significantly increase the cost of the data. However, it is believed that the improved quality of the data produced, reduced requirements for updating the data, and the positive influence of accurate data on user acceptance more than justify the additional cost. This appears to be a near classic case of a long-term reduction in life cycle costs with the added feature of early acceptance of the data.

The second most critical step in the job guide program is implementation of the data. An effective implementation program is essential for a smooth transition to the new system. A successful implementation is dependent upon effective procedures to accomplish the following: (a) orient and train maintenance personnel, (b) develop and communicate policies for using the data, and (c) make the data conveniently available. Successful implementation of improved technical data requires careful planning and preparation. A thorough implementation plan is essential. The requirements for an effective implementation are discussed in detail in Sections III and IV and Appendix C. They will not be discussed further here. However, the importance of an effective implementation program cannot be over-emphasized.

Recommendations

Based on the findings of the study, the following recommendations are made for use by organizations considering the procurement of job guide type technical data for new or existing systems. Recommendations applying specifically to the C-141 program were made available to MAC and AFLC at the end of Phase II and Phase III. They are summarized in Section III and IV.

1. The job guides should be based on a thorough task analysis. The task analysis process provides the best method of insuring that all tasks are covered and that effective procedures are developed. See Joyce *et al.* (1973a, 1973b, & 1973c) for recommended task analysis procedures.

2. The contractor should have complete and timely access to the equipment during the critical stages of data development.

3. A thorough "hands on" verification of the job guide and LTTA procedures should be accomplished. Only the very difficult and lengthy tasks, and the very simple tasks, should be excluded. The LTTA procedures should be verified to the maximum extent possible.

4. Consideration should be given to use of the dual-level approach. The dual-level approach can contribute significantly to acceptance of the data by experienced technicians. The dual-level feature also allows a technician to "grow with the system" as he gains experience, in that he can progress from the detailed to the general information level.

5. The job guides should be printed on very durable paper. At least the high use job guides should be printed on paper that is impervious to oil and water and will not easily tear out of the binder. The additional cost should be more than compensated for by savings resulting from not having to replace job guide manuals which have missing pages.

6. An improved binder should be developed or adopted for use with the job guides. The binder should have a hard back for easy storage and should have a means of securing pages which reduces the risk of pages being torn out.

7. Lengthy checkout procedures should be avoided. For an existing weapons system, the existing checkout procedures should be carefully checked and utilized if they are satisfactory. For new weapon systems, the checkout procedures should be designed to be as short as possible while providing an adequate check of the system. The orderly nature of proceduralized instructions apparently encourages writers to increase the length of checkouts. Lengthy procedures, however, tend to discourage the user and may encourage inattentiveness and errors.

8. Care should be taken to insure that only one JGM is required for one job. The grouping of job guides into JGMs should be such that the procedures for related tasks (e.g., follow-on tasks) are located in the same manual whenever possible. The requirement for taking more than one manual is very irritating to the technician.

9. A good, comprehensive implementation plan should be developed well in advance of actual implementation of the data. A well thought out, long range plan is necessary if major problems are to be avoided when job guides are introduced. This is especially true if the job guides are replacing conventional TOs for an existing system. The plan should provide guidance for the program in such areas as informing the bases, making decisions about utilization policy, providing for training, and encouraging utilization. This plan should then be used by the base project monitors to develop specific plans for implementation at each base. See Appendix C for guidance in developing implementation plans.

10. A short, effective training program should be developed and administered to all users prior to implementation of the data. The program should include instruction on the purpose and advantages of the new data, contents of each type of manual included in the system (JGM, LTTA, GAM, MSIM and WD), how to use the index, how to use the job guides, how to use the LTTAs, and policies for use of the data. Exercises should be provided to give the technicians practice in locating required materials.

11. A special system should be provided for identifying and correcting errors during the first few months after implementation. A special program should be established between the bases, the command headquarters, the appropriate Air Logistics Center and the contractor which will permit speedy handling of the AFTO Form 22s that document necessary changes to TOs. Under normal circumstances this is a long and cumbersome process. The users should be encouraged to identify and report errors in the data.

12. A strong emphasis should be placed on using the data. It is important that the users be encouraged to actually use the new data. This is especially true when job guides are replacing conventional TOs on an existing weapon system. In this situation there is generally a large group of experienced technicians available who prefer not to use any kind of TO. The transition to proceduralized data seems to be particularly difficult for these technicians. Definite utilization procedures and requirements are needed so that all know what is expected of them. Supervisors should encourage the use of the new TO and should insure compliance with local, command, and Air Force usage policies. Local and command inspectors should be very familiar with usage requirements in order that they might properly encourage and require TO utilization.

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APPENDIX A: TECHNICAL ORDER QUESTIONNAIRE

As part of a project to improve Air Force Technical Orders, a survey is being made by the Air Force Human Resources Laboratory to identify the strengths and weaknesses of existing TOs and proposed new types of TOs. Your experience with the present TO system can provide valuable information on its strengths and weaknesses and can provide a basis for recommendations for future modifications to the system. The following questions have been prepared to obtain information on how you use TOs and how you would like to see them changed. Please be frank and honest in expressing your opinions.

The information that you provide will be used for research purposes only. No attempt will be made to identify individuals. The results will be reported in summary form only.

New C-141 Technical Data

The Air Force has purchased a new type of technical data for the C-141A on-equipment maintenance. This new data will be tested at this base soon.

Two types of instructions are provided with the new data. They are job guide manuals (JGM) and logic tree troubleshooting aids (LTTA). The JGMs provide step-by-step instructions for all on-equipment maintenance of the C-141A. The instructions are keyed to detailed illustrations to help you locate the components referred to in the instructions. All of the information required to complete the job is included in the JGM. Sample pages from a JGM are shown on the following page.

LTTAs provide a troubleshooting strategy and step-by-step instructions for all on-equipment troubleshooting tasks. The instructions are presented in a format similar to that used in the JGMs and are supported by illustrations. The instructions specify the sequence of checks to be used, expected result at each check, and prescribe the proper corrective action.

Please examine the sample job guide manual on the following page and answer the questions beginning on page 11.

REMOVE AND INSTALL FUEL CONTROL UNIT

INSTALL FUEL CONTROL UNIT:

Inspect Engine Gearbox Oil Seal and Spline:

1. Inspect fuel control drive oil seal (2) for evidence of oil leakage. If leakage is evident, replace oil seal (2) per T.O. 1C-141A-2-4JG-3.

2. Clean gearbox spline (1) with wire brush and solvent, P-D-680 to remove dirt, grit and old lubricant.

3. Inspect internal splines (1) for overall condition. If splines are broken, chipped, or cracked and engine change or gearbox (ADH) change will be required.

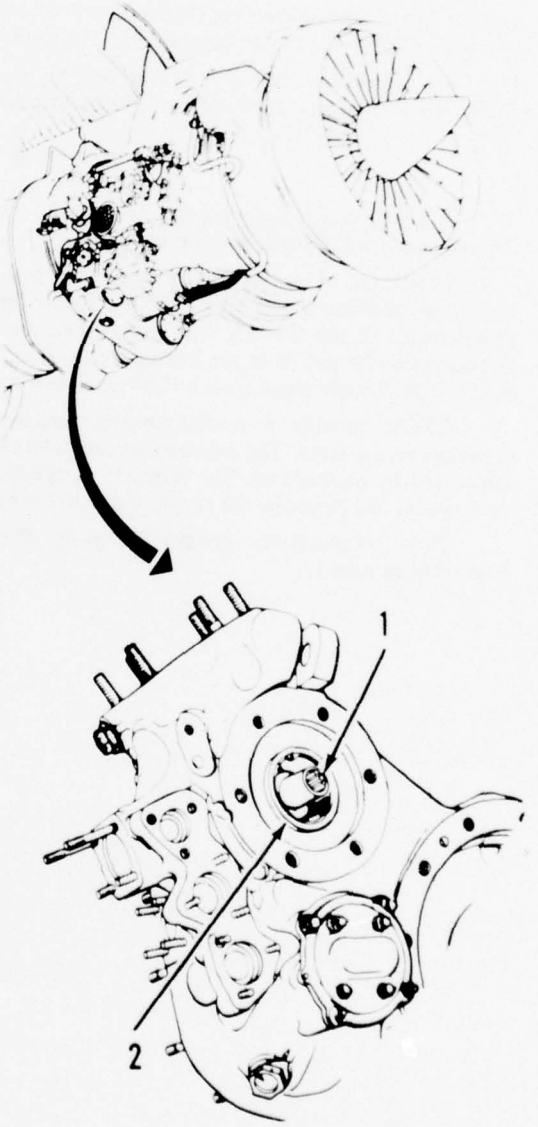
4. Remove (blend) any small nicks or dents in splines with a honing stone or small file.

5. Remove all traces of corrosion (red oxide) from spline with wire brush.

NOTE

In-process inspection of steps 1 thru 5 is required prior to performing step 6.

T.O.1C-141A-2-4JG-4



1. Have you ever used job guide manuals or logic tree troubleshooting aids similar to those described above?

____ 1. Yes
____ 2. No

2. Do you think that the new job guide manuals and troubleshooting aids will help you do your job?

____ 1. Better
____ 2. About the same
____ 3. Not as well

3. Do you like having detailed step-by-step instructions such as those found in the job guide manuals?

____ 1. Yes
____ 2. Makes no difference
____ 3. No

4. Do you like having detailed illustrations keyed to the step-by-step procedures?

____ 1. Yes
____ 2. Makes no difference
____ 3. No

5. Which type of technical data would you prefer to use?

For routine jobs:

____ 1. Traditional TO
____ 2. Checklist
____ 3. Job Guide Manuals
____ 4. Very general procedures

For non-routine jobs:

____ 1. Traditional TO
____ 2. Checklist
____ 3. Job Guide Manual
____ 4. Very general instructions

6. If you were required to use job guide manuals for every job, what would be your attitude?

____ 1. Pleased
____ 2. Mostly pleased
____ 3. Somewhat irritated
____ 4. Irritated

7. If you were experienced on another aircraft and transferred to work on the C-141, which of the following would be the most helpful to you in becoming qualified on the C-141?

____ 1. ATC school
____ 2. FTD school
____ 3. OJT
____ 4. Job Guide Manuals and Logic Tree Troubleshooting Aids
____ 5. Conventional TO

8. Which of the following do you believe would be the most likely to improve the efficiency of maintenance operations?

____ 1. More ATC training
____ 2. Better ATC training
____ 3. Better conventional TOs
____ 4. Job Guide Manuals and Logic Tree Troubleshooting Aids
____ 5. More qualified personnel
____ 6. Better supply support

APPENDIX B: JOB GUIDE QUESTIONNAIRE

This survey, prepared by the Air Force Human Resources Laboratory is a part of the Study of User Acceptance and Usability of the C-141 Job Guides. The data will be used to improve future Job Guide Manual purchases for new aircraft.

Please write your rank, AFSC, and Squadron in the spaces provided below. Your name is not required. Answer the questions as honestly as possible. You may write additional comments if you wish to do so. Remember, your opinions will help improve future technical orders.

RANK_____ AFSC_____ SQUADRON__ AMS__ FMS__ OMS _____ .

There are no right or wrong answers. Please indicate your most preferred answer (one) by circling or checking the appropriate letter.

PRIVACY ACTION STATEMENT

AUTHORITY: 10 USC 8012, Secretary of the Air Force; Powers, Duties, Delegation by Compsensation.

PRINCIPAL PURPOSE: To determine the opinions of the users concerning the usability and acceptance of the C-141 Job Guide Technical Orders.

ROUTINE PURPOSE: Results will be tabulated for reporting purposes.

DISCLOSURE: Disclosure is voluntary. However, your answers will help the Air Force improve the future technical orders. Your cooperation is greatly appreciated.

This survey has been approved by the Military Personnel Center.
Randolph AFB, Texas
USAF-SCN-76-150

1. How do you like the Job Guide Manuals?

____ a. They are completely satisfactory.
____ b. They are good, but could be improved.
____ c. They are satisfactory, but no better than the old TOs.
____ d. They are unsatisfactory.

2. The size of the Job Guide Manual is

____ a. Too small.
____ b. Too big.
____ c. Okay.
____ d. Just right.

3. The illustrations are

____ a. Excellent.
____ b. Poor.
____ c. Okay.

4. Do the job guide procedures contain all the information you need to do the job?

____ a. Yes, for all jobs.
____ b. Yes, for most jobs.
____ c. Some information is missing for some job guides, but guides are still useful.
____ d. Missing information makes job guides unusable.

5. Are the procedures correct?

____ a. Almost always.
____ b. Mostly.
____ c. Seldom.
____ d. Never.

6. Do you have any difficulty in understanding the procedures?

____ a. Always.
____ b. Mostly.
____ c. Occassionally.
____ d. Never.

7. Are too many books required to do one Job?

____ a. Always.
____ b. Mostly.
____ c. Occasionally.
____ d. Never.

8. Do you find the procedures in the job guides to be too simple (too detailed)?

____ a. Yes, for most jobs.
____ b. Yes, for some jobs.
____ c. No, about right for most jobs.

9. Do you use the dual-level feature?

____ a. Mostly.
____ b. Seldom.
____ c. What is the dual-level feature?

10. Have you had any problems with lost, torn, or dirty T.O. pages?
___ a. Yes, a lot.
___ b. Some.
___ c. Very little.
___ d. No.

11. Do you use the procedure headings as a checklist?
___ a. Frequently.
___ b. Sometimes.
___ c. Never.

12. Would you prefer to use
___ a. Traditional-style TOs.
___ b. Job Guide-style TOs.
___ c. Checklists.
___ d. No TOs.

13. What do you think is the best feature of the Job Guides?
___ a. Size.
___ b. Simplicity.
___ c. Step-by-step procedures.
___ d. Illustrations.
___ e. Dual-level of instructions.
___ f. Other

14. Many of the illustrations are printed on fold-out pages. Does this make the illustrations
___ a. Very convenient to use.
___ b. No problem to use.
___ c. Difficult to use.

15. The illustrations are:
___ a. Necessary to complete most jobs.
___ b. Helpful for most jobs.
___ c. Helpful but usually not necessary.
___ d. Not needed for any job.

16. An index is provided to help you locate information in the job guide manual. The index is:
___ a. Very helpful. Permits rapid location of all job guide information.
___ b. Usually helpful. Aids in locating most required job guide information.

17. The GAM provides general information on the AC and its systems. How useful is this manual?
___ a. Very useful. Used frequently.
___ b. Somewhat useful. Used occasionally
___ c. Seldom useful. Rarely used.
___ d. Have never used it.

18. As a source of information for your job, the new job guide manuals are:
___ a. Much better than the old TOs.
___ b. Better than the old TOs, but can be improved. Require refinement.
___ c. No better than the old TOs.
___ d. Worse than the old TOs.

19. One of the goals of the JG program is to provide better tech data to encourage use on the job. Do you feel that:

___ a. You use JGMs more than the TOs.
___ b. About the same as the old TOs.
___ c. Less than the old TOs.

20. How valuable do you think the Job Guides are to OJT?

___ a. Valuable – much better than the old TOs.
___ b. Valuable – about the same as the old TOs.
___ c. Of little value – about the same as the old TOs.
___ d. Of no value – much worse than the old TOs.

21. If you are an OJT trainer, how valuable are the Job Guides in helping someone learn the aircraft?

___ a. Very valuable – much better than the old TOs.
___ b. Valuable – about the same as the TOs.
___ c. Of little value – about the same as the old TOs.
___ d. Of no value – much worse than the old TOs.

22. Are less experienced technicians doing more work on the aircraft because of detailed procedures in the Job Guides?

___ a. Yes.
___ b. No.

23. Would you recommend that job guide manuals be purchased for use in your shop?

___ a. Yes, for all tasks.
___ b. Yes, for some tasks.
___ c. No.

24. Would you recommend that logic tree troubleshooting aids be purchased for use in your shop?

___ a. Yes, for all tasks.
___ b. Yes, for some tasks.
___ c. No.

25. Do you think that the new job guide manuals and troubleshooting aids will help you do your job?

___ a. Better.
___ b. About the same.
___ c. Not as well.

26. Do you like having detailed step-by-step instructions such as those found in the job guide manuals?

___ a. Yes.
___ b. Makes no difference.
___ c. No.

27. Do you like having detailed illustrations keyed to the step-by-step procedures?

___ a. Yes.
___ b. Makes no difference.
___ c. No.

28. Which type of technical data would you prefer to use?
For routine jobs:

___ a. Traditional TO.
___ b. Checklist.
___ c. Job Guide Manuals.
___ d. Very general procedures.

29. For non-routine jobs:

___ a. Traditional TO.
___ b. Checklist.
___ c. Job Guide Manual.
___ d. Very general instructions.

30. How do you feel about being required to use job guide manuals for every job?

___ a. Pleased.
___ b. Mostly pleased.
___ c. Somewhat irritated.
___ d. Irritated.

31. If you were experienced on another aircraft and transferred to work on the C-141, which of the following would be the most helpful to you in becoming qualified on the C-141?

___ a. ATC school.
___ b. FTD school.
___ c. OJT.
___ d. Job Guide Manuals and Logic Tree Troubleshooting Aids.
___ e. Conventional TO.

32. Which of the following do you believe would be the most likely to improve the efficiency of maintenance operations?

___ a. More ATC training.
___ b. Better ATC training.
___ c. Better conventional TOs.
___ d. Job Guide Manuals and Logic Tree Troubleshooting Aids.
___ e. More qualified personnel.
___ f. Better supply support.

Troubleshooting

If you have used Logic Tree Troubleshooting Aids (LTTAs), please answer the following **four** questions. If you have not used LTTAs, please complete the questionnaire by answering question #37.

33. Logic tree troubleshooting aids (LTTAs) specify the troubleshooting strategy and provide step-by-step instructions for isolating faults.
Do you prefer to:

___ a. Use LTTAs for all troubleshooting tasks.
___ b. Use LTTAs for infrequent troubleshooting tasks only.
___ c. Use LTTAs for the most difficult troubleshooting tasks only.
___ d. Develop own troubleshooting strategy and not use LTTAs at all.

34. How do you feel about being required to use LTTAs for all troubleshooting jobs?

___ a. Pleased.
___ b. Mostly pleased.
___ c. Somewhat irritated.
___ d. Irritated.

35. Do the LTTAs lead to correct isolation of the problem?

___ a. Yes, always.
___ b. Usually.
___ c. Sometimes.
___ d. Seldom.

36. Do LTTAs require more or less time to troubleshoot a problem?

___ a. Less time is required using LTTAs.
___ b. About the same amount of time.
___ c. More time is required when using LTTSs.

37. If you could influence the purchase of job guide type manuals for a new aircraft, what changes would you recommend?

APPENDIX C: GUIDANCE FOR THE DEVELOPMENT OF IMPLEMENTATION PLANS

Successful implementation must be planned well in advance of the actual start date, and it should involve the users as much as possible. Ideally, a Project Officer will have been selected from the major using command before the technical data contract is awarded. The command project officer (CPO) is very important to the success of the contract and the following implementation. He should be selected with care. If possible, the project officer should be of sufficient grade or have sufficient backing to "make things happen." The attention of and accesibility to a higher grade officer who can take the responsibility for making decisions for the Command is also vital.

The project monitors for each base should be selected early in the data development phase. The monitors should help select users to participate in the in-process reviews (IPRs). Base monitors should participate in as many meetings, conferences, and in-process reviews as possible to familiarize themselves with the data.

The Command Project Officer (CPO) and the base project monitors should meet to develop the command and base level implementation plans. The following topics should be included in the plans:

1. Training or orientation.
2. Dates of implementation.
3. Headquarters assistance.
4. Policy for using new TOs.
5. Removal of old TOs.
6. Informing all TO users (Supply, FTD, etc.).
7. Adequate supplies of new TOs.
8. Distribution of new TOs.
9. Storage of TOs in shops, trucks, and airplanes.
10. Error reporting.
11. Update procedures.
12. Base level briefings and Progress Reviews.
13. Follow-up reviews and inspections.

Specific guidelines for each of the above are discussed in the following paragraphs.

1. *Training or Orientation* – An effective training or orientation program is necessary to prevent confusion, dissatisfaction and failure to use the new TOs. While it is true that the job guide concept is relatively simple to understand and use, training is needed to insure that the users understand the purpose of the data, the contents of the data, and how to use them. A training program of only 3–4 hours duration can increase the utilization and acceptance of the data by making the users more familiar with the contents. The course should be developed by using command headquarters training personnel who are very knowledgeable about the contents and proper use of the books. Such topics as how to find information; how the data should be used; the kind of information that the job guides do and do not contain; contents and purpose of the MSIM, GAM, LTTA, and WD volumes; care and storage of the books; how to report errors; and how to update should be covered in the training. As much as is feasible, the training should require the students to participate by completing exercises to insure familiarity with the new data. The exercise should require the trainee to actually locate and review specific information. The training should be given at wing or squadron level by local training personnel. All maintenance personnel, including officers and senior NCOs should attend the training. The training will be the first opportunity for most of the people to see the new TOs, so it should be positive in nature. The class should be completed prior to, but not more than one month before implementation.

2. *Dates* – The actual dates of implementation should be selected to avoid conflict with other known extraordinary events at the bases, such as inspections, exercises, heavy TDY requirements, weapon

system changes, etc. All of the TOs should actually be available at each base, and ready for distribution *at least* two days prior to the first day of implementation. All necessary storage facilities for the TOs in the shops, trucks, or aircraft should be ready by the implementation date.

3. *Headquarters Assistance* – Assistance by headquarters personnel should play an important role in the implementation. In addition to developing the command policies on using the TOs, the CPO should indicate and monitor the development of the training or orientation program by the headquarters training section. The CPO and his team should also assist the bases in selecting the base level project monitors and technicians for IPRs and verification efforts. Headquarters assistance can also be given by presenting the initial briefing to the Deputy Commander for Maintenance (DCM) and his staff on the new TOs. During implementation, the CPO and his team should be available to assist in answering questions and encouraging proper use. This may require that implementation occur sequentially at the bases, rather than simultaneously. If simultaneous implementation is desired, some way should be found to have at least one knowledgeable headquarters representative at each base. This representative should work with the base project monitor to insure that personnel are knowledgeable and prepared for the first day of implementation. He should also be available to answer questions, monitor proper usage of the TOs, and assist in giving progress and status briefings to the DCM. A follow-up visit to the local bases should be made approximately 30 days after implementation. Additional visits would be appropriate if problems in using the TOs are prevalent.

4. *Policy for Using the TOs* – This is a very important topic that should be understood by both Headquarters and base level maintenance and inspection personnel. The policy for using the TOs probably will have been developed during the early stages of the data procurement process. Certainly the policy should be finalized by the time the implementation plan is developed. The CPO should insure that an approved usage policy does exist and that maintenance, inspection, and policy management personnel at both Headquarters and at base level are familiar with it. This is especially important because of the step-by-step proceduralized nature of the data. Does the experienced maintenance man *have* to follow *every* detailed step? Is it sufficient to review the procedure, then do the job by memory? Do some jobs require the user to follow every step, every time, experience and qualifications not withstanding? Do the Quality Control and Headquarters inspectors have the same understanding of usage requirements as the technicians and supervisors do? These and other questions should be answered by the command's policy for TO use. This policy must be understood and generally accepted by base level personnel.

5. *Removal of the Old TOs* –The old TOs which are being replaced by the new job guides should be removed from all shops, trucks, and aircraft on the morning of the first day of implementation. If the old TOs are kept in place, the new TOs will get very little use, the transition will be more difficult and longer, and the acceptance of the new TOs by the user is likely to be less. When in doubt or in a hurry, people will generally turn to whatever they are more familiar with. This would be the old TO. The best solution is to make the old TOs unavailable for use at the same time the new ones are to be implemented.

6. *Informing all Users* – All of the organizations who have occasion to use TOs, such as the Field Training Detachment (FTD), Material Control, and Base Supply should be made aware of the upcoming change in TOs and should be given an opportunity to become familiar with the new system in advance.

7. *Adequate Supplies of New TOs* – The CPO should receive reports from the base project monitors as to the completeness of the TO inventory at each base. This is to insure that each base does, in fact, have sufficient copies of each required volume to permit complete coverage of the required maintenance. If possible, the new TOs should be distributed at least two full working days prior to implementation. This will allow each technician an opportunity to review the books and recall the orientation class prior to actually using the data.

8. *Distribution of the New TOs* – The CPO and the base Project Monitor should determine how the new TOs will be distributed. Will distribution be by individual or by shop? How many copies should each shop get? Will TOs be placed in the flight line trucks and/or aircraft as well as the shops? Is the distribution policy consistent with the usage policy?

9. *Storage of the New TOs* – One of the typical characteristics of job guide-type TOs is their small size. This small size results in more volumes. Also, the binders that the job guides are stored in usually have soft covers and consequently are difficult to stand alone on a shelf. These facts may necessitate new storage facilities in the shop, the trucks, and the aircraft. The small, soft binders will generally require individualized compartments if they are to be arranged neatly. Greater amounts of storage space will also be required wherever the TOs are stored.

10. *Error Reporting* – The new TOs are certain to have errors in them which escaped detection during verification. The very detailed proceduralized nature of job guides make errors very noticeable to the users. Errors also decrease the confidence the user has in the data, and tend to discourage utilization. Procedures should be established by the CPO and the base project monitor to provide for efficient identification and reporting of errors. If possible, the routing of AFTO Form 22s from the user to Quality Control to Headquarters should be speeded up. Headquarters, in turn, should insure that minimum delay is encountered between the headquarters, the appropriate Air Logistics Center (ALC), the contractor and the publication of revisions. Prompt identification and correction of errors will improve maintenance procedures, increase user acceptance, and increase utilization of TOs.

11. *Updating Procedures* – The many pages of proceduralized data and the number of volumes may necessitate a change in update procedures. The CPO should work with the ALC TO manager and the base level Technical Order Distribution Office (TODO) to determine what the update requirements will be. Procedures should be developed to insure that efficient TO updating will occur.

12. *Base Level Briefing and Progress Reviews* – Initial briefings should be given by the CPO to each DCM and his staff early in the development phase. The briefing should cover the type of data being purchased, the differences between the new and old TOs, how the data will be used, the benefits of the new data, and the approximate implementation date. Support requirements from each base should be identified. These include a base level Project Monitor, squadron and branch level monitors, and technicians to participate in the in-process reviews and verification proceedings. The Project Monitor should keep the DCM and his staff informed about the development of the data and the plans for implementing them. It is necessary for the DCM and his staff to be supportive of and knowledgeable about the total TO program if successful implementation is to occur. Immediately prior to implementation, the Project Monitor should insure that the DCM and his staff fully understand the program, and that they do and will full support the implementation. During implementation, the CPO and the Project Monitor should keep the DCM and his staff informed about the status of the program and any problem areas. A briefing at the end of implementation should identify remaining problem areas, and should provide recommended solutions.

13. *Follow-Up Reviews and Inspections* – The base project monitors should continue to monitor the utilization of the data and identify problem areas. This information should be passed on to the CPO and the local DCM and his staff. A follow-up review should be considered by the CPO no earlier than 30 days after implementation, depending upon the progress reported by the project monitor. If possible, command and Air Force inspection teams should wait at least two months after implementation before inspecting maintenance at the base. This should give base officials ample time to smooth out any necessary changes in maintenance procedures. If there is a shakedown phase at one or two bases, insure that the project monitors from other bases are observers.

Command Headquarters Project Officer Checklist

Data Development Phase

- Insure that base monitors are named.
- Finalize usage plans (daily use, storage, update, etc.).
- Involve users (if identifiable) in IPRs.
- Brief DCM (preferably at his base) on data contents, use, benefits, etc.
- Insist upon "100% hands-on verification" using actual users.
- Develop base-leve implemenatation plan.

Pre-Implementation Phase

- Prepare orientation/training class-student workbook type handouts.
- Insure that HQ people responsible for policy, inspection, evaluatiin, etc. are in agreement with usage plans, evaluation requirements, etc.
- Visit each base to insure all (training, base implementation plan, storage, data) is ready and to brief each base project monitor, QC, and DCM on their responsibilities during implementation.
- Arrange special "quick" HQs and AFLC handling of AFTO Form 22s.

During Implementation

- Insure that teams are present at each base to assist, answer questions, encourage, etc.
- Help base project monitor identify problems and determine solution.
- Work with base project monitor and DCM as required.
- Monitor usage.

After Implementation

- Monitor status and progress via base project monitor.
- Insure (with Command HQ support, if necessary) that DCM is involved, committed, knowledgeable.
- Make follow-up visit 30 days after implementation week to determine status, progress, usage.
- Review reports of first inspection/evaluation to determine if problem exists.

Base Project Monitor Checklist

Data Development Phase

- Become familiar with the data being developed.
- Attend IPRs, conferences, etc.
- Help select qualified representatives to participate in IPRs, verification, etc.
- Help brief DCM, officers and key NCOs.
- Assist Command HQs Project Officer prepare Command level implementation plan.
- Consider special problems such as storage facilities, locations, use.
- Identify Squadron-level project monitors.
- Become familiar with Command Implementation Plan.
- Develop specific base level Implementation Plan.

Pre-Implementation Phase

- Insure that Staff and Squadron Training Agencies are ready to teach the Orientation and Training class.
- Review the schedules for each squadron to train all of their maintenance people.
- Insure that the DCM, Quality Control, officers, and key NCOs fully understand what the new data are and are not, and how the data are to be used by the technicians.
- Review storage locations, distribution and update plans, and AFTO Form 22 handling procedures.
- Review Implementation Plan with DCM and staff, key officers and NCOs, Quality Control inspectors, training agencies, and squadron project monitors.

During Implementation

- Insure that all old TOs are picked up at the start of the first day of implementation.
- Monitor usage of TOs, using Quality Control inspectors, squadron project monitors, and Command HQs team.
- Work with users to identify problems and determine solutions.
- Keep DCM informed of usage, progress, status, and problems.
- Assist supervisors, shop chiefs, users, etc. by answering questions and solving problems.

After Implementation Phase

- Continue to monitor data usage, problem, etc.
- Keep DCM and Command Project Officer informed.

APPENDIX D: LISTING OF AFSCs SURVEYED

325X0	Automatic Flight Control Systems
325X1	Avionics Instrument Systems
328X0	Avionic Communications
328X1	Avionic Navigation Systems
328X4	Avionic Inertial and Radar Navigation Systems
423X6	In-Flight Refueling Systems Mechanics
423X1	Aircraft Environmental Systems Mechanic
431X1	Aircraft Maintenance
426X2	Jet Engine Mechanic
423X3	Aircraft Fuel Systems

APPENDIX E: ADDITIONAL RESPONDENT COMMENTS

- Make plastic pages.
- Too many books, manuals, etc. are required by the job guides. They should be consolidated.
- The guides should be hard-backed.
- The technicians need previous knowledge of the old TOs and maintenance experience to help them understand the procedures.
- The procedures in the job guides are not detailed enough.
- Prefer to use job guide – style TOs and checklists together.
- Prefer to use traditional-style TOs and checklists together.
- The job guides are a good TO to use for basic operation and checkout of systems.
- The foldout pages are difficult to use:
  - in small work areas.
  - in strong wind.
  - due to the location of the fold-out in relation to particular steps.
  - because they don't fall in sequence to writings.
  - because they tear too easily.
- The GAM is very useful to some people, but not useful at all to others.
- The GAM is especially useful in becoming familiar with the aircraft.
- The index:
  - is incomplete, or not detailed enough.
  - difficult to use to locate specific data rapidly.
  - should list book number as well as TO number.
- The new JGMs are more convenient and easier to use than the old TOs.
- The simplification provided by the job guides is better than the TOs, but the information is not.
- The job guides are easier than the TOs to use for training.
- The LTTAs need to be improved and corrected.
- Irritated by requirement to use JGMs for evey job, because it takes longer to find the section and book than it takes to do most jobs.
- The LTTAs are not complete enough. They don't go far enough to isolate any difficult malfunctions.
- Use LTTAs for infrequent and/or most difficult troubleshooting tasks.

- The illustrations are poorly located in the book.
- The illustrations need more detail.
- More illustrations could be used.
- Some of the illustrations are incorrect and incomplete.
- The illustrations are necessary for new people to complete most jobs.
- Sometimes the items in the illustrations are too small to see details.
- Detailed illustrations keyed to the step-by-step procedures:
  - make the book too big.
  - are too distracting while reading.

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