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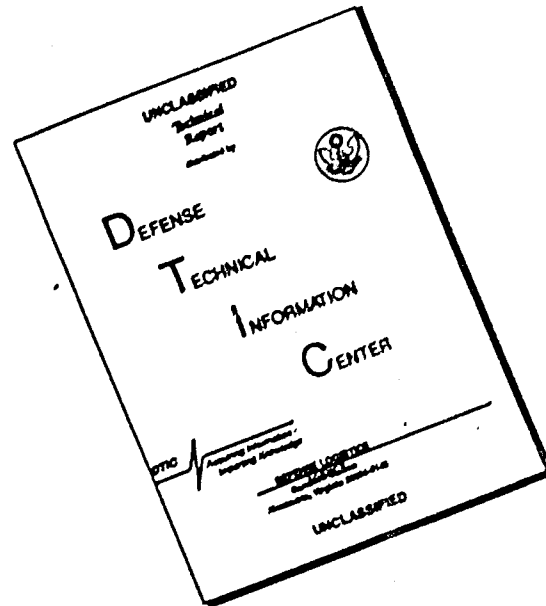
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PROJECT PIMO FINAL REPORT
PIMO BASIC TECHNICAL DATA STORAGE SYSTEM

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SERENDIPITY, INC.

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FOREWORD

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

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

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

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

This technical report has been reviewed and is approved.



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

ABSTRACT

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

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SECTION I

PIMO BASIC TECHNICAL DATA STORAGE (BTDS) PROGRAM

A. INTRODUCTION

A true test of a technical data management system is the degree to which the data reflect the details of the system which it supports. The speed and completeness with which the data are updated to reflect the latest equipment configuration and maintenance techniques of the system are two of the most important criteria of data management effectiveness.

Notwithstanding the expenditure of considerable resources, there does not exist in the armed services a suitable operational technical data configuration control system. It is considerably more difficult to control the needed changes to the technical data than it is to control hardware changes. One hardware change precipitates the requirement for myriad technical data changes. For example, one change to any aspect of the landing gear assembly of an aircraft generates requirements for changes to such documents as maintenance procedures, parts lists, special tools lists, supply catalogs, etc. Changes to maintenance procedures could require updating of electrical, structures, or hydraulic sections of the appropriate maintenance manuals.

The problems of managing changes to technical data are aggravated by factors which transcend those of the sheer size of the data base. The different methods by which hardware, hence the supporting technical data, are acquired by the services add to the complexities of the management problem. Control of the technical data supporting system hardware procured from a system contractor differs from GFE hardware procurement data management procedures.

As a part of the PIMO Phase II contract for the Air Force, Serendipity, Inc. focused upon the problem of technical data updating. Serendipity developed the Basic Technical Data Storage and Retrieval (BTDS) System for the production control and change control of technical data. (Technical data were used throughout the test to mean maintenance support data such as maintenance procedures, IPB data, and parts listings). The BTDS is an integrated group of computer programs used to identify technical data affected by changes and modifications to military systems, and to control the production of the data and its changes.

Project PIMO had as its major goal testing the concept of a new presentation format for maintenance data. The testing of this format called for the reformatting and control of a set of maintenance data. Essentially, this data consisted of all on-aircraft maintenance data for the C-141A aircraft, excluding the IPB and the flight manual. The BTDS Program was developed in order to ensure the timeliness of the data during and after its production, and also in order to ensure the actual production control of the data during the initial reformatting and revision phases.

The BTDS was made up of two sets of programs. The first group of programs performed the configuration control function of the Data Control System, thus providing the vehicle by which engineering changes were transformed quickly and completely into technical data changes required. A second group of programs provided for the production status control of the maintenance data and revisions as they were being produced. A discussion of each, the Configuration Control and the Production Control Programs of the BTDS follows.

SECTION II

CONFIGURATION CONTROL PROGRAMS

A. DESCRIPTION

The Configuration Control Programs of the Basic Technical Data Storage and Retrieval System were designed for the storage and recovery of information pertinent to the controlling and updating of maintenance data. The basic program represented a central depository of all information associated with the content of the maintenance data. This depository was in the form of a digital computer storage program.

A user language conducts the interface to the BTDS so that data control and all program options can be exercised with technical data information, but without requiring programmers.

The BTDS Programs had the following capabilities:

1. Storage of all information pertinent to the development of technical data.
2. Acceptance of revisions of designated data.
3. Retrieval of specified data.
4. Retrieval of answers to specific queries.

The BTDS Program was written in COBOL for large computer systems. (See Appendix I for the system and program flowcharts.) The computer language provided maximum compatibility with computers other than the ones presently being used. This, of course, is not to imply that the BTDS Programs would operate on other computers at present, but that the program was appropriately configured to be converted with minimum reprogramming.

The BTDS Configuration Control Programs were used to relate digitally specific source and reference material to the technical data. This information was stored in the BTDS. The inputs to the BTDS were those source data, drawings, or reports, which were used to develop the maintenance procedures, parts lists, special tool lists, IPB. The programming enabled the identification of all data (at the paragraph and page level) which would be affected by any change in the system equipment. Furthermore, changes in maintenance techniques or test equipment were transferred by the BTDS into change requirements for the maintenance data. The program storage and retrieval capability used in Project PIMO for the C-141A was sufficiently generic to be equally applicable to missile systems such as ATLAS and SATURN, to large aircraft systems, and to ground-based equipment such as tanks and heavy artillery, as well as to complex communication systems.

Figure 2-1 describes the prime system and technical support data production and modification interaction. The efficiency of the maintenance system was determined by the degree to which the maintenance support data represented the latest prime system configuration. The changes to the operational equipment were accomplished through modification kits in the field. The modification to the maintenance data occurred through either complete manual revision, change notices and/or supplements. This was true of all manuals including the Illustrated Parts Breakdown and associated parts listings as well as the regular maintenance procedure manuals. The BTDS Configuration Control was a vehicle by which these technical data could be updated to represent the latest equipment configuration.

This retrieval capability was, of course, the real advantage of the system. It was the vehicle by which specific segments of the maintenance support data were identified as candidates for revision. The only input required for this identification was the identification of technical order changes, engineering drawing changes, end item changes and part number changes. For Project PIMO, the prime

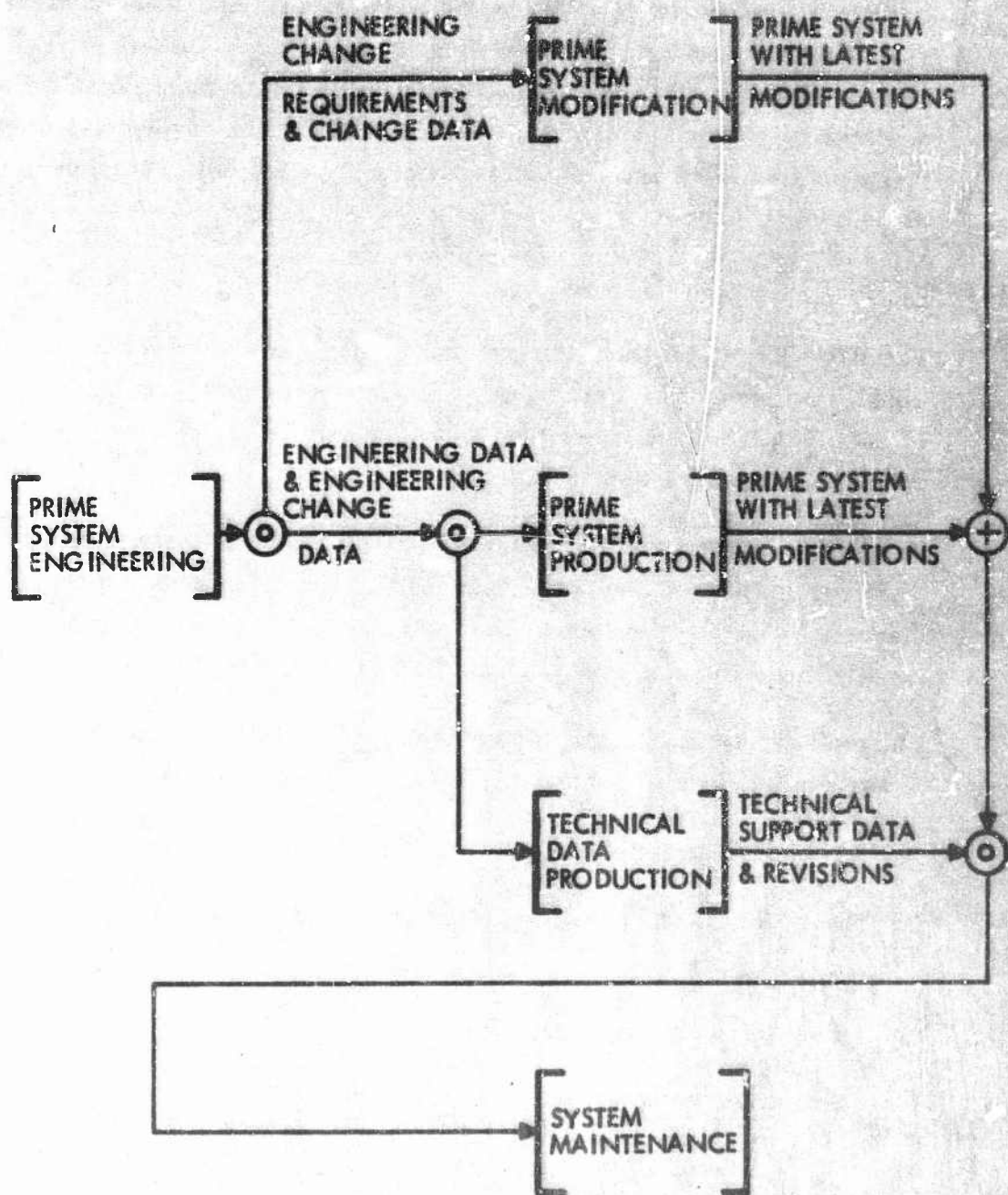


Figure 2-1 Prime System and System Technical Data Production Flowchart

source material was the C-141A Technical Orders, and these technical orders were the major documentation associated with the PIMO procedures. As changes occurred to technical orders, the changed paragraph or figure number was used to interrogate the BTDS. However, using the BTDS in the development of the initial maintenance data for a new system, the prime source documentation was the engineering drawings, end item, and part numbers associated with specific portions of the maintenance data.

B. RESULTS

The Basic Technical Data Storage and Retrieval System has been operationally employed for the past two years by Serendipity, Inc. on Project PIMO. The BTDS has more than met expectations in the area of controlling and updating technical data.

The BTDS Programs were developed with sufficient latitude to ensure their use as the primary tool for the initial development of maintenance manuals for any new system. The following is a brief description of some of the outputs and uses of the BTDS during Project PIMO.

The method used in storing source data during PIMO provided the latitude of associating specific material in the maintenance manual with:

1. Technical Orders, Engineering Reports, Test Procedures.
2. SOP (Standard Operating Procedure, used in many different maintenance actions.)
3. End item part number.
4. Special test equipment, tools and parts.
5. Applicable IPB figure number.

Figure 2-2 is an example of an SOP query. The SOP's were developed to ensure that instructions would be written the same way in every maintenance manual section.

PEND=Z100000000

PSTART=Z1

QUERY--FIND ACODES RELATED TO STYPE=TOP SMD=SOP

ACODE = 803000400	NO OF AFFECTED FRAMES IN ACTIVITY = 01
PSTART = Z100000000	PEND = Z100000000
FNO = 03	
ACODE = 8030030400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
PSTART = Z100000000	PEND = Z100000000
FNO = 02 05	
ACODE = 008000601	NO OF AFFECTED FRAMES IN ACTIVITY = 06
PSTART = Z100000000	PEND = Z100000000
FNO = 03 04 05 06 07 08	
ACODE = 0060030400	NO OF AFFECTED FRAMES IN ACTIVITY = 05
PSTART = Z100000000	PEND = Z100000000
FNO = 02 03 04 05 06	
ACODE = 0080110400	NO OF AFFECTED FRAMES IN ACTIVITY = 01
PSTART = Z100000000	PEND = Z100000000
FNO = 03	
ACODE = 0080220400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
PSTART = Z100000000	PEND = Z100000000
FNO = 03 06	
ACODE = 0050220400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
PSTART = Z100000000	PEND = Z100000000
FNO = 03 04	
ACODE = 0080250400	NO OF AFFECTED FRAMES IN ACTIVITY = 04
PSTART = Z100000000	PEND = Z100000000
FNO = 03 04 05 06	
ACODE = 0090070400	NO OF AFFECTED FRAMES IN ACTIVITY = 06
PSTART = Z100000000	PEND = Z100000000
FNO = 03 04 05 06 07 08	
ACODE = 0090100400	NO OF AFFECTED FRAMES IN ACTIVITY = 01
PSTART = Z100000000	PEND = Z100000000
FNO = 03	
ACODE = 0093140100	NO OF AFFECTED FRAMES IN ACTIVITY = 01
PSTART = Z100000000	PEND = Z100000000
FNO = 03	
ACODE = 0096450400	NO OF AFFECTED FRAMES IN ACTIVITY = 05
PSTART = Z100000000	PEND = Z100000000
FNO = 04 05 06 07 08	
ACODE = 8030020400	NO OF AFFECTED FRAMES IN ACTIVITY = 01
PSTART = Z100000000	PEND = Z100000000
FNO = 02	
ACODE = 8030020401	NO OF AFFECTED FRAMES IN ACTIVITY = 02
PSTART = Z100000000	PEND = Z100000000
FNO = 02 03	

QUERY REQUEST COMPLETE

Figure 2-2 Sample BTDS Query Printout (SOP)

The query request started, "Find activities related to SOP Z-1". Z-1 was actually a procedure for preparation for Rear Wing Spar maintenance; and parts of the SOP were used in many of the maintenance actions for flight controls and structures. The results were that the BTDS identified 14 unique activities.

During the source data documentation, all pages of each activity were coded as to the content of the illustration shown. This coding was at the removable end item level of indenture. This coding also permitted the identification of all frames of every activity which was concerned with a removable end item.

Figure 2-3 shows the result of the query, "What activity frames are affected by end item TO6004 (IFF Radar Antenna)?" Four activities are listed. If the existing model of the IFF Radar Antenna were replaced with a new model of antenna, this query would result in the identification of maintenance instructions possibly requiring illustration changes and changes in maintenance instructions associated with that end item.

This same coding scheme was used to identify subsystem component references when an engineering change affecting a subsystem was approved for modification. An engineering change affecting modifications to the HF-102 Communication System would be reviewed to determine the end items undergoing modification. If it were determined that all removable items in the HF System were affected, codes representing those end items would be used to query the BTDS. Figure 2-4 is the result of that query and the printout gives six different maintenance activity codes which were affected by modification of this system. All reference to the system within the maintenance manuals could then be updated according to the engineering change.

Tools, supplies and test equipment were also coded against each frame calling out the equipment. Figure 2-5 is a printout of the results of a query on aliphatic naphtha, a cleaning solvent. The printout lists 18

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PIMO

QUERY--FIND ACODES RELATED TO STYPE=PIC SMD=T PSTART=06004 PEND=0600400000

ACODE = S060000J01 NO OF AFFECTED FRAMES IN ACTIVITY = 02
PSTART = 0600400000 PEND = 0600400000
FNO = 03 04

ACODE = T060000100 NO OF AFFECTED FRAMES IN ACTIVITY = 01
PSTART = 0600400000 PEND = 0600400000
FNO = 15

ACODE = T060010100 NO OF AFFECTED FRAMES IN ACTIVITY = 01
PSTART = 0600400000 PEND = 0600400000
FNO = 15

ACODE = T060040400 NO OF AFFECTED FRAMES IN ACTIVITY = 02
PSTART = 0600400000 PEND = 0600400000
FNO = 04 06

QUERY REQUEST COMPLETE

Figure 2-3 Sample BTDS Query Printout
(End Item, Activity Frames)

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QUERY--FIND ACODES RELATED TO STYF=PIC SMO=V

ACODE = T030000100 NO OF AFFECTED FRAMES IN ACTIVITY = 04
 PSTART = 0300100000 PEND = 0300100000
 FNO = 04 05 06 07

ACODE = T030020400 NO OF AFFECTED FRAMES IN ACTIVITY = 04
 PSTART = 0300200000 PEND = 0300200000
 FNO = 03 04 05 06

ACODE = T030030400 NO OF AFFECTED FRAMES IN ACTIVITY = 03
 PSTART = 0300300000 PEND = 0300300000
 FNO = 03 04 05

ACODE = T030040400 NO OF AFFECTED FRAMES IN ACTIVITY = 02
 PSTART = 0300400000 PEND = 0300400000
 FNO = 03 04

ACODE = T030050400 NO OF AFFECTED FRAMES IN ACTIVITY = 02
 PSTART = 0300500000 PEND = 0300500000
 FNO = 06 08

ACODE = T030050400 NO OF AFFECTED FRAMES IN ACTIVITY = 02
 PSTART = 0300500000 PEND = 0300500000
 FNO = 03 05

QUERY REQUEST COMPLETE

Figure 2-4 Sample BTDS Query Printout
(End Items, Activity Codes)

QUERY--FIND ACODES RELATED TO TTYPE=526 TWO-TT-N-05 TNAME-ALPHATIC

NAPTHA

C

ACODE = 1010000400	NO OF AFFECTED FRAMES IN ACTIVITY = 05
ACODE = 1020000400	NO OF AFFECTED FRAMES IN ACTIVITY = 04
ACODE = 1030000400	NO OF AFFECTED FRAMES IN ACTIVITY = 05
ACODE = 1040000400	NO OF AFFECTED FRAMES IN ACTIVITY = 05
ACODE = L029130400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = L060100400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = B02620400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = B026560400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = S020000100	NO OF AFFECTED FRAMES IN ACTIVITY = 03
ACODE = S020020400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = S020030400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = S060000501	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = S060020400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = S060050400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = T060000501	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = U020010400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = V020020400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = X070060100	NO OF AFFECTED FRAMES IN ACTIVITY = 02

QUERY REQUEST COMPLETE

Figure 2-5 Sample BTDS Query Printout (Supplies)

activities using the solution. If all references to the solvent required modification or the solvent were to be replaced with a different type, the BTDS could be used to identify each and every page of the maintenance data which called out aliphatic naphtha. This assured that all the material which might be affected was identified in a matter of moments.

Test equipment used in a system maintenance also undergoes changes. The BTDS documentation allowed all references to special test equipment to be printed out, giving the test equipment number. Figure 2-6 lists 14 maintenance activities which were affected by the tester, Model L10. A further advantage of this test equipment inventory system of the BTDS was that this information detailing the various references to specific test equipment could be used with maintenance action frequency of occurrence data, allowing the suppliers of this equipment to approximate the quantity and type of test equipment allocation to each user location.

Each of the Remove and Install activities referenced an applicable IPB source for the removable item. With this information documented in the BTDS, one could identify all Remove and Install activities associated with any particular IPB figure number. Figure 2-7 is such a query, asking for all activities applicable to Figures 5-64 and 5-65 of Technical Manual T.O. 1C-141A-4(IPB). Two activities were affected by the first figure, and three by the second. Any change to an IPB figure could easily be translated to activity candidates for change.

The above samples of the BTDS output serve to indicate some of the ways in which the BTDS Program can be used as a technical data management system. The program itself would most benefit a technical data management system at the earliest development of the technical data, when any system is undergoing its most severe design changes. The source data would then become engineering drawings, engineering reports, etc. The effects of engineering changes and changes to the engineering data on the maintenance manuals could be readily and completely determined.

QUERY--FIND ACODES RELATED TO TTYPE=CEO TWO=6635-550-6496

TRANS-TESTER
MODEL 110

ACODE = 0020000600	NO OF AFFECTED FRAMES IN ACTIVITY = 03
ACODE = 0050000100	NO OF AFFECTED FRAMES IN ACTIVITY = 06
ACODE = 0060070400	NO OF AFFECTED FRAMES IN ACTIVITY = 08
ACODE = 0060090400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = 0060100400	NO OF AFFECTED FRAMES IN ACTIVITY = 020
ACODE = 0066570400	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = 0080000600	NO OF AFFECTED FRAMES IN ACTIVITY = 07
ACODE = 0090010100	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = 0080030100	NO OF AFFECTED FRAMES IN ACTIVITY = 03
ACODE = 0090010600	NO OF AFFECTED FRAMES IN ACTIVITY = 05
ACODE = 0090020600	NO OF AFFECTED FRAMES IN ACTIVITY = 03
ACODE = 0006390100	NO OF AFFECTED FRAMES IN ACTIVITY = 03
ACODE = 0900010100	NO OF AFFECTED FRAMES IN ACTIVITY = 02
ACODE = 0010050100	NO OF AFFECTED FRAMES IN ACTIVITY = 04

Figure 2-6 Sample BTDS Query Printout (Test Equipment)

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QUERY--FIND ACODES RELATED TO STYPE-IPB SNG-TOIC-141A-4 PSTART=050064 PERD=0500650000

ACODE = R020100400 NO OF AFFECTED FRAMES IN ACTIVITY = 01

PSTART = 0500640000 PEND = 0500640000
FNO = 01

ACODE = R026610400 NO OF AFFECTED FRAMES IN ACTIVITY = 01

PSTART = 0500640030 PEND = 0500640030
FNO = 01

ACODE = R023300400 NO OF AFFECTED FRAMES IN ACTIVITY = 01

PSTART = 0500650000 PEND = 0500650000
FNO = 01

ACODE = R023390400 NO OF AFFECTED FRAMES IN ACTIVITY = 01

PSTART = 0500650000 PEND = 0500650000
FNO = 01

ACODE = R023420100 NO OF AFFECTED FRAMES IN ACTIVITY = 01

PSTART = 0500650000 PEND = 0500650000
FNO = 01

QUERY REQUEST COMPLETE

Figure 2-7 Sample BTDS Query Printout (IPB)

C. PROCEDURES

The BTDS Program was the tool for updating maintenance procedure source data. In order for the system to have the capability for an efficient and fast update to the maintenance procedures, the BTDS was programmed to store information for each maintenance segment. A maintenance segment is that portion of the maintenance data which represents the data peculiar to some maintenance action or descriptive of a particular functionally related group of hardware (subsystem), an individual end item, or group of end items.

Examples of maintenance segments are the following:

"Bench checkout procedures for the VHF Navigation System",

"Adjustment of the Engine Fuel Control System",

"Removal of the Fuel Control Unit", and

"Illustrated Parts Breakdown of the Rudder Power Control".

Each segment had a unique activity code to locate it in the BTDS and each was documented with the following information at the page (or, if preferred, paragraph level) via a BTDS input form called Maintenance Activity Data (MAD) sheet:

1. Applicable end items identification,
2. Source data,
3. Applicable IPB,
4. Applicable special tools or test equipment, and
5. Applicable part numbers.

a. End Item Identification. All pictorial source data were associated with the maintenance segment and page. The pictorial

coding system allowed the interrogation of the BTDS for pages (and maintenance segments) affected by an end item change.

- b. Source Data (Drawings and Reports). All textual source data used in the development of the maintenance segment was coded on the Maintenance Activity Data Sheet form by engineering drawing or report number, revision date, and, if applicable, paragraph number or sheet number.
- c. Applicable IPB. For all types of maintenance data except Illustrated Parts Breakdown, the applicable IPB Technical Manual number revision date and figure numbers were coded against the maintenance segment. This IPB source was that figure number which illustrated the applicable maintenance segment end item and included the part number listing. This allowed cross-referencing between the parts breakdown used by supply and the maintenance procedural data used by the technician.
- d. Special Tools and Test Equipment. For each activity, special tools and test equipment were coded by name and number and associated with those pages within the maintenance segment which called out their use.
- e. End Item Part Number. The end item part number or numbers for the end item involved in the maintenance segment were listed against the pages upon which procedures or descriptions appeared against the end item. In the case of a single end item used on all of the system units, a single end item part number was listed with a "Usable On Code" of ALL. If more than one part number was applicable for an end item, each part number was listed against those pages which include procedures upon that end item. If the part number was usable on only a certain modification of equipment, then a "Usable On Code" (UOC) was assigned and coded against the end item in the BTDS.

The Maintenance Activity Dependency Sheet for each maintenance segment was inserted via the keypunch into the BTDS storage system. This MADS form identified for each PIMO maintenance segment: 1) the source data from which that segment was taken, 2) the end item part number, and 3) special tool numbers used in the reformatted maintenance procedure.

The BTDS also accepted all inquiries listing source data changes. These inquiries were keypunched and entered into the BTDS Program. The results of these inquiries were printouts listing, for each query, the name and maintenance segment code of each maintenance instruction page affected by the change.

SECTION III

USER LANGUAGE

A. INTRODUCTION

The BTDS user language was specifically designed to satisfy the management needs of a technical data management system by giving control of the storing and modification of data and the direction of inquiries to the user via the language. Using BTDS language, the user could define his request using a statement or series of statements. A free-form method of data input, BTDS-O-GRAM was employed to facilitate keypunching. This form was utilized for all computer request statements except STORE, which was an integral part of the Maintenance Activity Data Sheet (MAUS), Figure 3-1.

B. SYMBOLS

The following symbols are part of the BTDS language:

- = The equal sign separates the parameter designator from the parameter names or control word.
- ,
- (The left parenthesis begins a field with one type of information.
-) The right parenthesis ends a field with one type of information.

Basic technical data reference information was stored in the BTDS files via the Maintenance Activity Data Sheet (MADS) under the command STORE (AWS). The command was included on the MADS input form; thus, the data were ready for BTDS Control once the MADS form was completed.

Figure 3-1 Maintenance Activity Data Sheet (MADS)

B

Each activity segment was defined in the end-item-by-function matrix. This matrix was essentially a maintenance requirement list giving the procedure to be developed. The matrix listed C-141A end items/systems and the maintenance functions (e.g., Remove, Install, Operational Checkout procedures) supplied for the system or end item. Figure 3-2 shows a sample page from this matrix. The end item or system group had a unique alpha-numeric six-digit code. This code along with the function code (at the top) gave a ten-digit code for that maintenance segment. This code was the basic identifier of each individual activity (maintenance segment) documented in the BTDS.

The MADS, whether referring to a maintenance action or a system operational description, contained basic data related to the maintenance data. These data were sources of information used in the BTDS. The MADS was used as a keypunch form and therefore had a strict format.

C. ENTRIES

Following is a brief description of each entry on the sheet. The block in the upper right-hand portion of the form shows how to write letters and numbers.

ANALYST	--	Initials of the writer who develops the maintenance data.
ADATE	--	The date, written in the order shown, when the activity is completed.
REV	--	The revision number.
ACODE	--	The activity code which identifies the particular maintenance segment (activity). The code is a ten-digit alpha-numerical number. The first six-digits identify the end item piece of equipment; the next four, the type of maintenance data being performed. This code number may be obtained from the end item by function matrix.

PIRC
SERVANTY ASSOCIATED
FUNCTION BY END ITEM MATRIX

END ITEM NAME	FUNCTION	HOW-CENTER CHGS TRAVLS	TS	EM	FUNCTIONS	ADJ	DISP	CAL
RESEARCHERS INSTRUMENT GROUPS	W03000							
CLONES (6)	W03001							
CADEN RATE OF CLIMB INDICATOR	W03002							
CASIN ALTITUDE AND DEPRESSIONAL POSIS INDICATOR	W03003							
LIQUID CRYSAL QUANTITY INDICATOR	W03004							
GLIMP COMPASS INSTRUMENTS	W03005							
DECEL REAMFER INSTRUMENTS	W03006							
PILOT STATIC SYSTEM	W03007							
ANNUAL SHUTOFF VALVES	W03008							
FLIGHT ENGINEERS ALTIMETER	W03009							
NAVIGATOR'S ALTIMETER	W03010							
WEATER MAST AND HEAD (PILOT STATIC TUBES)	W03011							
FLIGHT INSTRUMENT GROUP	W03012							
STANDBY COMPASS, ADU-3/A	W03013							
ACCELEROMETER, ADU-6/A	W03014							
PRESSURE ALTIMETER	W03015							
AIRSPED INDICATOR	W03016							
AIRSPED MACH AMPLIFIER	W03017							
ALTITUDE VERTICAL VELOCITY AMPLIFIER	W03018							
FLIGHT DIRECTOR CPU-27A SYSTEM	W04000							
FLIGHT DIRECTOR COMPUTER	W04001							
HORIZONTAL SITUATION INDICATOR	W04002							
ATTITUDE DIRECTOR INDICATOR	W04003							
SWITCHING RATE GYROSCOPE	W04004							

Figure 2-2 Sample Page of Function by End-Item Matrix

ANAME -- Assigned Activity Name. This is restricted to 50 characters including spaces. To save character space, abbreviations will be used for common function names.

OFC -- Indicates where activity is performed.

ENAME -- End item or system name (same as in the activity name) restricted to 30 characters and spaces.

FRAME through NEPNC -- These are quantity counts of the remainder of the items on the form. They should all be filled (with zeros where appropriate). All following entries on the MADS are numbered so that the quantity can be obtained directly from the last entry made.

WUC -- Enter all work unit codes which are applicable to this activity. These can be obtained from the Work Unit Code Manual.

INCA -- Incorporated activities. If another activity is referenced anywhere within the activity, the activity code for that activity is entered here.

ETADU -- Equipment this activity depends upon. Enter the equipment part number for any equipment items which are affected while performing this activity. This is necessary since a change in that equipment might change the performance of this activity.

STYPE -- Type of source document. Type codes are as follows:
 TOP -- Technical Order Paragraph
 TOF -- Technical Order Figure
 IPB -- Illustrated Parts Breakdown
 EDO -- Engineering Document. Includes drawings, specifications, reports, etc.

- SNO** -- The source number is the engineering document number, drawing, report, etc., just as it is written on the document.
- PSTART** -- This entry provides the identifier for the portion of the source document used for a specific page (frame) of maintenance data. The ten spaces allotted on the MADS are broken into groups of three, four, two and one (in that order) for coding.
- PEND** -- This entry provides the identifier for the portion of the source document that along with the PSTART entry includes the total portion of that document which was used as the source entry.
- REFERENCED FRAMES (PAGES)** -- The next column is headed NO. This entry is the total number of frames to which this source reference applies (greater than 17 if the listed frames take more than one line). Following that is listed the page number to which this source reference applies.
- TTYPR** -- A code specifying the type of tool used. Type codes are as follows:
- STL -- Special tools (e. g., torque wrench, bearing removal kit).
 - CEQ -- Checkout Equipment (e. g., signal generator, multimeter and other test equipment).
 - SEQ -- Support equipment including expendable supplies, spares, local manufactured items, aerospace ground equipment (AGE), and ground-handling equipment.
- TNO** -- Identifying number for the referenced tool equipment or supply item.

TNAME	--	Tool name, limited to 30 characters and spaces. The quantity of frames on which this "tool" is mentioned is entered under NO, followed by the number of the frames on which it is used.
UOC	--	Usable-On-Code that specifies model to which this activity pertains.
EPNO	--	Equipment part numbers associated with this activity. You may find that the end item has several part numbers. Each part number will be listed on the same line as the Usable-On-Code which applies to that part number. If particular frames apply to different Usable-On-Codes or part numbers, these will be listed under Referenced Frames.

A summation of the foregoing description appears in Table I.

In response to the command STORE (AWS), the BTDS Program generated a printed image of the MADS input form as stored in the data files. Examples are shown in Figure 3-3.

D. PRINTING MAINTENANCE ACTIVITY DATA

A complete log of all MADS forms was maintained by BTDS Control and was available for reference. When additional copies of MADS information were required, they were generated by the command

PRINT (AWS) (ACODE = X)

where the parameter "X" is any 10-digit activity code. In response to this command, the BTDS Program generated a printed image of the MADS input form.

Examples of PRINT requests and computer responses are shown in Figures 3-4 and 3-5.

NAME OR LABEL	A/N/A	LENGTH	RANGE	SOURCE	FUNCTION
ACODE	AN	10	A00...0	Maintenance Segment by End Item Matrix	Activity code - (function by end item matrix designation).
ADATE	N	6	010166 311299	Analyst	Date maintenance activity data sheet is complete.
ANALYST	A	3	AAA ZZZ	Analyst	Initials of analyst.
ANAME	AX	6	Variable	Function by End Item Matrix	Activity-name (function by end item matrix designation).
CEMS	A	1	X or 'blank'	Analyst	Where activity is performed - communications and elec- tronics maintenance shop.
ENAME	AN	30	Variable	Maintenance Segment by End Item Matrix	Equipment name - (end item designation).
EPNO	AN	20	Variable	Manufacturer	Equipment part number for end item piece of equipment.
ETADU	AN	20	Variable	Manufacturer	Equipment this activity depends upon by equipment part number.
FME	A	1	X or 'blank'	Analyst	Where activity is performed - field maintenance shop.
FNC	N	2	01 95	Analyst	Frame number - relative to the formatted activity.
FRAME	N	2	01 98	Analyst	Quantity count of the frames comprising the activity.
INCA	AN	10	A00...0	Maintenance Segment by End Item Matrix	Incorporated activity code for referenced activities.
NDATAS	N	2	01 40	Analyst	Quantity count of the source data used in comprising the activity

Table I. Standard Element of Data Definition

NAME OR LABEL	A/N/AN	LENGTH	RANGE	SOURCE	FUNCTION
NEPNO	N	2	01 10	Analyst	Quantity count of the equipment part numbers.
NETADU	N	2	01 08	Analyst	Quantity count of the equipment this activity depends on.
NINCA	N	2	01 16	Analyst	Quantity count of the incorporated activities.
NTOOLS	N	2	01 20	Analyst	Quantity count of the tools.
NWUC	N	2	01 16	Analyst	Quantity count of the work unit codes.
OAM	A	1	X or 'blank'	Analyst	Where activity is performed-on-aircraft maintenance.
PSTART	AN	10	Variable	Source Text or Drawing	Figure, pictorial, or paragraph where textual source information begins.
PEND	AN	10	Variable	Source Text or Drawing	Figure, pictorial, or paragraph where textual source information ends.
REFERENCED FRAMES	N	2	01 40	Analyst	The frame number to which the source, tool or EPNO entry applies. NO. is the quantity count of the frame numbers for each entry.
SNO	AN	20	Variable	Source Text or Drawing	Identification source number of the source document.
TYPE	A	3	EDO TOP	Analyst	Type of source document IPB, EDO, PIC, ED, ER, ECP.
TNAME	AN	20	Variable	Analyst	Tool name.
TNO	AN	20	Variable	Manufacturer	Tool identification number.

Table 1. Standard Element of Data Definition (Cont.)

NAME OR LABEL	A1/N1/A1	LENGTH	RANGE	SOURCE	FUNCTION
TTYPE	A	3	CE ST	Analyst	Type of tool (CE, SE, ST)
UOC	A	3	AAA ZZZ	BTDS Control	Usable On Code specifying groups of aircraft by tail number.

Table I. Standard Element of Data Definition (Cont.)

SECURITY				PAGE 001			
MAINTENANCE ACTIVITY DATA SHEET							
RTES PROGRAM OUTPUT FOR REQUEST NO. 00							
(STORE-001)							
REQ AND INST NOSE DATA				REQ PWS CODE			
M030030400 REV10001 ANALYST101 DATE-25001				3			
ENAME - (NOSE 0001		) EPSE01-03		) ENCL-03		) ENCA-03	
		) ENVA01-04		) ENCL-03		) ENCA-03	
DUC -							
INCA -							
ETADU -							
STYPE	SAC	PS1001	EPND	FRAME NUMBERS			
(TDP) (T01C-1410-10	101001	(000010001100000000)	101	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	102	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	103	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	104	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	105	1			
TTYPE	TMC	TRAME	FRAME NUMBERS				
(SEQ) (MIL-6-5270	1	(000010001100000000)	1 103				
(SEQ) (MIL-2009047	1	(000010001100000000)	1 103				
UDC	EPND	FRAME NUMBERS					
(ALL) (3P21003)-101	1 1	1 1 ALL					
(ALL) (3P21003)-130	1 1	1 1 ALL					

SECURITY				PAGE 001			
MAINTENANCE ACTIVITY DATA SHEET							
RTES PROGRAM OUTPUT FOR REQUEST NO. 00							
(STORE-001)							
REQ AND INST FORWARD (ENGINE MOUNT (LEFT SIDE)				REQ PWS CODE			
L090260400 REV10001 ANALYST101 DATE-00101				3			
ENAME - (FORWARD ENGINE MOUNT-LEFT SIDE)		) ENVA01-05		) ENCL-05		) ENCA-05	
		) ENVA01-07		) ENCL-05		) ENCA-05	
DUC -							
INCA -							
ETADU -							
STYPE	SAC	PS1001	EPND	FRAME NUMBERS			
(TDP) (T01C-1410-10	101001	(000010001100000000)	101	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	102	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	103	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	104	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	105	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	106	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	107	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	108	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	109	1			
(TDP) (T01C-1410-2-0	230001	(000010001100000000)	110	1			
TTYPE	TMC	TRAME	FRAME NUMBERS				
(SEQ) (MIL-2009047	1	(000010001100000000)	1 103				
(SEQ) (MIL-2009047	1	(000010001100000000)	1 103				
(SEQ) (MIL-2009047	1	(000010001100000000)	1 103				
UDC	EPND	FRAME NUMBERS					
(ALL) (3P21003)-101	1 1	1 1 ALL					

Figure 3-3 Sample Computer Output of MADS Input Data

PAGE 1 OF 1
 DATE 8-21-87
 BY _____

STS-O-GRAM
 Serendipity Inc.

0-20000	10000	5-TWO
0-61700 0	200000 3	0-ALPHA 2

1 STORE STATUS (1111111111111111)
 2 STORE STATUS (1) NEW TO (1)
 3 STORE STATUS (1) INSTALLED (1)
 4 CHANGE (1111111111111111)

5 DELETE (111111)
 6 PRINT (111111)
 7 FIND (1111)
 8 FIND ACTIVITIES (111111)

000 to 101
 CHANGE TIMES

NOTE:
 (1) DELETES A VARIABLE DESIGNATION ONLY IS REQUIRED
 (2) DELETES A VARIABLE DESIGNATION AS WELL AS ITS VALUE IS REQUIRED
 (3) IF THE MESSAGE CANNOT FIT ON ONE LINE, THAT DATA CAN BE SPLIT BETWEEN ANY FIELDS (FOLLOWING A NEXT PARSEFIELD) AND THEN THE REST OF DATA CAN APPEAR AS THE SECOND LINE BY REPEATING THE COMMAND WITH 9(CONT) PRECEDING THE CHANGED DATA

```

112345678910111213141516171819202122232425262728293031323334353637383940
PRINT(AMS)(RCODE=H030050400)
PRINT(AMS)(RCODE=L023050400)
  
```

Figure 3-4 Sample PRINT Request

SECURITY
PMS
MAINTENANCE ACTIVITY DATA SHEET

PAGE 004

SYS PROGRAM OUTPUT FOR REQUEST NO. 04
(PRINT-AME)

REN AND INST USE CODE ORG PMS CODE

NO00000000 REV10001 ANALYST:JP 1 DATE-00007 E

FRAME - INDE CODE) CFRAME=00 MIME =00 RTFRM=00 TIME=00

)MATA=04 MPLS=02 MEND=00

MAC -
INCA -
ETADU -

STYPE	SNO	PSTART	PEND	FRAME NUMBER
(TOP)	1701C-141A-10	191001	104400000011000000000	101
(TOP)	1701C-141A-2-4	230001	100000000010000000000	102
(TOP)	1701C-141A-2-4	230001	100000000010000000000	103
(TOP)	1701C-141A-2-4	230001	100000000010000000000	104

ITYPE	TNO	TNAME	FRAME NUMBER
(SC)	101L-0-1070	1 10RSAFE	1 100
(SC)	100-00000007	1 10CMTRE	1 100

MAC	EPMS	FRAME NUMBER
(ALL)	13021003-101	1 1 3 0 ALL
(ALL)	13021003-130	1 1 3 1 ALL

SECURITY
PMS
MAINTENANCE ACTIVITY DATA SHEET

PAGE 006

SYS PROGRAM OUTPUT FOR REQUEST NO. 05
(PRINT-AME)

REN AND INST OIL PRESSURE TRANSMITTER ORG PMS CODE

LO2320000 REV10001 ANALYST:JP 1 DATE-00004 E

FRAME - OIL PRESSURE TRANSMITTER) CFRAME=00 MIME =01 RTFRM=00 TIME=00

)MATA=04 MPLS=00 MEND=00

MAC - 51PMS
INCA -
ETADU -

STYPE	SNO	PSTART	PEND	FRAME NUMBER
(TOP)	1701C-141A-10	150001	100000000010000000000	101
(TOP)	1701C-141A-2-4	000001	100000000010000000000	102
(TOP)	1701C-141A-10	150001	100000000010000000000	103
(TOP)	1701C-141A-2-4	000001	100000000010000000000	104

MAC	EPMS	FRAME NUMBER
(SC)	10500010	1 1 1 102 00

Figure 3-5 Sample Computer Output of PRINT Request

E. CHANGING/DELETING DATA

Changes to the basic technical data were accomplished by deleting the old data and entering the new data. Deletions were restricted to an entire activity; therefore, for any change or deletion of data on an activity, all information on the Maintenance Activity Data Sheet (MADS) was deleted. This does not mean that one cannot request a specific change or an addition of one data item to a stored activity.

Limited changes, such as a one-for-one change, an addition of one source reference, or addition of a special tool to an activity could be requested on the BTDS-O-GRAM. BTDS Control translated the request to a DELETE command for the specified activity, requested the appropriate data cards to be keypunched, inserted the updated data cards in the MADS card deck, and requested a STORE command to enter the updated activity.

Large changes (more than five specific items) required new MADS. BTDS Control had the new form keypunched, DELETED the old activity and STORED the new data.

The command that generated a deletion was

DELETE (AWS) (ACODE = X)

where "X" is any 10-digit activity code.

Examples of DELETE and CHANGE requests and computer responses are shown in Figure 3-6.

F. QUERIES

The BTDS Program would initiate a search of its data files to find all items which satisfy specified conditions upon receipt of a Query command. The BTDS Program responded to queries by printing a list of all activity codes and their relative frame numbers applicable to the specified parameter. The BTDS Program expected a complete and

exact command before initiating action; any portion left out or improperly written resulted in a diagnostic message and wasted command.

4. Query on Source Data

This represented the querying of the BTDS Program for information to determine the extent and impact of a particular source reference.

The command was:

```
      (ACODE)
FIND  ( FNO ) (SType = x) (SNO = y)
      (PSTART = u) (PEND = v)
```

FIND Initiates a transfer to the query program and must be present for all query results.

(ACODE)
(FNO) The first parameter indicates whether relative frame numbers (FNO) or activity codes only (ACODE) are desired.

(SType = x) The second parameter indicates the type of source file to be searched. "x" may be any of the source types used on the Maintenance Activity Data Sheets (MADS)

These are:

IPB

EDO

PIC

(SNO = y) The third parameter indicates the source document I.D. number.

(PSTART = u) The fourth parameter indicates the point at which the source reference begins.

(PEND = v) The last parameter indicates the point at which the source reference ends.

"y", "u", "v", are written in the same format as for MADS input.

The span of paragraphs "u" and "v" is unlimited. "u" can be the first paragraph of an engineering report and "v" the last paragraph of the manual. If only one paragraph or figure is desired, "u" and "v" are identical.

Examples of SOURCE QUERY requests and computer responses are shown in Figures 3-7 and 3-8.

2. Query on Tool Data

This represented querying the BTDS Program for activities and frames within an activity that referenced a particular tool.

The command was:

```
FIND        (ACODE)
            ( TTYPE = x )    (TNO = y)
            ( FNO )
```

(ACODE)
(FNO) The first parameter indicates whether relative frame numbers (FNO) or activity codes only (ACCDE) are desired.

(TTYPE = x) The second parameter indicates the type of tool file to be searched. "x" may be any of the tool types used on the Maintenance Activity Data Sheet (MADS). These are:

STL

CEQ

SEQ

(TNO = y) The last parameter indicates the tool identification number.

NAME L. J. /
 DATE 3-21-67
 BY ESER

3708-O-GRAM
Sovendipity Inc.

0-0 ZERO
 0-ALPHA 0
 1-0000
 2-ALPHA 2
 3-1000
 4-ALPHA 4

5 DELETE (0)(0)
 6 PRINT (1)(0)
 7 FWD (1)(0)
 8 FIND ACTIVITIES (0)(0)

9 STONE STATUS (0)(0)(0)(0)
 10 STONE STATUS (0) SENT TO (0)
 11 STONE STATUS (0) INSTALLED (0)
 12 CHANGE (0)(0)(0)(0)

JOB NO 104
 SERVICE TYPE

NOTE: (0) GENERATED A VARIABLE INDICATOR ONLY IS REQUIRED
 (0) GENERATED A VARIABLE REGISTRATION AS WELL AS ITS VALUE IS REQUIRED
 (0) IF THE MESSAGE CANNOT FIT ON ONE LINE THEN DATA CAN BE SPLIT BETWEEN ANY FIELDS FOLLOWING A RIGHT PARENTHESIS) AND THEN THE NEXT
 OF DATA CAN APPEAR AS THE SECOND LINE BY REPEATING THE COMMAND WITH A (0000) PRECEDING THE REQUIRED DATA

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
FIND(FWD)	(STYPR=TRP)	(SMF=TRP)	C-14/A-2-2	)	(PSMET=0700	3	10000)	(NAME=0000000000)																				
FIND(FWD)	(STYPR=TRP)	(SMF=TRP)	C-14/A-2-2	)	(PSMET=0200	140010)	(NAME=0200100010)																					
FIND(FWD)	(STYPR=TRP)	(SMF=TRP)	C-14/A-2-9	)	(PSMET=0200	090010)	(NAME=0200090010)																					
FIND(FWD)	(STYPR=TRP)	(SMF=TRP)	C-14/A-2-4	)	(PSMET=0400	370010)	(NAME=0400370010)																					
FIND(FWD)	(STYPR=TRP)	(SMF=TRP)	C-14/A-2-5	)	(PSMET=1000	000000)	(NAME=1000000000)																					

Figure 3-7 Example of SOURCE QUERY Request

SERENDIPITY
PING

PAGE 030

QUERY--FIND ACCOES RELATED TO STYPE=TOP SNO=TOIC-141A-2-2
 ACCOE = 107000400 NO OF EFFECTED FRAMES IN ACTIVITY = 0
 FNC = J7 J8
 ACCOE = 107010400 NO OF EFFECTED FRAMES IN ACTIVITY = 01
 FNC = J2

PSTART=070010000 PENO=1000000

QUERY REQUEST COMPLETE

SERENDIPITY
PING

PAGE 040

QUERY--FIND ACCOES RELATED TO STYPE=TOP SNO=TOIC-141A-2-3
 ACCOE = 107020400 NO OF EFFECTED FRAMES IN ACTIVITY = 03
 FNC = 02 04 05

PSTART=020010000 PENO=0300100

QUERY REQUEST COMPLETE

SERENDIPITY
PING

PAGE 050

QUERY--FIND ACCOES RELATED TO STYPE=TOP SNO=TOIC-141A-2-4
 ACCOE = 005000400 NO OF EFFECTED FRAMES IN ACTIVITY = 04
 FNC = 01 02 03 10 11 12
 ACCOE = 005000400 NO OF EFFECTED FRAMES IN ACTIVITY = 12
 FNC = J2 03 04 05 06 07 08 09 10 11 12 13

PSTART=000000000 PENO=0000000

QUERY REQUEST COMPLETE

SERENDIPITY
PING

PAGE 101

QUERY--FIND ACCOES RELATED TO STYPE=TOP SNO=TOIC-141A-2-5
 ACCOE = 1020020400 NO OF EFFECTED FRAMES IN ACTIVITY = 05
 FNC = J3 J4 05 J6 07

PSTART=040000000 PENO=0400000

QUERY REQUEST COMPLETE

SERENDIPITY
PING

PAGE 102

QUERY--FIND ACCOES RELATED TO STYPE=TOP SNO=TOIC-141A-2-5
 THERE ARE NO ENTRIES FOR THIS REQUEST
 QUERY REQUEST COMPLETE

PSTART=100010000 PENO=100010000

Figure 3-8 Sample Computer Outputs of SOURCE
QUERY Requests

Examples of TOOL QUERY requests and computer responses are shown in Figures 3-9 and 3-10.

3. Query on Equipment Part Numbers

This represented querying the BTDS for data references of system equipment. The BTDS Program listed all activities and related frames that were formatted against a particular piece of equipment.

The command was:

```
FIND (ACODE) (EPNO = x)
      ( FNO )
```

(ACODE) The first parameter indicates whether relative frame numbers (FNO) or activity codes only (ACODE) are desired.

(EPNO = x) The last parameter indicates the equipment part identification number.

Usually, when Change Control personnel required information concerning a piece of aircraft equipment, it was desirable to know not only the technical data referencing the equipment, but data that were dependent on the equipment in some manner. This information could be obtained with a second command which determined if the equipment had been referenced as an ETADU on Maintenance Activity Data Sheet (MADS).

The command was:

```
FIND (ACODE) (ETADU = x)
```

(ACODE) Note that the first parameter has only one value (ACODE).

(ETADU = x) The last parameter indicates the equipment part identification number.

BTDS - O - GRAM
Serendipity Inc.

JOB NO 105 DATE 1-21-67
MESSAGE TYPES TIME 4 OF 1
Y ERLW

0-ZERO	1-COM	8-TWO
9-ALPHA 0	2-ALPHA 1	9-ALPHA 9

2 STORE STATUS () () () () () () ()
3 STORE STATUS () SENT TO ()
STORE STATUS () INSTALLED ()
4 CHANGE () () () ()

5 DELETE () () () ()
6 PRINT () () ()
7 FIND () ()
8 FIND ACTIVITIES () () ()

NOTE:
a) () DENOTES A VARIABLE DESIGNATION ONLY IS REQUIRED
b) () DENOTES A VARIABLE DESIGNATION AS WELL AS ITS VALUE IS REQUIRED
c) IF THE MESSAGE CANNOT FIT ON ONE LINE THEN DATA CAN BE SPLIT BETWEEN ANY FIELDS (FOLLOWING A RIGHT PARENTHESIS) AND THEN THE NEXT
OF DATA CAN APPEAR AS THE SECOND LINE BY REPEATING THE COMMAND WITH A (COUNT) PRECEDING THE COMMAND BACK

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
FIND(FM0) (TTYPE=C0) (TIME=ATM/C) (TIME=1J/000-NO/4/1)																																																																																																			
FIND(FM0) (TTYPE=50) (TIME=1550/4-4) (TIME=0-0-1/1)																																																																																																			
FIND(FM0) (TTYPE=ST) (TIME=1/1/000/1) (TIME=000-0/1/1-000/1/1)																																																																																																			

Figure 3-9 Example of TOOL QUERY Request

SERENDIPITY ASSOCIATES
PING

PAGE 003

QUERY--FIND ACROSS RELATED TO TTYPE=C00 TNO=ATRIA
TNAME=FIBER-WALLEY

ACODE = L093260400 NO OF EFFECTED FRAMES IN ACTIVITY = C1
FNC = .3

QUERY REQUEST COMPLETE

SERENDIPITY ASSOCIATES
PING

PAGE 004

QUERY--FIND ACROSS RELATED TO TTYPE=SEQ TNO=L53014-4
TNAME=D-RING

ACODE = L023250400 NO OF EFFECTED FRAMES IN ACTIVITY = C2
FNC = C2 .3

QUERY REQUEST COMPLETE

SERENDIPITY ASSOCIATES
PING

PAGE 006

QUERY--FIND ACROSS RELATED TO TTYPE=STL TNO=11C1904P1
TNAME=CSD-OIL-DRAIN-NOSE

ACODE = L040050000 NO OF EFFECTED FRAMES IN ACTIVITY = C1
FNC = .3

ACODE = L040050000 NO OF EFFECTED FRAMES IN ACTIVITY = C2
FNC = .3 C2

QUERY REQUEST COMPLETE

Figure 3-10 Sample Computer Outputs for TOOL QUERY Request

Examples of EPNO and ETADU QUERY requests and computer responses are shown in Figures 3-11 and 3-12.

4. Query on Activity Codes

This represented querying the BTDS for references of a particular activity code. This command did not print a list of activity codes that were present in the system or a printed image of Maintenance Activity Data Sheet (MADS). These requests were accomplished with PRINT commands. This command initiated a search to locate and print other technical data segments that had incorporated this data in their respective format.

The command was:

FIND (ACODE) (INCA = x)

(ACODE) Note that first parameter has only one value (ACODE).

(INCA - x) The last parameter indicates the activity code where "x" must be the full 10-digit ACODE.

Examples of INCA QUERY requests and computer response are shown in Figures 3-13 and 3-14.

G. DIAGNOSTIC MESSAGES

The BTDS Program included various diagnostic routines for checking the mechanical validity of data and the logical and/or content validity of data requests. Error messages which attempted to clearly identify the trouble were printed to facilitate the rectification of errors.

The following list contains the error messages generated by the BTDS Program and their explanations. Words on a message that had to vary from situation to situation are denoted by "****".


```

                                SEARCHIVITY                                PAGE 007
                                PIND
QUERY--PIND ACODES RELATED TO EPNO = 001500-1
ACODE = 000151000R  NO OF EXPECTED FRAMES IN ACTIVITY = C2
PNC = ALL
ACODE = 51300017C  NO OF EXPECTED FRAMES IN ACTIVITY = C3
PNC = ALL
ACODE = 001234000U  NO OF EXPECTED FRAMES IN ACTIVITY = C3
PNC = ALL
QUERY REQUEST COMPLETE

```

```

                                SEARCHIVITY                                PAGE 010
                                PIND
QUERY--PIND ACODES RELATED TO ETADU = 10112000101
THERE ARE NO ENTRIES FOR THIS REQUEST
QUERY REQUEST COMPLETE
JOB FINISHED

```

Figure 3-12 Sample Computer Outputs of EPNO and ETADU Request

BTDS O-GRAM
Scrimply Inc.

JOB NO. 107
MESSAGE TYPE:

DATE 1-15-67
BY ECRE

0-ZERO	1-ONE	2-TWO
3-ALPHA 0	3-ALPHA 1	3-ALPHA 2

2. STORE STATUS (a)(b)(c)(d)(e)
3. STORE STATUS (b) SENT TO (c)
STORE STATUS (c) INSTALLED (d)
4. CHANGE (c)(d)(e):

5. DELETE (a)(b)(c)
6. PRINT (1)(2)(3)
7. FIND (1)(2)
8. FIND ACTIVITIES (a)(b)(c)

NOTE:
a) () DENOTES A VARIABLE DESIGNATION ONLY IS REQUIRED
b) () DENOTES A VARIABLE DESIGNATION AS WELL AS ITS VALUE IS REQUIRED
c) IF THE MESSAGE CANNOT FIT ON ONE LINE THAN DATA CAN BE SPLIT BETWEEN ANY FIELDS (FOLLOWING A RIGHT PARENTHESIS) AND THEN THE REST OF DATA CAN APPEAR AS THE SECOND LINE BY REPEATING THE COMMAND WITH A SECOND) PROCEEDING THE REQUIRED DATA

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
FIND(A20DE)(INC B=U030U0G400)																																							

Figure 3-13 Example of INCA QUERY Request

PAGE 011

SERENIPIITY ASSOCIATES
PTMO

QUERY--PTMO ACCDES RELATED TO INCA - 0030000400

ACODE = 002123050C
ACODE = 002123040C

QUERY REQUEST COMPLETE

Figure 3-14 Sample Computer Output of INCA QUERY Request

ERROR -- THIS ACTIVITY IS ALREADY STORED IN THE BTDS SYSTEM. EITHER DELETE THE PRESENT ACTIVITY OR RE-ENTER THE ACTIVITY WITH CORRECT CODE. ACODE = ''**

(This error message will occur if a MADS has already been stored in the data files for the same activity code as the attempted STORE.)

ERROR -- THIS ACTIVITY IS NOT PRESENT IN THE BTDS SYSTEM.

ACODE = ''**

(This error message indicates a PRINT request for an activity that is not present in the system.)

ERROR -- BAD COMMAND. THIS MAY CAUSE A NUMBER OF BAD COMMANDS TO BE PRINTED.

BAD COMMAND = '' FROM CARD '*****'**

(This error message will occur anytime a data card is not standard to the BTDS input format. If the correct command should have been STORE (AWS) and was improperly key-punched, there will be a sequence of bad commands, one for each card in the activity. This is caused by the BTDS interpreting each card in succession in search of a legal command. No action is performed on this command.)

ERROR -- THIS BTDS REQUEST IS OUT OF SEQUENCE -- WOULD REQUIRE REWINDING ALL SYSTEM TAPES -- REQUEST IGNORED.

'***'**

(This error message indicates that data has been misarranged -- concerns BTDS control only; '**' would indicate the ignored request.)

ERROR -- THIS ACTIVITY HAS EXCEEDED THE LIMIT ON ''
INFORMATION.**

ACODE = '**'**

(This error message indicates that a parameter or data information has been exceeded. The information may be SOURCE, TOOL, INCA, ETADU, or EPNO inputs. The quantity of the specified information has either been incorrectly stated on the Maintenance Activity Data Sheet (MADS) or improperly keypunched. No action is performed on this activity.)

TAPE ERRORS -- FILES NOT AVAILABLE

(This error message indicates that incorrect data files were mounted at the computer facility.)

SECTION IV

PRODUCTION CONTROL PROGRAM

A. DESCRIPTION

The Production Control (STATUS) Programs are the portion of the BTDS System which provided production status information. This program though used throughout the technical data production phases was capable of handling change or revision status at the maintenance segment level. The program used inputs from production stations (illustration, typing, editing, Q.C.) to monitor the over-all production loop with reference to each segment or segment groups of the technical data. The information provided by this program was the following:

1. Identification of all the maintenance information in each production station.
2. Information as to the output of each production station.
3. Over-all production status of each group of maintenance data.
4. Information as to the number of loops each package has gone through in any station in the production loop.

Using the information supplied by the STATUS programs, production management personnel could evaluate the effectiveness of each of the stations in the production loop while also scheduling the over-all technical data production program.

The STATUS program was used during PIMO to supply the production status of the technical data to management, and to supply this information both from the standpoint of technical data requirements and the production station. This enabled management to allocate resources to those production stations most requiring it. Furthermore, these programs provided the information for evaluation of the over-all

production flow of the data as compared with the scheduled flow.

B. PURPOSE

The Production Control (STATUS) Programs were designed to enable a monitoring of the production and status of a technical publications process. They were successfully used during PIMO for this purpose.

The status program outputs consisted of a series of computer tab runs which periodically listed the activity status and the production status. The tab runs were updated weekly. The purposes of the status program outputs were to provide:

1. The location of any activity package in the technical publication process.
2. A history of the technical publication functions and correspondingly, the length of time in functions performed on each individual activity package.
3. The status of the recent and over-all production rate of each station (i.e., illustration, typing, editing, Q.C.) in the technical publication process.
4. The status of the number of activity packages either queued or in process at each station.
5. The average performance time in each station and the average number of times an activity package had to be "reworked" in a station.
6. The over-all production status of the total effort (percent completed).

C. RESULTS

1. Current Activity Status

The first STATUS Program output was the Current Activity Status which is shown in Figure 4-1. (See Appendix II for details on how to read the Current Activity Status printout.) This tab run listed for each activity the current location within the technical publications process by station (station codes are noted on the Flow Chart in Figure 4-2) and the past history of that activity in addition to other status information. The location data enables the rapid location of any activity package. This report was prepared weekly; therefore, when attempting to locate an activity package, it was possible that it had moved on to a subsequent station. If this was the case, the activity package could be easily traced by a review of the activity status updating form (Figure 4-3 -- Source of Data Input to the STATUS Program) at the station it was last in and following the stations until it was found.

The activity package history data including the number of times in each station, the total elapsed time in each station, and the station last left and last entered, allowed the review of possible areas for an activity package. This tab run was designed to be critically reviewed on a weekly basis in order to identify possible problem areas in their initial stages. Some of the problems it was capable of identifying were:

- 1) Activity packages being queued at the entrance to any station.
- 2) Production time in any station exceeding the expected production time.
- 3) Activity packages looping back to be reworked by any station.

The purpose of the evaluation features of the program was not to exercise rigid production controls on the stations, but rather to identify the

CURRENT ACTIVITY STATUS

ACTIVITY CODE	CURRENT STATIONS	V F C M U K Z M	STATION DATA																	REV MUM	
			02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	19			
R0201204	7	LEVELER KUD ASSEMBLY, MLC	5	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	148	0	6
			5	32	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			153	166	194	197	0	197	0	0	0	0	0	0	0	0	0	0	0	0	
R0201206	2	LEVELER KUD ASSEMBLY, MLC	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R0201304	4	AXLE, MLC	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	119	0	10
			34	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			152	159	159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		COULD NOT FIND ACTIVITY CODE R0201604																			
R0201504	9	BRAKE TORQUE LINKS	8	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	119	0	6
			12	16	13	0	6	1	5	0	0	0	0	0	0	0	0	0	0	0	
			137	153	164	166	170	167	172	178	0	0	0	0	0	0	0	0	0	0	
R0201604	2	UNLOCK ACTUATING ARM, MLC	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	161	0	10
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R0201704	2	TORQUE LINKS, MLC	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	161	0	10
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		STATUS ERROR R0201604 11 01 10077																			
R0201804	3	UNLOCK ASSEMBLY, MLC	4	2	2	1	1	0	1	1	0	0	0	0	0	0	0	0	119	0	10
			12	7	46	4	0	6	3	0	0	0	0	0	0	0	0	0	0	0	
			197	197	184	183	0	194	197	0	0	0	0	0	0	0	0	0	0	0	
		STATUS ERROR R0201806 11 01 10077																			
R0201806	2	UNLOCK ASSEMBLY, MLC	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	181	0	15
			11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			197	197	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R0201974	7	DOOR UNLOCK LATCH ASSEMBLY, MLC	4	7	1	1	1	0	2	1	0	0	0	0	0	0	0	0	119	0	12
			19	21	7	2	0	3	7	0	0	0	0	0	0	0	0	0	0	0	
			155	159	159	153	0	175	175	0	0	0	0	0	0	0	0	0	0	0	

Figure 4-1 Current Activity Status

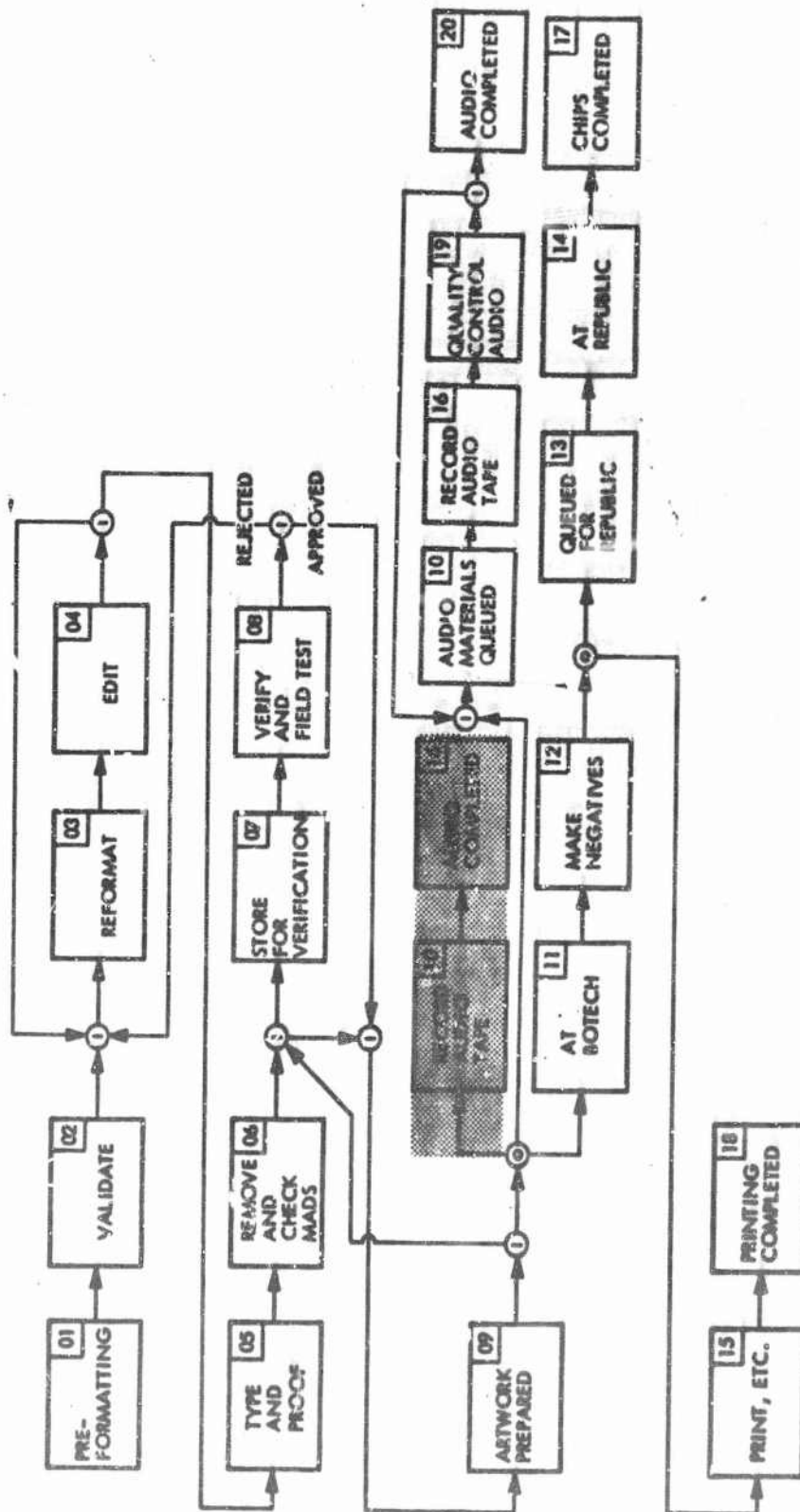


Figure 4-2 Stations in Formatting Process

ACTIVITY STATUS UPDATING FORM

STATION _____
 PERIOD COVERED _____ TO _____
 SHEET NUMBER _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
CARD TYPE							ACTIVITY CODE										LEAVIN	ENTER	DATE			NUMBER						
UPDATE																	STATION	STATION	DAY	NO.	YR.	OF						
																						FRAMES						

Figure 4-3 Activity Status Updating Form

problems being encountered in the process, thereby allowing an early solution to alleviate the problems.

2. Number of Activities Accomplished Since Last Report

This tab run, shown in Figure 4-4, reported for each system, priority, and total systems the number of activity packages accomplished by each station since the last report (weekly). The activities accomplished were reported by:

- 1) The initial time accomplished or a repeat (rework) time accomplished.
- 2) Whether the activity packages were accomplished prior to or subsequent to the verification function.
- 3) Total number of activity packages and number of frames in the activity packages accomplished.

This tab run contained many of the problem identification features mentioned for the previous tab run; however, the analysis was done at a grosser level -- by system, priority, or all systems.

3. Number of Activities Accomplished to Date.

This tab run, shown in Figure 4-5 is identical to the previous tab run with the exception that the data were cumulative from the beginning of the technical publications process rather than just from the previous update of the STATUS Program.

This report allowed an evaluation of the over-all production status or the percent of total effort completed by system, priority, and total systems.

4. Number of Activities in Process by Station

This tab run, shown in Figure 4-6 identified the number of activities either queued at the entrance to or in process for each station.

CAL DATE: 29-08-7
 PMA DATE: 29

NUMBER OF ACTIVITIES ACCOMPLISHED SINCE LAST REPORT

SYSTEM	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	19
14 FUSELAGE EQUIP - FLIGHT STATION																
INITIAL	0	1	1	1	1	2	1	4	0	5	0	0	0	0	0	0
REPEAT	0	1	1	1	1	1	1	2	0	1	0	0	0	0	0	0
PRE-VR	0	2	2	2	2	2	1	4	0	4	0	0	0	0	0	0
PO-VR	0	0	0	0	1	1	1	4	0	4	0	0	0	0	0	0
TOTAL	0	4	4	4	5	6	4	16	0	14	0	0	0	0	0	0
FRAMES	0	14	18	18	18	27	16	53	0	44	0	0	0	0	0	0
1 STRUCTURE																
INITIAL	0	1	2	0	0	0	1	3	0	5	0	0	0	0	0	0
REPEAT	2	3	3	4	3	0	1	1	0	6	0	0	0	0	0	0
PRE-VR	2	6	3	0	0	0	1	1	0	1	0	0	0	0	0	0
PO-VR	0	0	4	4	3	0	1	3	0	2	0	0	0	0	0	0
TOTAL	2	6	7	4	3	0	2	4	0	3	0	0	0	0	0	0
FRAMES	32	88	141	74	64	0	39	92	0	58	0	0	0	0	0	0
TOTAL - CHIP 4																
INITIAL	20	24	19	14	19	4	18	28	0	30	0	0	0	0	0	0
REPEAT	6	19	23	20	13	3	19	19	0	10	0	0	0	0	0	0
PRE-VR	26	43	39	29	19	9	14	28	0	13	0	0	0	0	0	0
PO-VR	0	0	11	11	10	2	3	24	0	17	0	0	0	0	0	0
TOTAL	26	43	42	36	32	11	18	47	0	20	0	0	0	0	0	0
FRAMES	382	557	551	472	476	128	434	497	0	251	0	0	0	0	0	0
15 CARGO COMPARTMENT																
INITIAL	4	2	1	1	0	0	0	1	0	1	0	0	0	0	0	0
REPEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PRE-VR	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
PO-VR	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
TOTAL	4	2	1	1	0	0	0	1	0	1	0	0	0	0	0	0
FRAMES	100	37	3	3	0	0	0	10	0	10	0	0	0	0	0	0
12 LIGHTING SYSTEM																
INITIAL	2	13	18	38	19	0	8	13	0	18	0	0	0	0	0	0
REPEAT	2	27	39	4	5	0	0	8	0	10	0	0	0	0	0	0
PRE-VR	4	40	52	42	20	0	0	18	0	9	0	0	0	0	0	0
PO-VR	0	0	1	2	1	0	0	1	0	1	0	0	0	0	0	0
TOTAL	4	40	53	44	21	0	0	19	0	10	0	0	0	0	0	0
FRAMES	42	370	346	307	194	0	0	132	0	73	0	0	0	0	0	0
TOTAL - CHIP 5																
INITIAL	6	15	19	39	16	0	0	14	0	11	0	0	0	0	0	0
REPEAT	2	27	35	6	5	0	0	6	0	0	0	0	0	0	0	0
PRE-VR	8	42	53	43	20	0	0	18	0	9	0	0	0	0	0	0
PO-VR	0	0	1	2	1	0	0	2	0	2	0	0	0	0	0	0
TOTAL	8	42	54	49	21	0	0	20	0	11	0	0	0	0	0	0
FRAMES	142	907	849	310	154	0	0	142	0	83	0	0	0	0	0	0
TOTAL - ALL SYSTEMS																
INITIAL	148	175	154	100	74	42	56	81	0	72	0	0	0	0	0	0
REPEAT	62	129	133	58	39	14	11	50	0	2	0	0	0	0	0	0
PRE-VR	207	329	260	127	95	71	90	71	0	38	0	0	0	0	0	0
PO-VR	1	6	27	37	20	11	11	40	0	36	0	0	0	0	0	0
TOTAL	210	333	287	186	113	58	67	131	0	74	0	0	0	0	0	0
FRAMES	2881	4679	3393	1949	1258	77	412	1224	0	432	0	0	0	0	0	0

Figure 4-4 Number of Activities Accomplished Since Last Report

CAL DATE 28-08-7
PIMJ DATE 232

NUMBER OF ACTIVITIES ACCOMPLISHED TO DATE

SYSTEM	STATIONS												08	09	10	11	12	13	14	15	16	17
	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17						
14 FUSELAGE EQUIP - FLIGHT STATION																						
INITIAL	13	14	14	12	9	3	4	10	0	0	0	0	0	0	0	0						
REPEAT	2	4	3	5	5	1	1	1	0	0	0	0	0	0	0	0						
PRE-VR	15	18	17	14	8	3	6	3	1	0	0	0	0	0	0	0						
PO-VER	0	0	0	3	6	1	1	7	0	0	0	0	0	0	0	0						
TOTAL	30	36	34	32	28	12	22	27	11	10	10	10	10	10	10	10						
FRAMES	90	108	104	105	78	35	90	99	44	47	44	44	44	44	44	44						
1 STRUCTURE																						
INITIAL	21	20	16	11	10	0	0	2	0	0	0	0	0	0	0	0						
REPEAT	2	17	18	10	10	2	2	2	1	0	0	0	0	0	0	0						
PRE-VR	22	35	27	15	11	9	0	2	0	1	0	0	0	0	0	0						
PO-VER	1	2	7	6	0	1	2	1	0	2	0	0	0	0	0	0						
TOTAL	26	26	20	16	10	12	10	5	0	3	0	0	0	0	0	0						
FRAMES	256	260	428	267	191	159	150	79	0	50	0	0	0	0	0	0						
TOTAL - CHIP 4																						
INITIAL	66	93	82	68	59	40	24	33	0	21	0	0	0	0	0	0						
REPEAT	11	64	73	42	39	4	4	14	0	18	0	0	0	0	0	0						
PRE-VR	79	133	109	67	53	43	44	22	0	18	0	0	0	0	0	0						
PO-VER	2	6	23	23	41	2	2	27	0	16	0	0	0	0	0	0						
TOTAL	97	159	150	100	80	64	44	69	0	38	0	0	0	0	0	0						
FRAMES	1000	1343	1514	1108	856	404	443	407	0	230	0	0	0	0	0	0						
15 CARGO COMPARTMENT																						
INITIAL	5	2	2	2	2	1	1	0	0	1	0	0	0	0	0	0						
REPEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
PRE-VR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
PO-VER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
TOTAL	5	2	2	2	2	1	1	0	0	1	0	0	0	0	0	0						
FRAMES	110	47	12	12	10	10	10	0	0	10	0	0	0	0	0	0						
12 LIGHTING SYSTEM																						
INITIAL	72	63	78	69	27	6	6	14	0	10	0	0	0	0	0	0						
REPEAT	10	35	21	6	9	0	0	6	0	6	0	0	0	0	0	0						
PRE-VR	79	111	91	94	29	6	6	19	0	9	0	0	0	0	0	0						
PO-VER	3	7	2	1	3	0	0	1	0	1	0	0	0	0	0	0						
TOTAL	62	118	95	95	32	6	6	20	0	10	0	0	0	0	0	0						
FRAMES	930	1039	987	357	205	36	36	129	0	73	0	0	0	0	0	0						
TOTAL - CHIP 5																						
INITIAL	77	66	74	61	20	7	7	14	0	11	0	0	0	0	0	0						
REPEAT	10	38	21	6	9	0	0	6	0	6	0	0	0	0	0	0						
PRE-VR	84	107	93	96	29	7	7	19	0	9	0	0	0	0	0	0						
PO-VER	3	7	2	1	4	0	0	1	0	2	0	0	0	0	0	0						
TOTAL	67	121	95	57	33	7	7	20	0	11	0	0	0	0	0	0						
FRAMES	1045	1486	999	369	215	44	44	129	0	83	0	0	0	0	0	0						
TOTAL - ALL SYSTEMS																						
INITIAL	473	404	362	266	198	127	98	81	0	75	0	0	0	0	0	0						
REPEAT	89	260	250	98	88	14	17	40	0	3	0	0	0	0	0	0						
PRE-VR	500	637	578	292	158	129	98	63	0	41	0	0	0	0	0	0						
PO-VER	12	27	54	54	118	12	17	56	0	37	0	0	0	0	0	0						
TOTAL	520	666	582	364	278	141	115	119	0	78	0	0	0	0	0	0						
FRAMES	5778	7680	6248	4457	2508	1653	1305	1020	0	630	0	0	0	0	0	0						

Figure 4-5 Number of Activities Accomplished To Date

SYSTEM	NUMBER OF ACTIVITIES IN PROCESS BY STATION										CAL DATE 29-08-7		PING DATE 232			
	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	19
14 FUSLAGE EQUIP - FLIGHT STATION																
INITIAL	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
REPEAT	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0
PRE-VR	0	1	2	0	1	1	0	0	0	0	0	0	0	0	0	0
PO-VER	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	3	0	1	1	0	0	0	0	0	0	0	0	0	0
FRAMES	0	3	20	0	13	7	0	0	0	0	0	0	0	0	0	0
1 STRUCTURE																
INITIAL	1	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0
REPEAT	7	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
PRE-VR	8	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
PO-VER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
FRAMES	0	0	15	34	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL - CHIP 4																
INITIAL	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
REPEAT	11	2	3	1	1	1	0	0	0	2	0	0	0	0	0	0
PRE-VR	16	2	3	1	1	1	0	0	0	2	0	0	0	0	0	0
PO-VER	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0
TOTAL	16	2	5	4	3	2	0	0	0	2	0	0	0	0	0	0
FRAMES	203	42	103	77	71	7	0	0	0	71	0	0	0	0	0	0
15 CARLO COMPARTMENT																
INITIAL	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
REPEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PRE-VR	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
PO-VER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
FRAMES	100	25	21	0	0	0	0	0	0	0	0	0	0	0	0	0
12 LIGHTING SYSTEM																
INITIAL	0	1	2	10	25	0	0	0	0	0	0	0	0	0	0	0
REPEAT	0	4	16	1	0	0	0	0	0	0	0	0	0	0	0	0
PRE-VR	0	5	16	11	24	0	0	0	0	0	0	0	0	0	0	0
PO-VER	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	5	19	11	25	0	0	0	0	0	0	0	0	0	0	0
FRAMES	0	44	139	90	185	0	0	0	0	0	0	0	0	0	0	0
TOTAL - CHIP 5																
INITIAL	4	2	5	10	25	0	1	0	0	0	0	0	0	0	0	0
REPEAT	0	4	16	1	0	0	0	0	0	0	0	0	0	0	0	0
PRE-VR	4	5	18	11	24	0	1	15	0	0	0	0	0	0	0	0
PO-VER	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	6	21	11	25	0	1	18	0	0	0	0	0	0	0	0
FRAMES	100	69	160	90	185	0	3	143	0	0	0	0	0	0	0	0
TOTAL - ALL SYSTEMS																
INITIAL	354	45	38	73	34	7	17	64	0	17	0	0	0	0	0	0
REPEAT	15	37	44	12	14	1	2	67	0	11	0	0	0	0	0	0
PRE-VR	373	92	74	75	29	4	17	57	0	15	0	0	0	0	0	0
PO-VER	0	0	0	0	1	0	2	74	0	13	0	0	0	0	0	0
TOTAL	473	92	92	85	48	5	19	131	0	28	0	0	0	0	0	0
FRAMES	4582	1085	1045	822	461	71	265	1404	0	195	0	0	0	0	0	0

Figure 4-6 Number of Activities in Process by Station

This tab run was designed to allow the early identification of "bottle-necks" in the technical publication process.

5. Average Performance Data on Completed Activities by Station

This tab run, shown in Figure 4-7 summarized the station performance data for those activities that had been completed. The average time in each station and the average number of times in each station were listed by system, priority, and total systems.

6. Progress Status of Activities

This tab run, shown in Figure 4-8, listed the gross production status. Combined with Figure 4-9, it enabled an evaluation of the percent of total effort accomplished.

D. SPECIFICATIONS

1. Program

The technical data production control status monitor consisted of five computer programs written in 7094 COBOL. A brief discussion of the programs is given below.

- a. Status - 1: Periodically updated the technical data control status by accepting data segment change of status instructions. Printed out the present status and past history of each data package. Also output an updated data segment file.
- b. Status - 2: Accepted the output of Status-1 and updated the status summary files. Printed out summary data on the over-all status and the status and production of each station in the technical data control process.
- c. Change: Accepted change instructions to add, delete, or change any activity in the function-by-end-item matrix; change in the history or status of any activity due to the input or erroneous change of status cards.

CAL DATE 14-09-7
PTMO DATE 221

AVERAGE PERFORMANCE DATA ON COMPLETED ACTIVITIES BY STATION

SYSTEM	TIME TIMES	STATIONS																
		02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	19	
11 PNEUMATIC SYSTEM	4.0	2.1	1.3	2.1	0.5	2.2	3.2	4.1	5.2	7.5	1.7	13.2	13.7	3.6	0.7	0.9		
	1.25	1.36	1.72	1.41	1.50	1.11	1.23	1.14	1.03	1.12	1.12	1.22	1.22	1.00	1.00	1.00		
TOTAL - PRIOR 3	5.3	3.7	2.2	1.7	0.3	10.3	3.2	3.6	12.2	2.2	22.5	21.6	4.7	0.6	1.3			
	1.93	1.95	1.68	1.58	1.29	1.23	1.15	1.20	1.06	1.13	1.16	1.12	1.12	1.01	1.06	1.06		
3 PROPULSION SYSTEM	5.1	6.2	2.5	1.4	0.4	9.1	2.1	2.7	14.7	12.2	2.7	22.2	23.2	3.1	0.6	1.9		
	1.15	1.00	2.06	2.30	1.44	1.40	1.10	1.25	1.11	1.12	1.12	1.22	1.22	1.02	1.10	1.10		
4 AUXILIARY POWER PRODUCTION	3.2	3.6	1.7	2.3	0.7	5.2	3.7	3.5	12.1	2.1	1.1	12.5	17.1	2.2	0.3	1.7		
	1.17	1.11	1.03	1.13	1.22	1.19	1.17	1.26	1.03	1.29	1.10	1.22	1.32	1.00	1.23	1.02		
14 FUSELAGE EQUIP - FLIGHT STATION	1.03	1.22	1.22	1.17	1.13	1.19	4.7	4.7	1.2	1.2	0.5	2.6	3.2	1.2	2.9	9.3		
	1.2	10.1	19.7	3.7	0.2	1.3	1.15	1.22	1.21	1.42	1.33	1.25	1.15	1.42	1.25	1.15		
1 STRUCTURE	1.10	1.12	1.00	1.05	1.05	3.7	4.2	2.0	2.0	0.3	11.2	4.6	3.0	10.2	2.0	0.2		
	17.2	20.2	3.9	0.5	1.5	1.27	1.25	2.12	1.91	2.00	1.25	1.25	1.50	1.22	1.22	1.22		
TOTAL - PRIOR 4	1.20	1.20	1.01	1.22	1.02	4.2	4.3	1.9	1.2	0.5	2.9	4.1	2.0	11.1	9.5	1.2		
	17.2	19.3	3.5	0.5	1.7	1.13	1.71	1.29	1.22	1.59	1.11	1.45	1.21	1.27	1.17	1.17		
15 CARGO COMPARTMENT	1.21	1.21	1.01	1.27	1.07	4.9	3.1	2.1	2.3	0.4	12.1	3.7	7.6	12.7	7.3	1.1		
	23.3	23.0	23.0	5.2	0.1	2.1	1.10	1.12	1.02	1.10	1.25	1.00	1.22	1.00	1.22	1.21		
12 LIGHTING SYSTEM	1.17	1.17	1.00	1.22	1.02	4.3	3.2	1.9	2.7	0.4	11.7	5.2	1.5	12.2	0.7			
	20.2	19.2	2.7	0.4	2.7	1.14	1.22	1.29	1.12	1.12	1.00	1.00	1.22	1.03	1.12	1.23		
TOTAL - PRIOR 5	1.12	1.23	1.00	1.03	1.03	4.5	3.5	2.0	2.5	0.4	12.0	4.5	3.2	13.2	10.1	0.9		
	21.5	10.3	20.3	2.1	0.3	2.5	1.13	1.40	1.22	1.12	1.12	1.00	1.00	1.32	1.03	1.19		
TOTAL - ALL SYSTEMS	1.20	1.20	1.20	1.00	1.03	1.02	4.7	4.2	2.3	1.9	0.5	11.6	4.4	2.7	14.1	12.2		
	1.0	20.6	19.2	3.7	0.4	1.6	1.19	1.49	1.04	1.14	1.14	1.22	1.22	1.01	1.04	1.04		

Figure 4-7 Average Performance Data on Completed Activities by Station

SYSTEM	PROGRESS STATUS OF ACTIVITIES					CAL DATE PING DATE	29-08-7 232
	TOTAL NUMBER	NUMBER NOT BEGUN	NUMBER IN PROCESS	NUMBER COMPL	FRAMES IN PROCESS			FRAMES COMPL	AVE TIME COMPL
10 COMMUNICATIONS SYSTEM	49	19	26	0	248	0	0.00
9 NAVIGATION SYSTEM	100	36	42	0	643	0	0.00
13 INSTRUMENT SYSTEM	70	44	26	0	294	0	0.00
2 FUEL SYSTEM	41	40	1	0	5	0	0.00
5 HYDRAULIC POWER PRODUCTION	102	31	71	0	810	0	0.00
TOTAL - CHIP 1	399	172	166	0	1200	0	0.00
7 FLIGHT CONTROL SYSTEM	302	99	202	0	2746	0	0.00
6 ELECTRICAL POWER PRODUCTION	49	16	34	0	123	0	0.00
TOTAL - CHIP 2	354	109	248	0	2869	0	0.00
8 LANDING GEAR SYSTEM	129	21	104	0	1240	0	0.00
11 PNEUMATIC SYSTEM	224	300	124	0	1430	0	0.00
TOTAL - CHIP 3	349	121	228	0	2670	0	0.00
3 PROPULSION SYSTEM	199	102	91	0	909	0	0.00
4 AUXILIARY POWER PRODUCTION	62	46	14	0	162	0	0.00
14 FUEL/ARE EQUIP - FLIGHT STATION	98	81	14	0	97	0	0.00
1 STRUCTURE	78	46	22	0	291	0	0.70
TOTAL - CHIP 4	300	279	101	0	1012	0	0.00
15 CARGO COMPARTMENT	140	131	9	0	199	0	0.00
12 LIGHTING SYSTEM	163	59	64	0	637	0	0.30
TOTAL - CHIP 5	203	190	43	0	796	0	0.00
TOTAL - ALL SYSTEMS	1724	871	853	0	9930	0	0.00

Figure 4-8 Progress Status of Activities

CURRENT AS OF 10 AUG 67

TABULATION OF FUNCTION BY END ITEM MATRIX CODE

SYSTEM 13 INSTRUMENT SYSTEM

	SAC	TSS	YEM	NEA	IMST	ADJ	INDP	CAL
TOTAL V'S	0	0	0	10	10	0	0	1
TOTAL T'S	13	0	0	11	2	0	0	0
TOTAL S'S	0	0	0	20	0	0	0	0
TOTAL 'S	43	53	50	4	20	0	20	27

SYSTEM 14 FUELAGE EQUIP - FLIGHT STATION

	SAC	TSS	YEM	NEA	IMST	ADJ	INDP	CAL
TOTAL V'S	2	0	0	10	10	1	0	0
TOTAL T'S	0	0	0	14	0	0	0	0
TOTAL S'S	0	0	0	27	0	0	0	0
TOTAL 'S	2	0	0	4	0	0	0	0

SYSTEM 15 CARGO COMPARTMENT

	SAC	TSS	YEM	NEA	IMST	ADJ	INDP	CAL
TOTAL V'S	4	0	0	42	42	0	0	0
TOTAL T'S	20	0	0	24	0	15	0	0
TOTAL S'S	0	0	0	0	0	0	0	0
TOTAL 'S	72	104	104	20	20	00	104	104

TOTAL ALL SYSTEMS

	SAC	TSS	YEM	NEA	IMST	ADJ	INDP	CAL
TOTAL V'S	40	0	0	440	447	102	0	10
TOTAL T'S	240	0	0	375	200	00	0	5
TOTAL S'S	0	0	0	201	0	1	0	0
TOTAL 'S	1110	1390	1390	152	152	1190	1390	1372

Figure 4-9 Tabulation of Function by End-Item Matrix Code

d. Print: Printed the function-by-end-item matrix from the latest activity file. Also summarized the function-by-end-item matrix by system.

e. Load: Initially accepted the function-by-end-item matrix in order to set up the activity files. Also set up and initiated the status summary files.

2. Execution

With the exception of LOAD, these programs were designed to be stacked. The stacking order was CHANGE, STATUS-1, STATUS-2, and PRINT. If it was not necessary to run CHANGE and/or PRINT, they could be eliminated from the run.

The latest status and past history of transactions of activity packages and the status summary files were maintained on magnetic tape and updated periodically. This tape was called the Master Activity File. The tape output of the last series of status runs was considered to be the New Master Activity File until the computer preparations were initiated for the next run, when it became the Old Master Activity File.

E. DOCUMENTATION PROCEDURES

As the activity packages went through the technical data control system they passed through a number of stations (or functions) as depicted by Figure 4-2. Each time an activity left one of these stations, the transaction was recorded on the activity status updating form (Figure 4-3). The activity code of the activity package, leaving the station to be entered, the date, and sometimes the number of frames (pages) in that activity, were entered.

The activity status updating forms were periodically keypunched and the cards used as input to Status-1. Status-1 required that the activity flow be sequential (an activity package could not leave a station without first entering that station). If such an error was found, Status-1 printed out

an error message identifying the problem and skipped the change of status instruction. It was then necessary to correct the error and re-submit the skipped instructions in the next periodic run.

1. Load

a. Input. The function-by-end-item matrix was inputted in the following punched card format:

1-48	Activity nomenclature
49-54	End item number (first of 6 digits of the activity number)
65-66	System Operational Check formatting code
67-88	Troubleshoot System formatting code
89-70	Troubleshoot Unit formatting code
71-72	Remove formatting code
73-74	Install formatting code
75-76	Adjust formatting code
77-78	Inspect formatting code
79-80	Calibrate formatting code

Also, a PIMO date Look-up Table was inserted. The PIMO date is a Julian date with each working day numbered sequentially from a set date. The Look-up Table enabled the conversion from calendar dates to the PIMO date which was used in later calculations. Input format was on punched cards with each card having 15 fields of three columns each. These values were stored in a two-dimensional matrix with the axis corresponding to the month and day number.

b. Output. New Master Activity File containing:

- (1) The PIMO calendar matrix.
- (2) The initialized activity files.
- (3) The initialized status summary files.

2. Status - 1

a. Input

- (1) Activity status update cards. For format see Figure 4-3.
- (2) Old Master Activity File.

b. Output

- (1) New Master Activity File (without updated status summary files).
- (2) Listing of each activity, its current status and past history. Figure 4-1 shows a sample output.

3. Status - 2

a. Input. New Master Activity File created as an output of Status - 1.

b. Output

- (1) New Master Activity File (with updated status summary files).
- (2) Five summary tables as described below:
 - (a) Number of Activities Accomplished Since Last Report (Figure 4-4). This report showed by system and by priority group for all the data, the number of activity package transactions made since the last

periodic update by station. A description of the rows are as follows:

- Initial - indicates the number of activity packages going through that station for the first time.
- Repeat - indicates the number of activity packages being reworked by that station.
- Pre-ver - indicates the number of activity packages going through that station before they went through the verification function.
- Po-ver - indicates the number of activity packages going through that station after they went through the verification function.
- Total - total activity packages going through that station.
- Frames - total frames (pages) included in the activity packages going through that station.

(b) Number of Activities Accomplished to Date (Figure 4-5). Identical to the above except the time period is since the beginning of the technical data control process.

(c) Number of Activities in Process by Station (Figure 4-6). Indicates the number of activity packages in that station as of the periodic cut-off date.

(d) Average Performance Data on Completed Activities by Station (Figure 4-7). For all completed activity packages, this report indicates the average time and the average number of times spent in each station.

(e) Progress Status of Activities (Figure 4-8). Indicates the total number, number not begun, number in process, number completed, frames in process, frames completed, and average time in system of completed activities for all those activities requiring re-formatting as shown in the function-by-end-item matrix.

4. Print

- a. Input. New Master Activity File.
- b. Output. Listing of activities in the function-by-end-item matrix and a summary of the formatting codes in the function-by-end-item matrix. Sample outputs are shown in Figures 3-2 and 4-9.

5. Change

a. Input

- (1) Old (or New) Master Activity File.
- (2) Change instructions in punch card format. Three command instructions can be input; they are ADD, DELETE, or CHANGE. The ADD command will add in the entire file for an end item. DELETE will eliminate an entire file for an end item. CHANGE will change any data item in any end item file or in any of the summary files.

b. Output

- (1) Old (or New) Master Activity File (with changes made).
- (2) Listing of changes made to the activity files. The example output is shown in Figure 4-10.

The system and program flowcharts for the production status control program can be found in Appendix I of this volume.

END ITEM U09327 WAS ADDED
 END ITEM Q1322 - NOMENCLATURE CHANGED TO WING SPOILER POSITION INDICATING SYSTEM
 END ITEM Q02663 - NOMENCLATURE CHANGED TO SPOILER CABLE SERVO ACTUATOR
 END ITEM Q11001 - NOMENCLATURE CHANGED TO MD-1 AND MD-2 STALL PREVENTION COMPUTERS
 END ITEM Q12007 - NOMENCLATURE CHANGED TO AUTOMATIC FLIGHT CONTROL SYSTEM
 END ITEM Q12001 WAS ADDED
 END ITEM Q12302 WAS ADDED
 END ITEM Q12305 WAS ADDED
 END ITEM Q12304 WAS ADDED
 END ITEM R01009 WAS ADDED
 END ITEM R01009 - NOMENCLATURE CHANGED TO EMERGENCY BRAKE PRESSURE INDICATING SYSTEM
 END ITEM R02666 WAS ADDED
 END ITEM R02666 - NOMENCLATURE CHANGED TO PORTLINE BRAKE PRESSURE INDICATING SYSTEM
 END ITEM S96000 - FUNCTION (04) CHANGED FROM Y TO
 END ITEM S06007 - FUNCTION (06) CHANGED FROM TO V
 END ITEM S09011 - FUNCTION (03) CHANGED FROM TO V
 END ITEM S90001 COULD NOT BE FOUND
 END ITEM S90001 WAS ADDED
 END ITEM U04011 - NOMENCLATURE CHANGED TO CARGO COMPARTMENT TEMPERATURE INDICATING SYSTEM
 END ITEM U04011 - FUNCTION (01) CHANGED FROM TO Y
 END ITEM U04011 - FUNCTION (04) CHANGED FROM V TO
 END ITEM U04011 - FUNCTION (05) CHANGED FROM V TO
 END ITEM U09004 WAS ADDED
 END ITEM U09011 WAS ADDED
 END ITEM U09011 - NOMENCLATURE CHANGED TO BLEED AIR PRESSURE INDICATING SYSTEM
 END ITEM U18004 WAS ADDED
 END ITEM U23004 WAS ADDED
 END ITEM U23005 - NOMENCLATURE CHANGED TO TOTAL AIR TEMPERATURE INDICATING SYSTEM
 END ITEM U23005 WAS ADDED
 END ITEM U23005 - NOMENCLATURE CHANGED TO CREW LIGHT EXHAUST QUANTITY INDICATING SYSTEM

Figure 4-10 Changes Made to Activity Files

APPENDIX I

BTDS PROGRAM AND SYSTEM FLOWCHARTS

On the following pages are the System and Program Flowcharts for the Basic Technical Data Storage and Retrieval (BTDS) Programs. Figures I-1 through I-4 depict the system flow for various commands peculiar to the BTDS. These commands include data input, deletion, printout, and query. Figures I-5 through I-7 illustrate the over-all computer program flow.

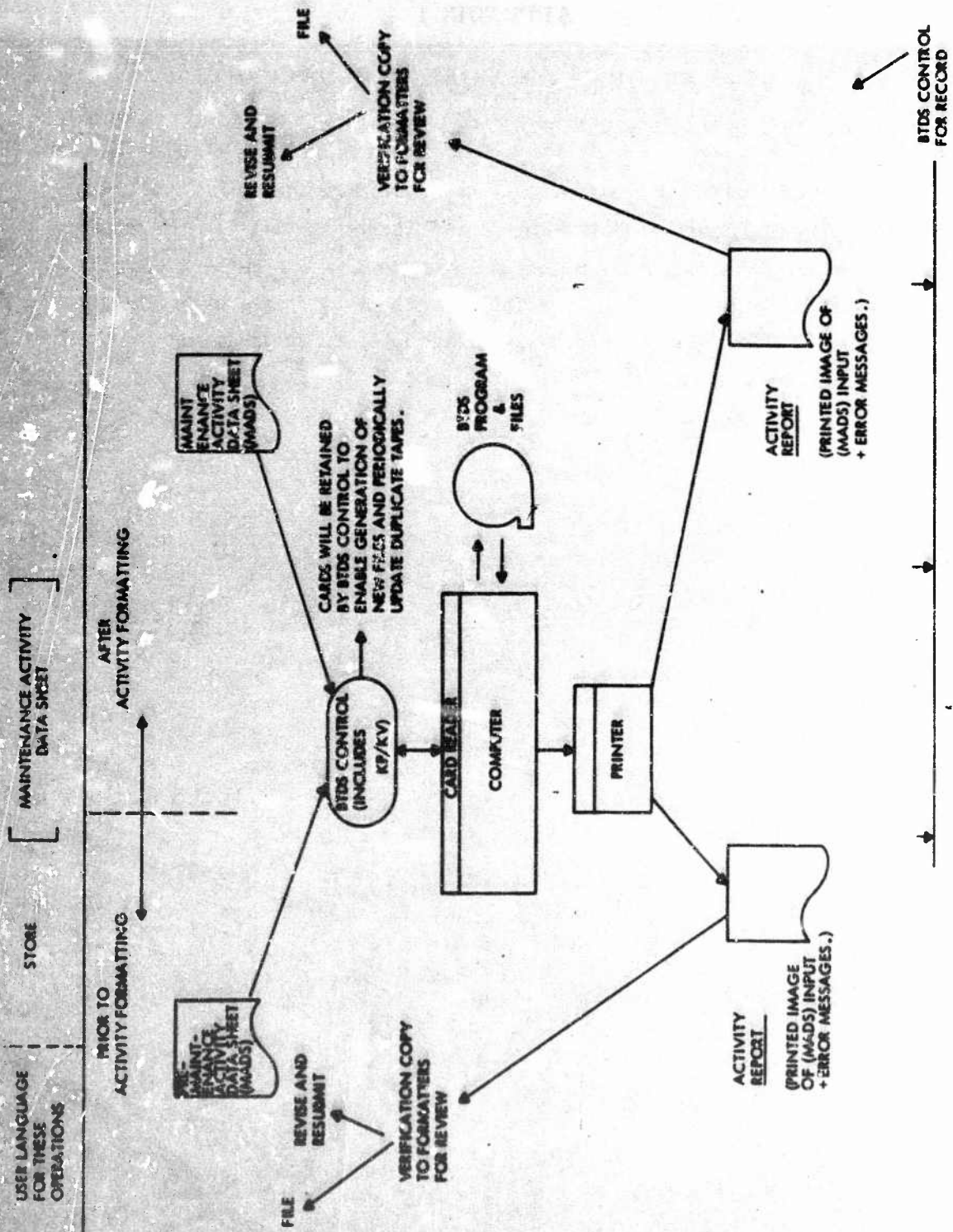


Figure I-1 Basic Data Input -- BTDS System Flowchart No. 1

USER LANGUAGE FOR THESE OPERATIONS	DELETE	["ACTIVITY CODE"]
--	--------	-------------------

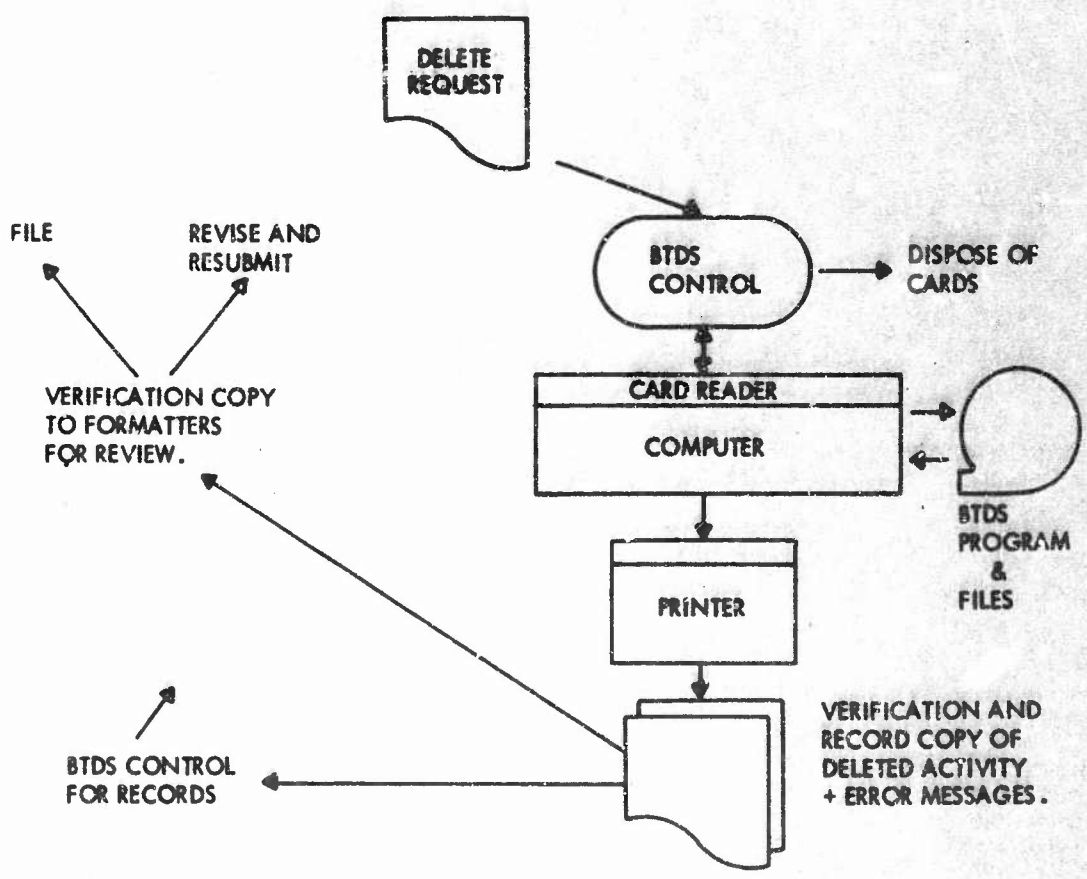


Figure I-2 Activity and/or Frame Deletion --
BTDS System Flowchart No. 2

USER LANGUAGE
FOR T-3SE
OPERATIONS

[PRINT AWS ACODE = "ACTIVITY CODE"]

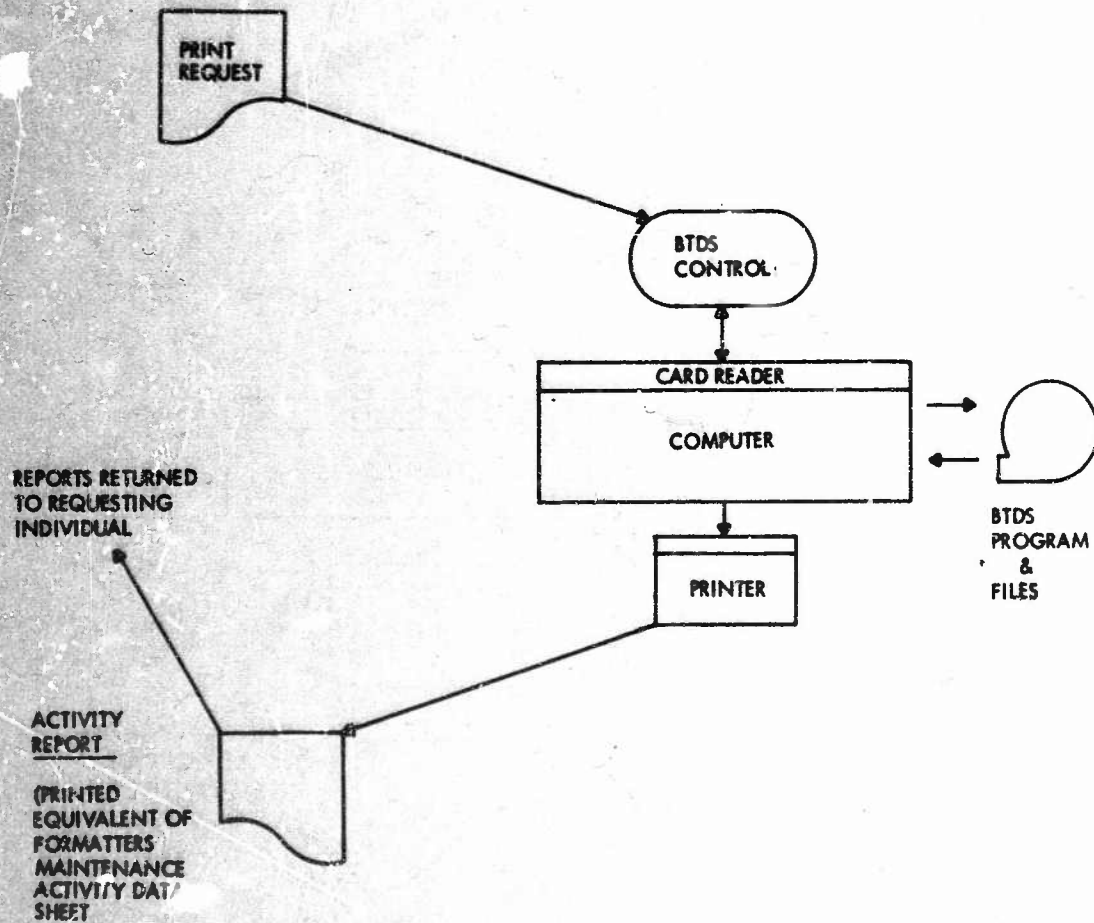


Figure I-3 Request for Data Printout --
BTDS System Flowchart No. 3

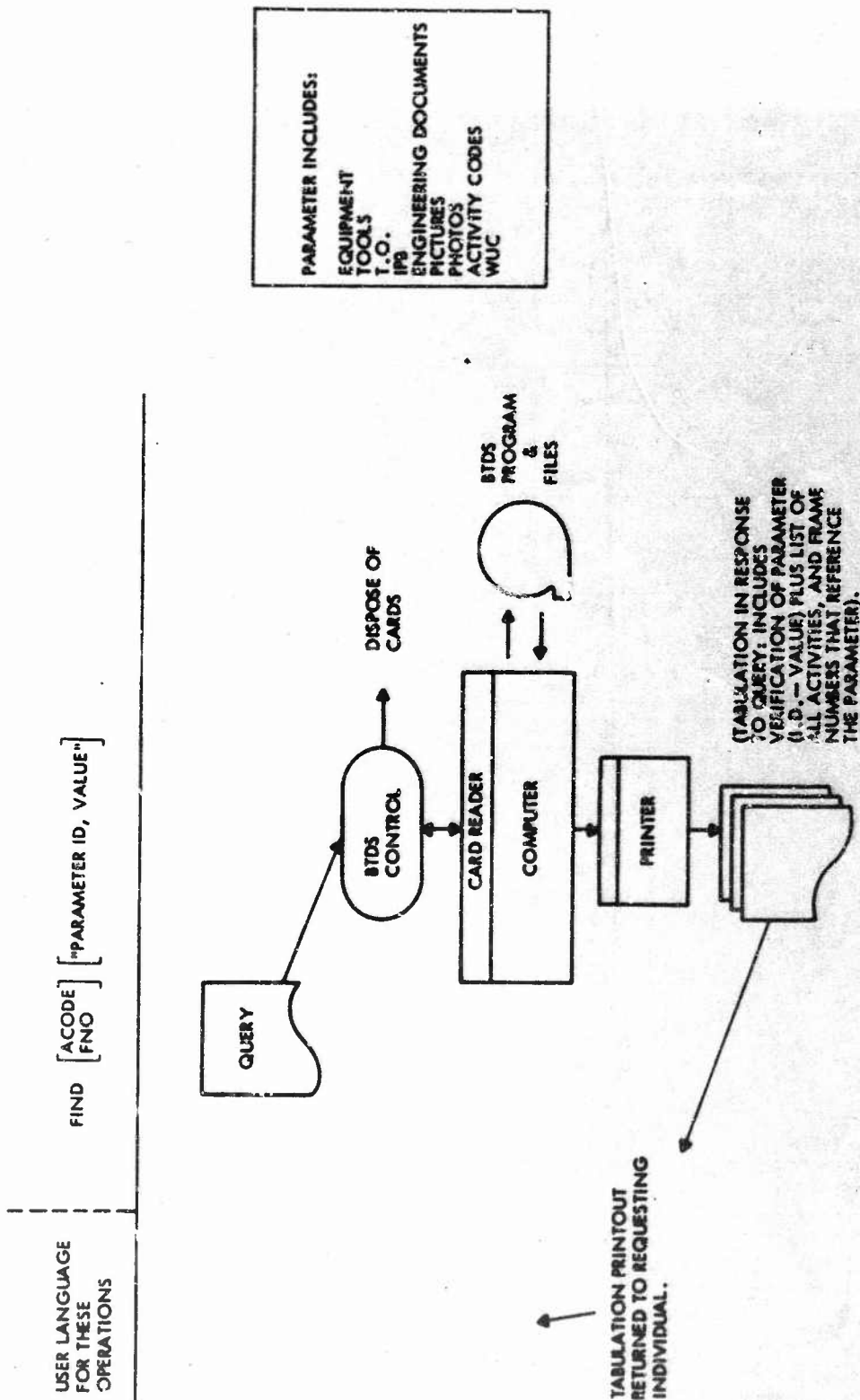


Figure I-4 BTDS Queries No. 1 --
BTDS System Flowchart No. 4

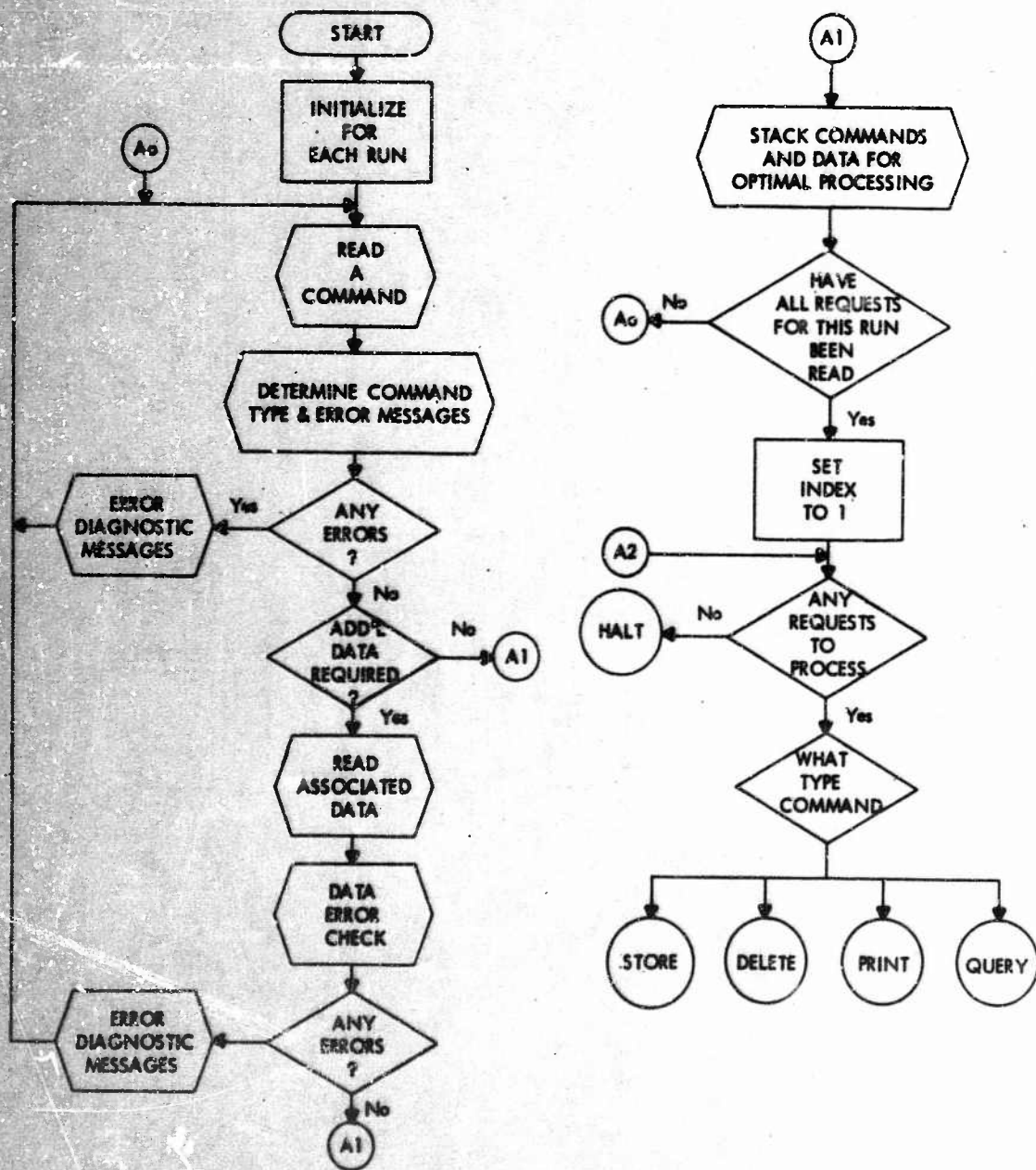


Figure 1-5 BTDS Program Flowchart No. 1

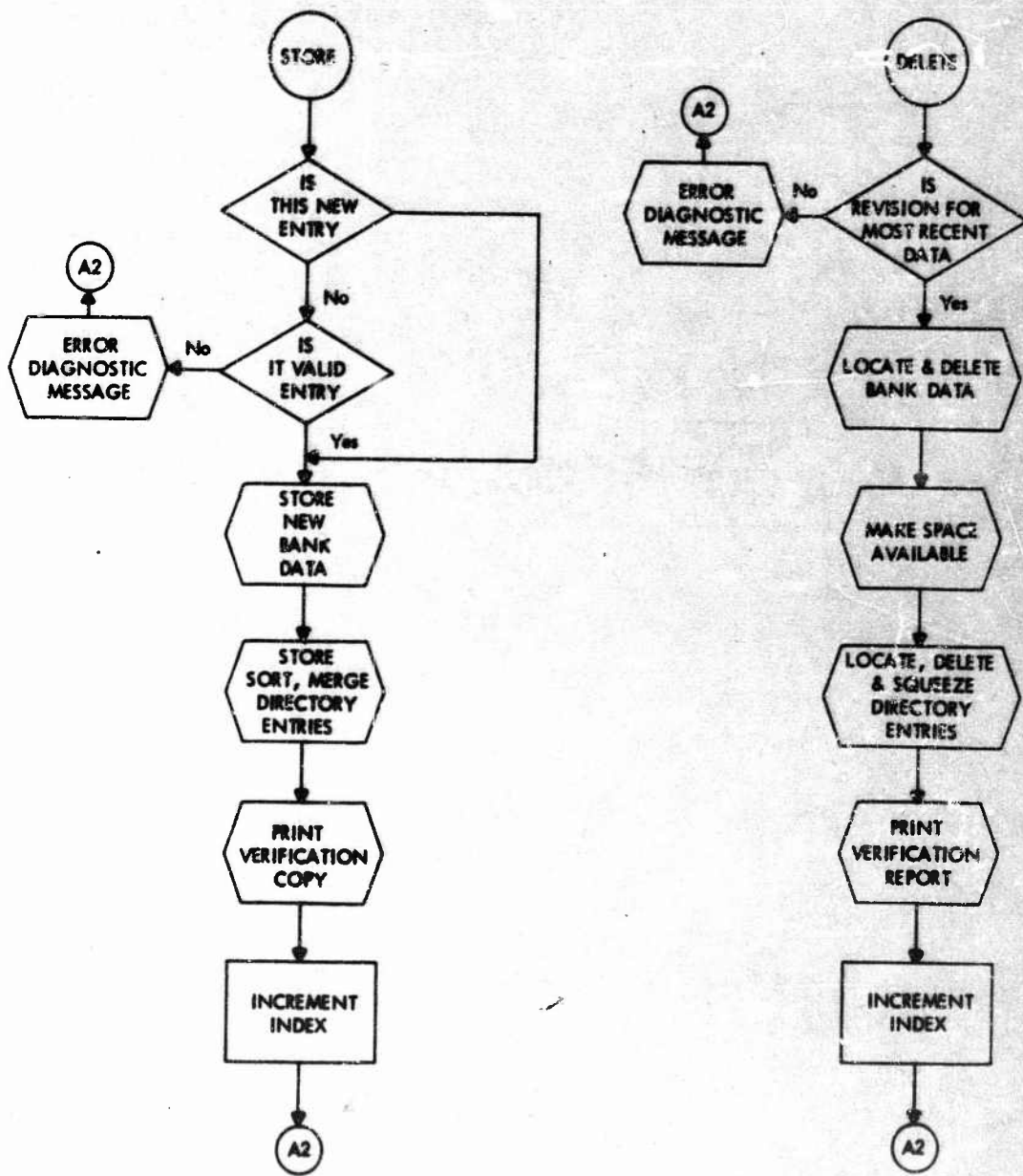


Figure I-6 BTDS Program Flowchart No. 2

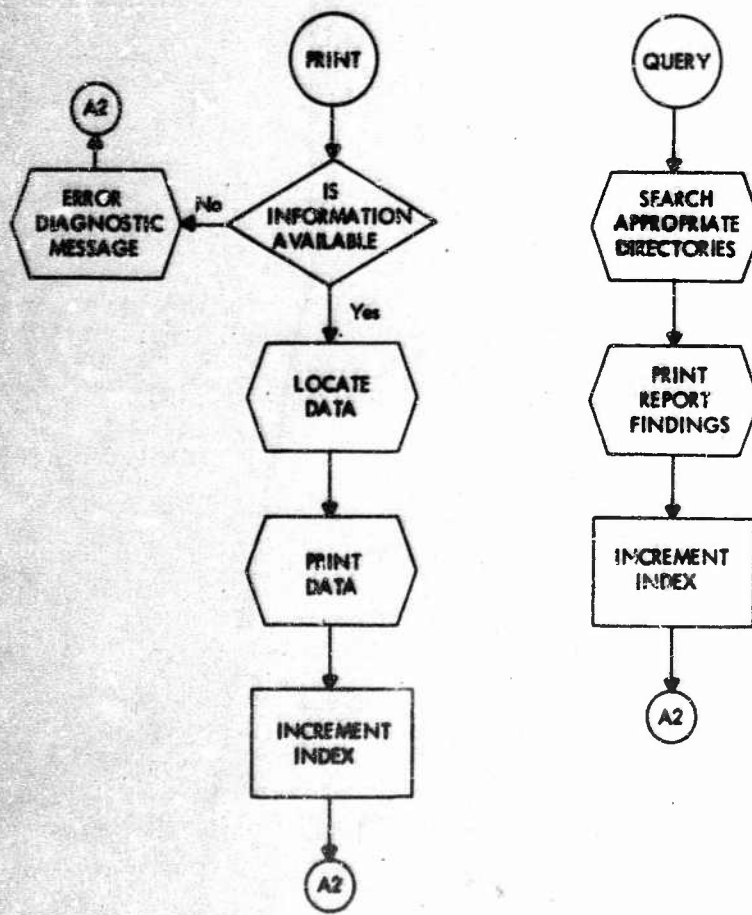


Figure I-7 BTDS Program Flowchart No. 3

APPENDIX II

CODES USED FOR CURRENT ACTIVITY STATUS PRINTOUT

The current activity status printout can be read quite simply if one understands the basic codes and entries. The basic codes and entries are encircled on Figure II-1. Definitions for the codes and entries are keyed to the encircled items as listed below:

1. Activity code.
2. An "X" in this column indicates that the activity has been through verification (Station 3).
3. A "Y" in this column indicates that the activity is "frozen" (no further revisions allowed).
4. An "X" in this column indicates that the activity is completed (it has reached Stations 17, 18, and 20).
5. Station number (see the reverse side of Figure 4-3 for the station identifier).
6. Numbers of the stations where the activity is currently located.
7. The number of status changes for that activity since the last status run.
8. Error code which indicates an activity update card that had an activity code not in the Old Master Activity File.
9. Error code which indicates that an activity update card has had a transaction which was out of sequence (the update card indicated that the activity left Station 11 and went to Station 1; however, the Old Master Activity File had the location of the activity as being in Station 3).

10. Number of times the activity has been in that station.
11. Elapsed days (not including the current time) that the activity has spent in that station.
12. The PIMO date the activity last entered or left that station (if the activity is in that station, it is the date last entered; if the activity is not in that station, it is the date last left).
13. PIMO date the activity entered the system.
14. PIMO date the activity entered Station 17.
15. PIMO date the activity entered Station 18.
16. PIMO date the activity entered Station 20.
17. Number of frames for that activity.

Security Classification

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

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11. SUPPLEMENTARY NOTES Distribution of this report is limited because it contains technology restricted by Mutual Security Acts.		12. SPONSORING MILITARY ACTIVITY Space and Missile Systems Organization Air Force Systems Command Norton Air Force Base, California	
13. ABSTRACT This report describes the latest phase in the program to develop and evaluate PIMO (Presentation of Information for Maintenance and Operation), a job guide concept applied to maintenance. Between August 1968 and April 1969, a test was conducted at Charleston AFB, South Carolina, to determine the effectiveness of PIMO. Three immediate behavioral effects were expected: 1) reduction in maintenance time, 2) reduction in maintenance errors, and 3) allow usage of inexperienced technicians with no significant penalty. Experienced and inexperienced Air Force technicians performed maintenance on C-141A aircraft using PIMO Job Guides presented in audio-visual and booklet modes. Performance was measured in terms of time to perform and procedural errors. The performance was compared with the performance on the same jobs by a control group, i.e., experienced technicians performing in the normal manner. The following conclusions were drawn from the test results: 1) after initial learning trials, both experienced and inexperienced technicians using PIMO can perform error-free maintenance within the same time as experienced technicians performing in the normal manner, 2) inexperienced technicians perform as well as experienced technicians when both use PIMO, 3) there is no significant difference between audio-visual and booklet modes, 4) the users revealed an overwhelmingly positive reaction to PIMO, and 5) the performance improvements provide the capabilities to significantly improve system performance defined in terms of departure reliability, time-in-maintenance, and operational readiness. This report also presents a description of the recommended operational system, specifications and guidelines for PIMO format development, including troubleshooting.			

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

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