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THE RAND/TAC INFORMATION AND ANALYSIS SYSTEM: VOLUME IV— THE SYSTEM SOFTWARE

Fred Finnegan and Anders Sweetland

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The RAND Corporation
SANTA MONICA • CALIFORNIA

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1700 MAIN ST. • SANTA MONICA • CALIFORNIA • 90406

PREFACE

The RAND/TAC information and analysis system provides for the collection, processing and analysis of operations, maintenance and supply data, using an IBM 1401 computer to assist in data purification and in the management and evaluation of aircraft operations and support at base level. The system is unique in that the data collected are identified with the specific sortie (and in some instances to the specific leg within the sortie). This allows the user to perform many kinds of analyses not ordinarily possible, relating mission use to reliability, manpower and spares usage.

The system grew out of a number of special field tests (e.g., Rapid Roger, Skoshi Tiger, Tack Down) exploring the feasibility of using a small business computer to assist with materiel and operations problems at base level. In the tests prior to Combat Dragon, it was necessary to "create" the maintenance analysts through an extensive educational process. Combat Dragon was unique in that Air Force personnel carried out the entire project from data collection through final writeup with no assistance from RAND, other than the initial training in the use of the system.

It is now possible to organize the loose collection of notes, procedures and programs into a formal system description. Accordingly, this RAND effort comprises four Memorandums containing essentially the package of materials used in training the Combat Dragon team. The information is organized as follows: Volume I (RM-5666-PR) is for data collectors and editors responsible for providing the data bank to be used in subsequent analyses; Volumes II (RM-5667-PR) and III (RM-5668-PR) are for analysts (especially people who will be doing maintenance analysis) to familiarize them with the available programs and analysis products, and to encourage them to ask questions and explore the data in an imaginative way; and Volume IV (RM-5669-PR) is for the "data services branch" of the evaluation or analysis team, to identify procedures and to impart an understanding of what the analyst is attempting to do.

Surprisingly, even though the system is entirely computerized, readers need not have a knowledge of computer hardware and software to

follow the text. A knowledge of the details of aircraft weapon systems would be useful, for although we describe such operations, the descriptions are somewhat cursory. In particular, a familiarity with aircraft maintenance procedures would be useful.

The concepts, techniques and programs of the RAND/TAC information and analysis system should be adaptable to future Air Force base-level management information systems, whether manual or highly mechanized. Provided that the appropriate computer is available, the RAND/TAC system can easily be introduced at a base and used without modification for field tests or other purposes. Recent changes in a number of standard Air Force forms and in data linkages, however, may make them preferable to the RAND/TAC forms for a particular base exercise.

With modest changes to current Air Force data collection procedures and reprogramming of the analysis packages, the system would provide a valuable supplement to current base analysis reports--a supplement more attuned to questions that are and should be asked by base maintenance management. The system will also provide a detailed guide and check list for the design-development of new base-level information systems and should provide direct input to analysis portions thereof.

SUMMARY

The RAND/TAC information and analysis system provides for the collection, processing and analysis of operations, maintenance and supply data, using a small business computer to assist in data purification and in the management and evaluation of aircraft operations and support at base level. It is unique in that operational and logistics variables are interrelated through several features of the data and analysis systems to permit identification of operational events connected with a particular sortie and relate these to explicit maintenance or supply actions preceding or following the sortie, management actions, and key environmental conditions.

The system consists of a series of forms for collecting operational data, maintenance actions, maintenance manpower availability, aerospace ground equipment utilization, supply demand, cannibalization and issue data, a series of computer programs and manual procedures for editing, reformatting and processing to provide basic displays, and other programs to provide basic analysis packages. The system is designed to minimize duplicative recording of data elements, and has flexible computer programs to permit a wide variety of analyses.

The four volumes constituting this effort present a complete system description, together with instructions on how to perform analyses using the system programs. Volume I (RM-5666-PR) contains the descriptions of and procedures for collecting and editing the data -the forms, procedures and program operating instructions. Volumes II (RM-5667-PR) and III (RM-5668-PR) are concerned with the analysis programs and procedures, and with analysis design and methods. The first emphasizes how the programs work, the second how questions can be answered. In a sense both volumes are written for a career that currently does not exist in the Air Force: the maintenance analog of the operations analyst. A person interested in this field should be versed not only in maintenance but also in data processing, computers, statistical methods and experimental design.

Each time RAND participated in a special field test, such as Combat Dragon, Skoshi Tiger, and Tack Down, it was necessary to "create" the maintenance analysts by an extensive educational process. Volume

II attempts to encapsulate the first part of that educational process. It introduces the prospective analysts to the data bank, the programs and the procedures needed to process the operations, maintenance and supply analysis data.

Volume III is based on the second stage of the learning process. It assumes that the user has now mastered the elements of the program and can focus his attention on answering questions. Thus it addresses analysis fundamentals: dependent and independent variables, data fields, sorting, data selection and tagging. Then it discusses a variety of areas of interest to maintenance management and shows how each can be explored with the system. Finally, some of the background and philosophy of experimental design is discussed.

Volume IV (RM-5669-PR) describes the computer programs used with the system. To encourage a rapprochement between the analysts and the programmers, we have attempted to include sufficient information for the programmer to understand the general outlines of what the analyst is attempting, as reflected by the functions of the computer programs.

ACKNOWLEDGMENTS

It is impossible to credit all those who made contributions to the system. Hall Logan (TAC-OA) and Sergeants James Fisher and Melvin Ericson (TAC) provided most of the maintenance procedures. Calvin Gogerty (RAND) designed the entire supply inclusions. Chauncey Bell (RAND) designed the "off-equipment" bench repair procedures. Sergeant Jack Marshall and Technical Sergeant Elias Martinez contributed to the 1401 programming, as did Mrs. Colleen Dodd of RAND. A special thanks is due Miss Doris Dong of RAND who did the art work.

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GLOSSARY

Abort rate	The rate of aborted sorties made by a unit in a given period. The most frequently used equation is the following: abort rate = sorties aborted/sorties attempted.
Action taken	The type of maintenance performed: repaired, removed and replaced, calibrated, etc.
AGE	Aerospace ground equipment.
AGE utilization	A display showing both active and standing flight-line utilization of AGE.
Aircraft display	Also called flight-line display and flight line queue sort. Shows pictorially the maintenance and status history of each aircraft for a 24-hour period.
Base-line	Such data are counts of the times an event was attempted, e.g., sorties flown in a certain category.
Break-rates	Along with write-ups, break-rates are the major independent variables in determining aircraft recovery and turnaround, and are therefore the major determiners of sortie generation capability. Break-rates are determined for both aircraft and aircraft systems. The equation is as follows: break-rate = system fix count/sorties flown.
Chi-square	An analysis program that makes statistical comparisons of frequency counts to determine whether nonrandom behavior exists.
Code 799	No defect discovered.
Code 800	Removed or replaced to facilitate maintenance.
Code T	Removed for cannibalization.
Code U	Replaced after cannibalization.
Combat Dragon	An exercise with A-7A aircraft in Vietnam.
Cost-effectiveness	An exercise with F-4C aircraft at McDill Air Force Base.
Daily package	Processing of operations, maintenance, supply and scheduling data by means of edits, error listing, and aircraft and work center displays.
Delay time	The accumulation of work interruptions on each system and each work center by aircraft.
Demand rate	Most frequently, supply demand rates. Most frequently, demand rate = demand (request)/ sorties flown

Deviation-Degradation (DEVDEG) program	A computer program. Lists and counts missions' deviation-degradation data from the 308 forms.
Dichotomous data	Data that has only two categories: for example, yes-no, 0-1, hit-miss, aborted-nonaborted, malfunctioned-nonmalfunctioned.
Easy data	Data collected by one person at a single collection point, as opposed to tough data.
Edit mask card	Locates the decimal phase that is edited into the data field just before printing.
Edit program	Searches for and identifies errors, reformats data, relieves data recorder of all possible unnecessary burden.
Eight/two pocket	Card drop pocket on the 1401.
Eighty-eighty (80-80) listing	Records are printed as they exist on the card (or tape) without separation of the fields.
Error listing	An image of each card containing a computer-detected error plus a description and location of each error.
ETIC	Estimated time to in-commission status.
ETR delay code	Equipment temporarily removed.
Field location card	Locates low- and high-order positions of the fields on the record.
Flight-line display	See aircraft display.
Frequency Counter (FREQ) program	Searches any field of unknown and unsorted data, builds a table, and counts the frequency of entries in the field.
Gang punch	To punch identical or constant information into all of a file of cards.
Gross fix time	Period from touchdown to end of maintenance. Includes unscheduled maintenance only.
Gross turnaround	Period from touchdown to end of maintenance, includes both scheduled and unscheduled maintenance.
Hard data	Keypunched data, as opposed to soft data.
Harmonic mean	The method of computing helps minimize the effect of unequal sample size by using the reciprocal of n.
Hourly Frequency Accumulate	A program that computes the frequency counts for resource utilization for each of the 24 hours during the day.
How malfunction code (how mal)	Describes the nature of the malfunction: burned, distorted, cracked, overheated, etc.

Independent variables	May affect system behavior, as opposed to dependent variables, which are the things being affected.
KBA	Killed by air.
K-97 report	Weekly of maintenance data forwarded to the Logistics Command.
Lag time	Period from touchdown until maintenance begins.
Man-hours	Hours of direct labor.
Manpower Utilization Sequence	Relates personnel utilization (direct on-equipment labor) to sorties flown.
	Manpower utilization — Searches each minute of the hour to find the number of men working each hour.
	Manpower available — Produces a summary card showing the number of men available for each hour of each work center day.
	Touchdown counts — Produces a card for each day showing the number of touchdowns for each hour of that day.
Mission essential items	Essential items for accomplishing the objective of the sortie.
MDC	Maintenance data collection portion of AFM 66-1.
MND	Maintenance nondeliveries.
Net fix time	Active fix time when work is being accomplished. Lags and delays are not included, refers only to unscheduled maintenance.
Net turnaround	Same as net fix time except it includes the scheduled maintenance as well.
NORM	Not operationally ready, maintenance.
NORS	Not operationally ready, supply.
NORS-G	Not operationally ready for supply, grounded.
NRP pocket	Card drop pocket on 1401.
NRTS	Not reparable this station.
Observed frequency	Count of successes, failures, aborts, etc.
Off-equipment file	MDC records of bench repair actions.
On-equipment bench repair	Repair done without item going through conventional materiel control channels.

OR rate	Operationally ready rate: OR rate = hours ready/hours possessed.
Oxnard format	The output format of the Edit program always includes clock hours. Oxnard refers to the project for which the format was designed.
Oxnard project	An exercise with F-101 aircraft at Oxnard Air Force Base.
Pearson product moment correlations	Statistical measure showing the amount of relationship between two measures.
PS code	Primary-secondary code. A column (in record format Ms) for use as a squadron (or other) designator.
Quantitative data	Manhours, elapsed time. Contrasts with frequency count data.
Rapid Roger	An exercise with F-4C aircraft in Thailand.
Recombine program	A special purpose program used in the Recovery Sequence. Eliminates duplications, adds a dummy sortie card to the end of each tail number subset and merges the sortie deck output by Single, First and Last with the nonsortie data output by Compute Elapsed Time.
Recovery Sequence	Preprocessed edit output data. This involves computing elapsed times, converting to Julian Calendar, and coding the sortie data for first, last and single sorties of the day. Requires Col. 80=0, =2, =3 records. Involves four programs: Compute Elapsed Time: Single, First, and Last; Recombine; and Clint.
Recovery Summary (RECSUM) program	An analysis program. Provides a complete, readily comprehensible summary of aircraft recovery and turnaround in a one-page general summary with back-up pages containing detail.
SAC Full Force	An exercise with B-52, B-47, KC-135 and KC-97 aircraft.
Sequential Frequency Distribution	Summarizes and displays events across 24-hour period.
7-cards	Produced by Clint program. Aircraft recovery records that include only the unscheduled maintenance action and the postflights. Aircraft turnaround records that include both scheduled and unscheduled maintenance data.
8-cards	Produced by Clint program. System records that include both scheduled and unscheduled maintenance actions.

9-cards	Produced by Clint program. Work center records that include the scheduled and unscheduled maintenance actions of all work centers.
Sick bird analysis	Determines whether individual tail numbers show atypical write-up rates based on the sorties flown, by obtaining the sortie and write-up counts for each aircraft card, using Chi-square testing for nonhomogeniety.
Single, First and Last (S/F/L) program	A special program used only in the Recovery Sequence. Makes a single sortie card from the pairs of sortie cards resulting when a flight crosses midnight. The program also determines and tags by tail number the sequence of sorties flown each day.
Skoshi Tiger	An exercise with F-4C, F-5A, and F-100 aircraft in Southeast Asia.
Soft data	Data not keypunched, as opposed to hard data. Generally verbal information.
Sortie length	Measured from takeoff to chock time (engine shut-down).
Sparrowhawk	An exercise with F-4C, F-5A, and A-4 aircraft at Eglin Air Force Base.
Splattergrams	Displays write-ups, sortie-by-sortie, to give a snapshot history of each aircraft. Program computes write-up rates for each aircraft and prints them at the end of each tail number.
Spread-field list	Provides a listing with each field isolated from the adjacent one by blanks. Much easier to read than an 80-80 listing.
Support general codes	Scheduled maintenance codes.
Supply 1050 system	The 1050 is the standard supply computer.
System repeat write-up analysis	A repeat write-up is identical to the write-up on the previous sortie.
Tack Down	An exercise with C-130 aircraft at Pope Air Force Base.
Throughput time	Time it takes to get a job out of the computer, measured from request to delivery.
Tough data	Data collected by many persons at many points, tough to get.
TMS	Type, model and series of aircraft.

Turnaround data	Output that includes all maintenance actions.
Units produced	A count of maintenance actions. Each job is assigned one unit of work.
Vector	A record that describes the status of a system at a given time.
When discovered code	Code showing when the malfunction is discovered: before flight, during flight, during inspection, etc.
Work Center Display	Also called work center queue sort. Shows 24-hour pictorial history of work center.
Work unit codes analysis	Summarizes on one page all the meaningful information on form 300 records for each work unit code.
Write-ups	A malfunction is "written-up," i.e., described. Along with break-rates, write-ups are the major independent variables in determining aircraft recovery and turnaround.
Z-score	Score expressed in sigma units.
ZI	Zone of Interior (USA)
Zone punch	11-punch (-) or 12-punch (+) on card used when punching Alpha or special characters.

I. INTRODUCTION

EQUIPMENT SPECIFICATIONS

The equipment specifications for programs listed in this volume are the following:

1. IBM 1401 computer with
   a. Four tape drives
   b. 16,000 positions of core storage
   c. Advanced programming package, including
      1) Multiply-divide
      2) Address modification
      3) Indexing
      4) Store address register
      5) High-low-equal compare
      6) Expanded print edit
      7) Move record
2. IBM card sorter
3. IBM printing keypunch

A complete list of the 1401 autocoder source and object programs and instructions for obtaining a copy of the programs are listed in Appendix C.

PROGRAM TABLES AND CONTROL CARDS

The programs described in this volume require control cards* and, in some instances, item master tables for

1. Execution of the programs
2. Control of input and output
3. Selection of data
4. Editing of data

Preparation of the program control cards (items 1, 2 and 3 above) is described in the operating procedure for each program. Before any processing can be done, the data must be processed by the Edit program. Preparation of the item master tables must be accomplished before the Edit program can be executed.

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*See Appendix A for all referenced control card and data card formats.

The Edit program requires the following master tables:

1. Work center table
2. Tail number table
3. Aerospace Ground Equipment (AGE) table

The basic information for the tables should be obtained from the Maintenance Analysis section and keypunched in the prescribed format (i.e., formats M1, M2 and M3). A card is punched for each item code, and each table is maintained in item code sequence.

With this system there are three major sequences of data processing with the computer. The first of these is the Data Editing Sequence (also referred to as the Daily Package). The second, called the Recovery Sequence, summarizes the data by the individual sortie. The third, the Analysis Sequence, uses the output of the first two sequences to analyze the data. As would be inferred, this latter sequence is modified extensively, depending on the analyst's needs. The three sequences are shown in Figs. 1, 2 and 3. In addition, because of its complexity, the Manpower Utilization Sequence is also shown, Fig. 4.

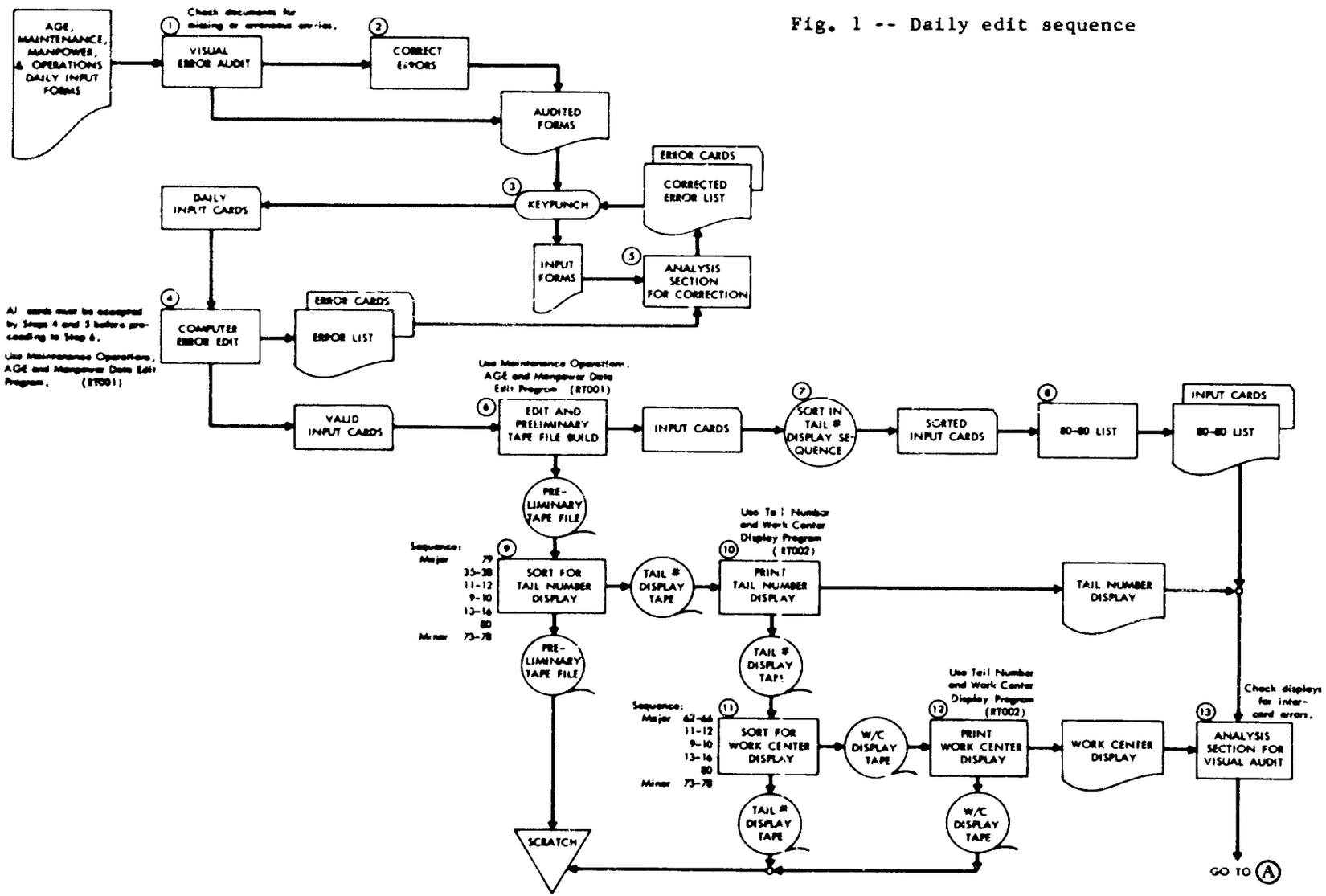


Fig. 1 -- Daily edit sequence

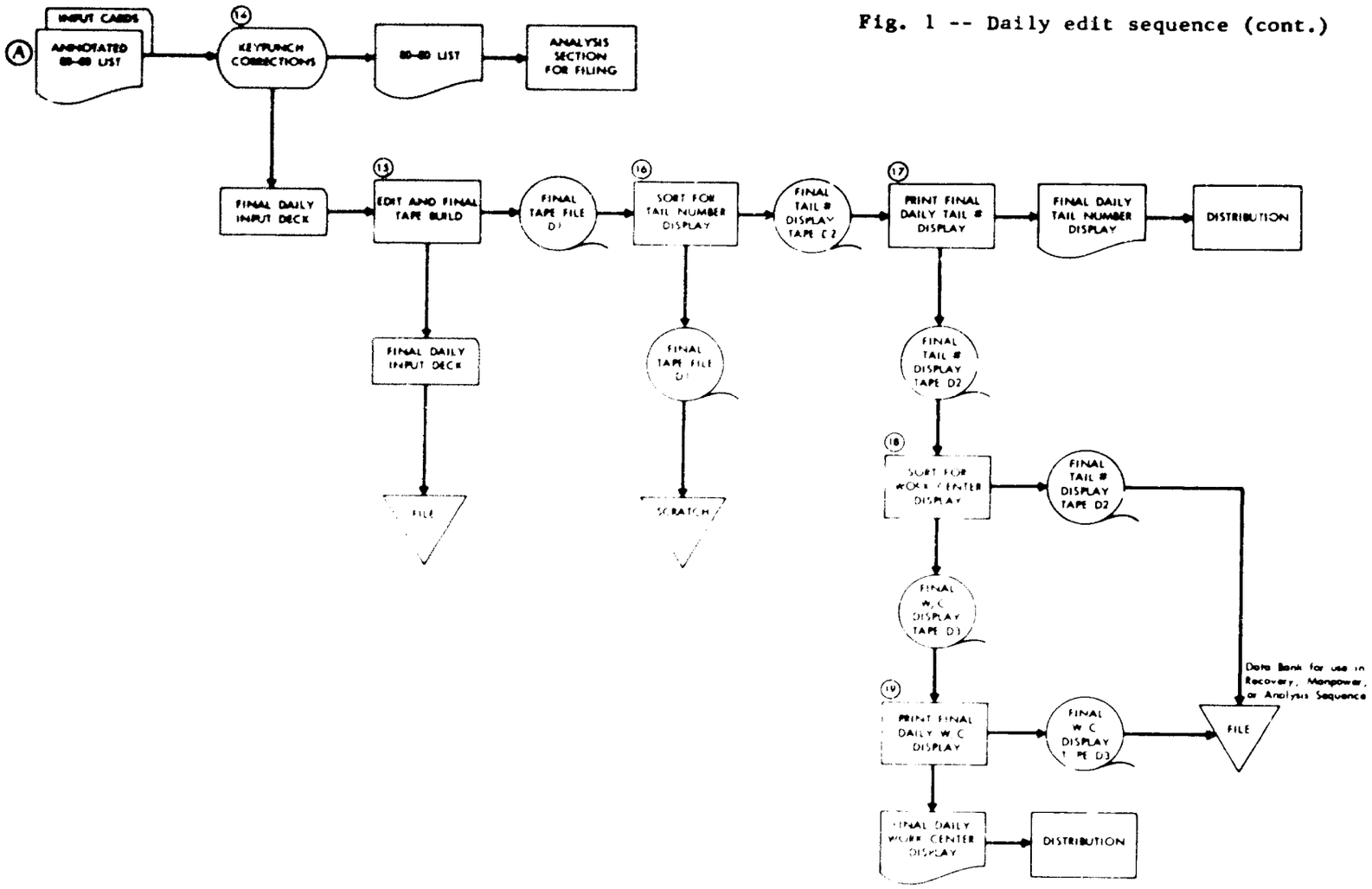


Fig. 1 -- Daily edit sequence (cont.)

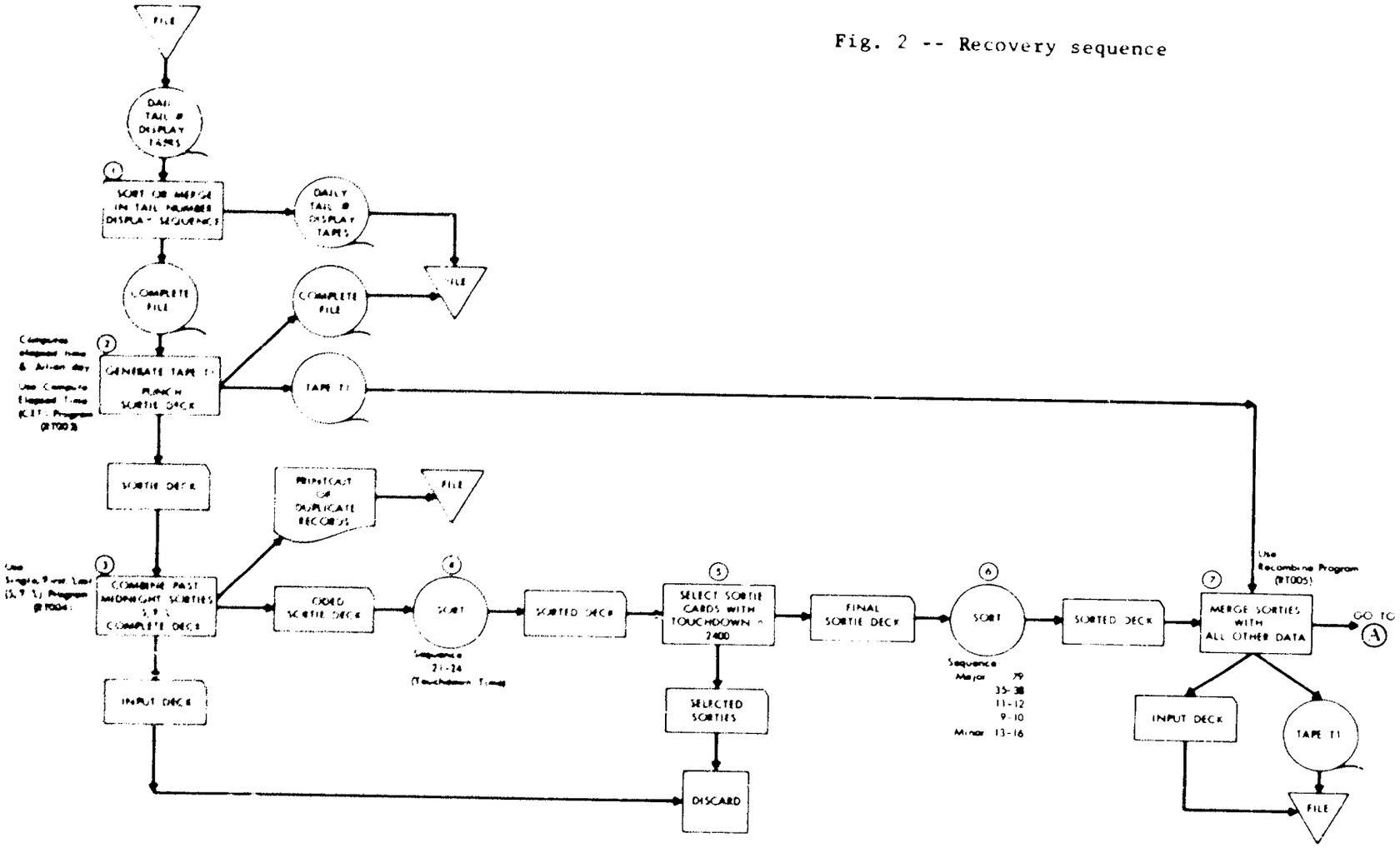
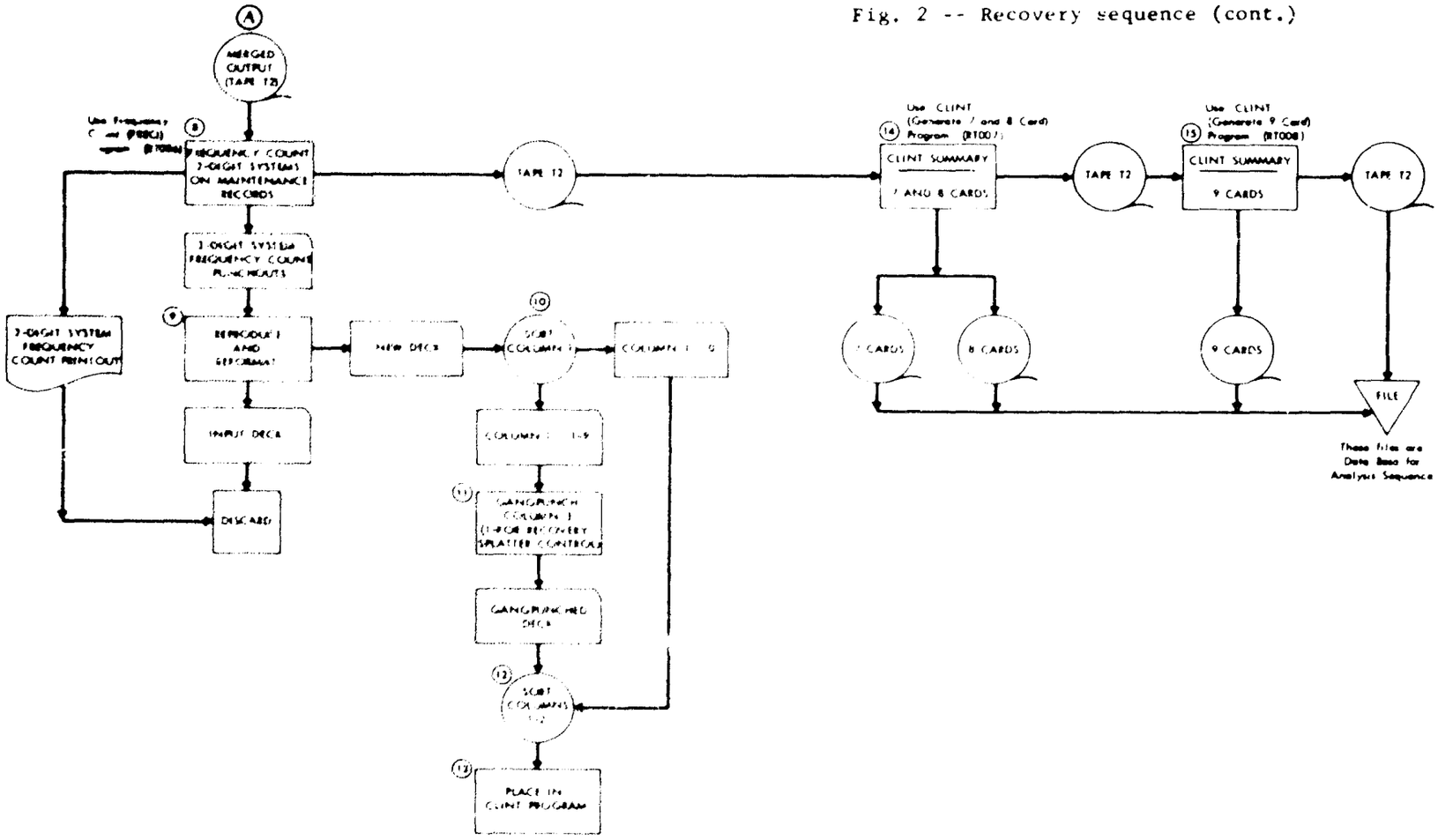


Fig. 2 -- Recovery sequence

Fig. 2 -- Recovery sequence (cont.)



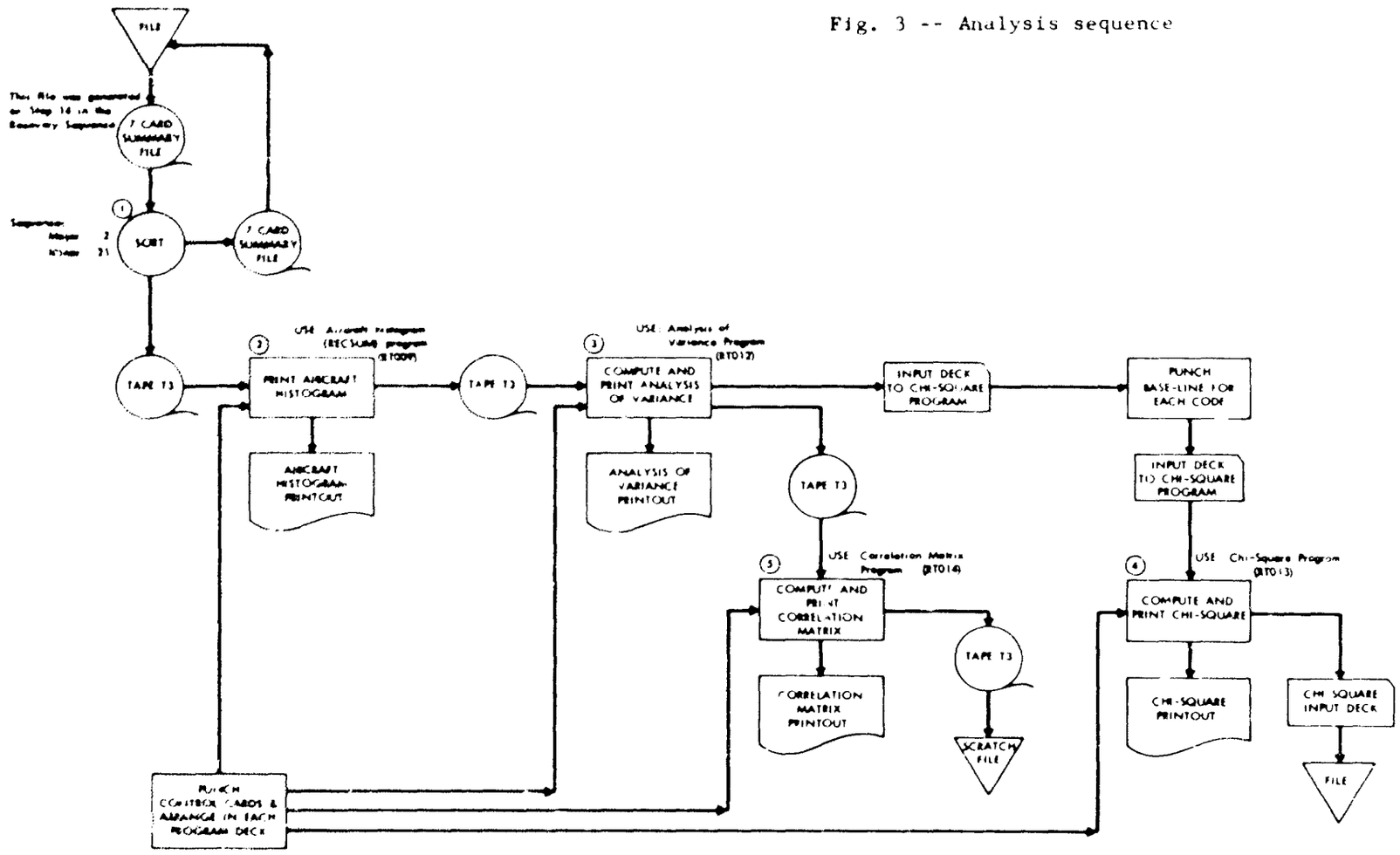
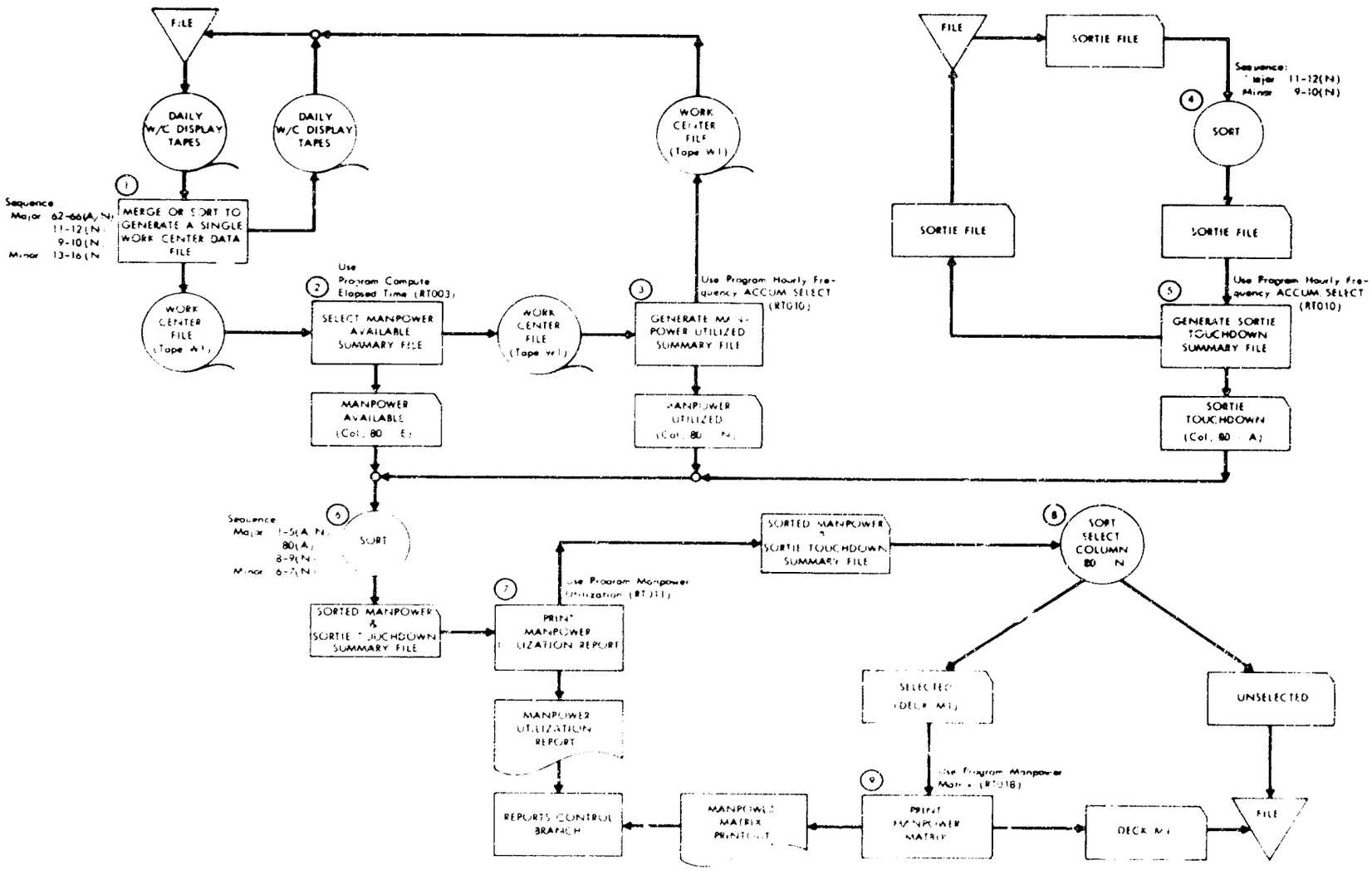


Fig. 3 -- Analysis sequence

Fig. 4 -- Manpower utilization



II. PROGRAM DESCRIPTIONS

In the following sections each program is described individually in the following sequence:

Purpose--describes the function the program performs.

Method--describes the basic logic of the program.

Operation--describes the operating procedure for executing the program. (One input/output option is described for each program.)

Program setup--shows the deck setup of the program, control cards, tables and input data necessary for execution.

Printout--if the program produces printed output, a sample is shown of a printout that would be produced by executing the program as described in the operating procedure.

The programs process or generate unblocked tape with no tape header or trailer labels.

In the operating procedures the instruction "Load and Go" has the following definition:

Ready tape unit(s)
Ready printer
Ready punch
Place program in reader
Press check reset and start reset on the console
Press check reset and load on the reader

PROGRAM INPUT/OUTPUT FILES

Program Identification	Program Name	Input		Output		
		Cards	Tape	Cards	Tape	Print
RT001	maintenance, operations, AGE and manpower date edit	maintenance, operations, AGE and manpower daily keypunched data	none	1) reformatted valid data (Onward format)	tape D1 (card images of reformatted valid data)	error card listing
RT002	tail number and work center display	reformatted data	1) tape D2 (sort of tape D1) for tail number display 2) tape D3 (sort of tape D2) for work center display	none	none	1) tail number display 2) work center display
RT003	compute elapsed time	reformatted data	tape D2	option to punch selected cards (code in column 80)	tape T1	none
RT004	single/first/last (F/L) sortie cards	sortie cards (format M)	none	coded sortie cards	none	none
RT005	recombine	coded sortie cards	tape T1	none	tape T2	listing of duplicates in file
RT006	frequency count	any card deck (program is general purpose)	any unblocked tape containing images	summary cards with frequency counts	none	listing of counts and contents of field being counted
RT007	Clint (generate 7 and 8 cards)	equivalent to records on tape T2	tape T2	1) 7 cards (aircraft recovery) 2) 8 cards (2-digit system recovery)	1) 7 cards (aircraft recovery) 2) 8 cards (2-digit system recovery)	samples of recovery computations
RT008	Clint (generate 9 cards)	equivalent to records on tape T2	tape T2	9 cards (work center recovery)	9 cards (work center recovery)	samples of recovery computations
RT009	aircraft histogram	7, 8 or 9 cards from Clint programs	7, 8 or 9 card (card images on tape) from Clint programs	summary card with time accumulations	none	aircraft histogram
RT010	hourly frequency accumulate/select	any reformatted data cards	Tape D1 (or sorted file of tape D1S)	24-hour spread summary cards (format W)	none	24-hour spread summary
RT011	manpower utilization	24-hour spread summary card (format W)	none	none	none	manpower utilization
RT012	analysis of variance	any card deck (program is general purpose)	any file with card images	summary of samples	none	analysis of variance
RT013	chi-square	any card deck with the necessary variables	any file with the necessary variables	none	none	chi-square
RT014	correlation matrix	any card deck with the necessary variables	any file with the necessary variables	none	none	correlation matrix
RT015	AGE display	AGE utilization (format S)	sorted tape T2 (program selects and displays format S records)	none	none	AGE display
RT016	deviation-degradation	deviation-degradation comment (format U)	format U records selected from tape T2	none	none	deviation-degradation detail list
RT017	form 305 generator	work center master table (format M1)	none	none	none	form 305
RT018	manpower matrix	24-hour spread summary cards (format W)	none	none	none	manpower matrix
A9002	Combat Dragon form 101 operations edit	form 101 operations keypunched data (formats CD1-CD7)	cumulative operations data file	none	updated cumulative operations data file	detail list of all card input with error cards identified
D9001	Combat Dragon supply U/X/W card edit	form 401, 402 and 403 supply keypunched data (formats CD8-CD10)	cumulative supply data file (formats CD11-CD13)	none	updated cumulative supply data file (formats CD11-CD13)	detail list of all card input with error cards identified

PROGRAM RT001: MAINTENANCE, OPERATIONS, AGE AND MANPOWER DATA EDIT

Purpose

This program addresses intra-card errors: each card is treated separately. Legality checks fall into four general categories: missing data, illegal data, improper alphabetic or numeric entries, and field comparison errors. The checks made are designed to detect types of errors that have caused the most trouble during the past several years of analyzing maintenance data. Two levels of error control are provided:

1. Data that cannot be processed by the analysis package are rejected immediately. Maintenance records, for example, must contain credible job start and stop times, crew size, work centers and tail numbers.
2. Data that can be processed by the analysis package even though they contain errors can pass through the edit program under control of a switch setting. For instance, a missing how-malfunction code may or may not be important to the circumstances. The switch setting determines whether this type of error is accepted or rejected.

Method

1. The program processes card input only, and the cards must be ordered in major sequence on Col. 80. If desired, the input can be sorted on a minor sequence to assist in locating the source documents of records containing errors.
2. The program edits data and produces records (card or tape) as follows:

Input (Col. 80=) → (In Oxnard Format)*	Output (Col. 80=)
D	M
0	0
If the how-malfunction code is alpha →	1
2	2
If no landing time →	S
And if data contains a comment →	B
3	3
5	E
6	F
7	G
8	H
9	9

See Appendix A for record layouts of data identified by the above codes.

---

*Volume I, page 9, the Reformatting Function.

3. The program edits data for the following:
   a. Valid tail numbers, work centers and AGE codes by doing table look-ups in the appropriate item master table. (The program reads and stores the tables before reading any data cards.)
   b. Improper coding in a column or field. For instance, the month field on all records should fall within the limits of 01-12. If either or both columns are blank or contain alphabetic characters, or if the value punched is less than 01 or greater than 12, the record will be rejected.
   c. Agreement between two fields. As an example, a maintenance record with job start time equal to or greater than the job stop time would be rejected.
4. Any error sensed in the record will cause the record to be printed (Fig. 6). The printout will show
   a. A column locator showing the 80 column counts (1-80).
   b. The card image showing the contents of the card in error.
   c. An error identifier--a mnemonic under each column or field in error. (Alpha-numeric = A, blank = B, compare = C, error = E.)
5. Output is under control of sense switch settings.

Operation

This operation describes steps 4, 6 and 15 on the Daily Edit Flowchart.

1. Obtain the keypunched data deck for
   Aerospace Ground Equipment
   Maintenance
   Manpower
   Operations
2. Place the following tables and table loading stopper card, in the sequence listed, between card numbers 17 and 18 of the object program (card number is punched in Cols. 72-75) shown in Fig. 5.
   a. AGE table (format M4).
   b. Tail-number table (format M2).
   c. Work-center table (format M1).
   d. Table loading stopper card (format C4).
3. Punch a gang-punch master card (format C6).

Columns	Punch	Field Description
1	"-" (3-8 punch)	Card identity
2	8	Year
3	R	Command code

4. Place the punched card behind the object program.

5. Follow the deck with the keypunched data deck.

6. Mount a scratch tape on unit 1 and unit 2.

7. Sense switches I/O, A, C, F, G--"on".

8. Load and go object program and data deck.

9. Program will
   a. Read cards.
   b. Perform edit of each card.
   c. When an error is sensed:
      (1) Print a heading identifying the 80 columns of the card.
      (2) Print the image of the card in error.
      (3) Print a line of mnemonics locating the column(s) in error (this line is printed after all edits of the card have been completed).
      (4) Reformat (to the Oxnard format) and write all error-free cards on the tape on unit 1.

10. When the reader stops, press start to process last cards.

11. Program will
    a. Write an end-of-file on the tape on unit 1. (Tape D1 when final edit.)
    b. Rewind and unload unit 1.
    c. Clear punch of all punched error cards.
    d. Print end-of-job message.
    e. Halt at IC = 10353.

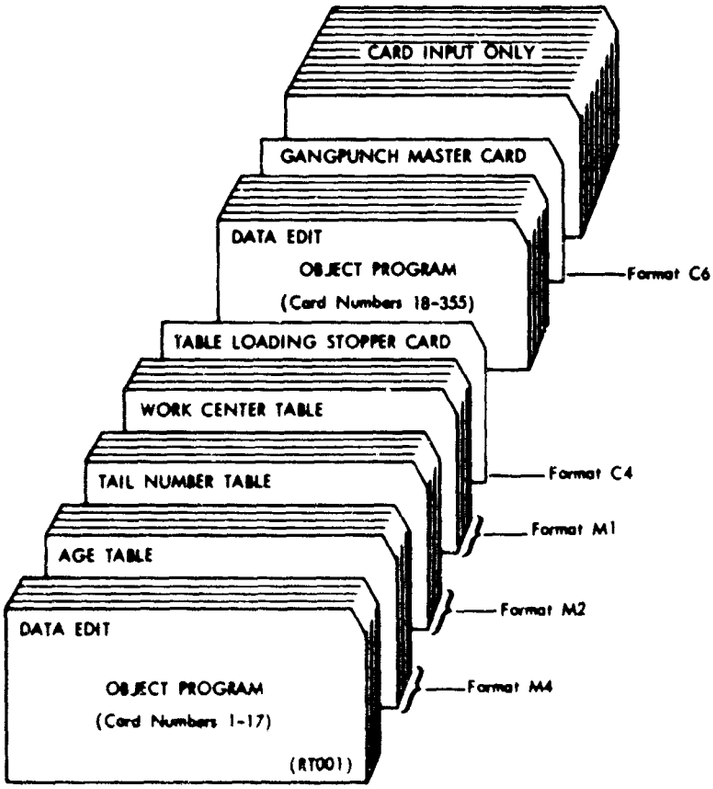


Fig. 5 -- Maintenance operations, AGE and manpower data edit program setup

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
.CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
EEEE  EEFFFFFFF       FCCCCCCCC              FEFFE                                0.1        235
                                                                                        *REJECT*

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
.BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
EFEE  EEFFFFFFE       CCCCCCCC               FFFEFE                               0.1        236
                                                                                        *REJECT*

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
.1234F*01011234566666A212001300112345F     2222222222222222222231333344455       0.1        238
                                      EFFF
                                                                                        *REJECT*

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
.1234F*01011234566666A212001300112345F1111                  33333344455           0.1        239
                                          FFFFFFFFFFFFFFE
                                                                                        *REJECT*

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
.1234F*01011234566666A212001300112345E1111222222222222222cccc2      44455        0.1        240
                                                          FEFEFE
                                                                                        *REJECT*

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
.1234F*01011234566666A212001300112345F1111222222222222222222333333   55         0.1        241
                                          EEEFEE
                                                                                        *REJECT*

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
.
FEFE  FEFFEEFEEEFEFFECCCCCCCCCFBBBBBBBBBF      BBBBB BBBB                          0.1        245
                                                                                        *REJECT*

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
.
FEFE  EEEFEEFEEFFFEEEFCCCCCCCCCEBBBBBBBBBE      BBBBB BBBB                          0.1        246
                                                                                        *REJECT*
                                ERRORS=000325  INPUT=000246  END OF JOB
```

Fig. 6 -- Error edit printout

PROGRAM RT002: DAILY TAIL NUMBER AND WORK CENTER DISPLAYS

Purpose

The printouts generated by this program are used to allow the following:

1. Error edit. They permit the visual review of inter-card relationships to detect data omissions and inconsistencies. These types of errors are not caught by the error edit program, which is concerned only with intra-card errors.
2. System monitoring. They provide a means for understanding the interweaving of the relationships among operations, maintenance, supply and scheduling.
3. Analysis initiation. They provide a starting point for analyses, which generally begin with hand computations based on display data.

Method

1. The edited operations, status and flight-line maintenance data, in Oxnard format, are processed by this program to produce both the tail-number and work-center displays. The file, which may be card or tape, is ordered as shown:

Tail-Number Display

Major	Col.	79	A	PS code
↓	Cols.	35-38	N	tail number
	Cols.	11-12	N	month
	Cols.	9-10	N	day
	Cols.	13-16	N	time (hour/minute)
	Col.	80	AN	card type
Minor	Cols.	73-78	AN	report number

Work-Center Display

Major	Cols.	62-66	AN	work center
↓	Cols.	11-12	N	month
	Cols.	9-10	N	day
	Cols.	13-16	N	time (hour/minute)
	Cols.	80	AN	card type
Minor	Cols.	73-78	AN	report number

2. The program displays all formats containing start and stop times by converting the times to quarter-hour segments and using the values as parameters for plotting in the 24-hour display. The character plotted depends on the record being

processed. If it is a sortie record (format M), an "F" will be plotted; if a maintenance record (format K), a numeric digit representing crew size (the count of men performing the job) will be plotted; if a delay record (format L), a "D" will be plotted; if a status record (format Q), an alpha code as defined in AFM 65-110 will be plotted. The pictorial displays are detailed in several fields to the right. For maintenance records the conventional AFM 66-1 data (work unit code, work center, action taken, when discovered, how malfunction and type of maintenance) plus elapsed time (computed by subtracting start time from stop time) and total man-hours (elapsed time multiplied by crew size) will be printed. For sortie records, type of sortie flown, mission number, flight crew and sortie deviation codes will be printed. For delay records, in addition to most of the items listed for a maintenance record, the delay code will be printed.

3. A summary line is printed at the bottom of each display which is a count of the maintenance crew size data pictorially displayed. In addition, an "F" is printed in any quarter-hour segment when the aircraft is flying. To the right of the summary line is a recap of the quarter-hour segments: F (flyers), M (men working) and S (white space).

4. The program allows selection and printing of data for a single day from a multi-day file by punching the desired data in an optional control card (format C7) and placing it in the program deck as shown in the program deck setup.

Operation

This operation describes steps 9-12 and 16-19 on the Daily Edit Flowchart.

1. Sort the final daily edited data tape (tape D1) as follows:

Major	Col.	79	A	squadron
	Cols.	35-38	N	tail number
	Cols.	11-12	N	month
	Cols.	9-10	N	day
	Cols.	13-16	N	clock time
	Col.	80	AN	card type
Minor	Cols.	73-78	AN	report number

2. Call the sorted output tape (tape D2).

3. Place the following tables and control card in the sequence listed, behind the object program shown in Fig. 7:
   a. Tail-number table (format M2)
   b. Work-center table (format M1)
   c. Table loading stopper card (format C4).

4. Mount tape D2 on unit 4.

5. Sense switches I/O, A, C, G--"on".

6. Load and go the object program, tables and stopper card.

7. Program will
   a. Read unit 4.
   b. Reformat and list the data in display printout format as shown in Fig. 8.
   c. Print a daily summary line for each tail number.
   d. Eject to a new page when a change in tail number is sensed, and print a summary of sorties flown, man-hours expended, and average man-hours per sortie.
   e. Print a list of tail numbers (contained in the tail-number table) which had no data printed.
   f. Rewind and unload unit 4.
   g. Print end-of-job message.
   h. Halt at IC = 4117.

Work-Center Display

8. Sort the tail number display tape (tape D2) as follows:

Major	Cols. 62-66	AN	work center
↓	Cols. 11-12	N	month
	Cols. 9-10	N	day
	Cols. 13-16	N	clock time
	Col. 80	AN	card type
Minor	Cols. 73-78	AN	report number

9. Call the sorted output tape (tape D3).

10. Mount tape D3 on unit 4.

11. Sense switches I/O, A, C, E, G--"on".

12. Load and go object program, tables and stopper card. (Same program and deck setup used to list the tail-number display.)

13. Program will
   a. Read unit 4.
   b. Reformat and list the data in display printout format as shown in Fig. 9.
   c. Print a daily summary line for each work center.
   d. Eject to a new page on a change in work center code.
   e. Rewind and unload unit 4.
   f. Print end-of-job message.
   g. Halt at IC = 4117.

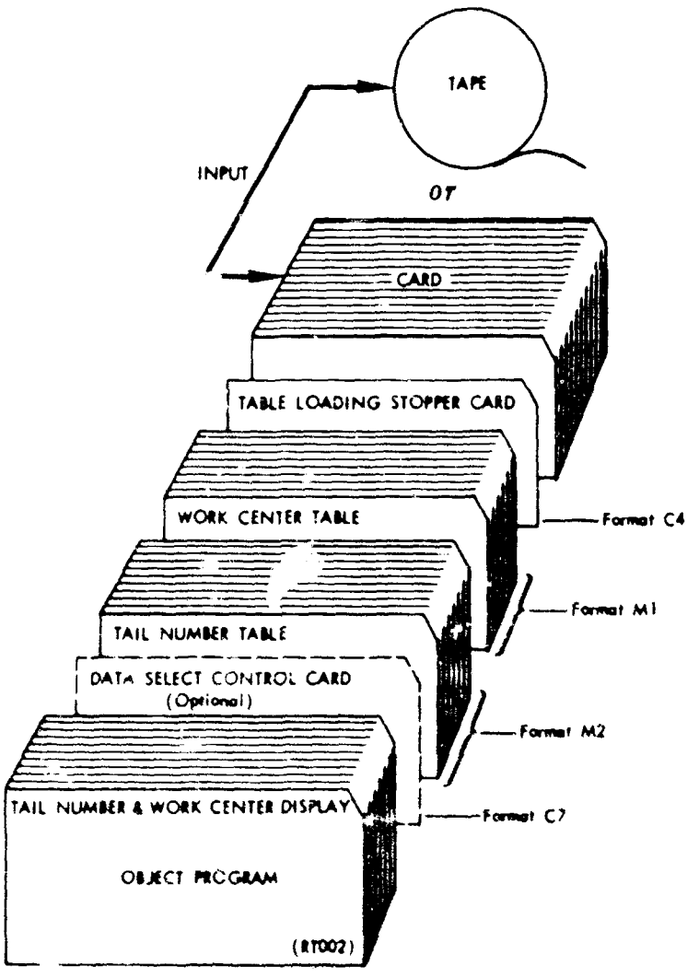
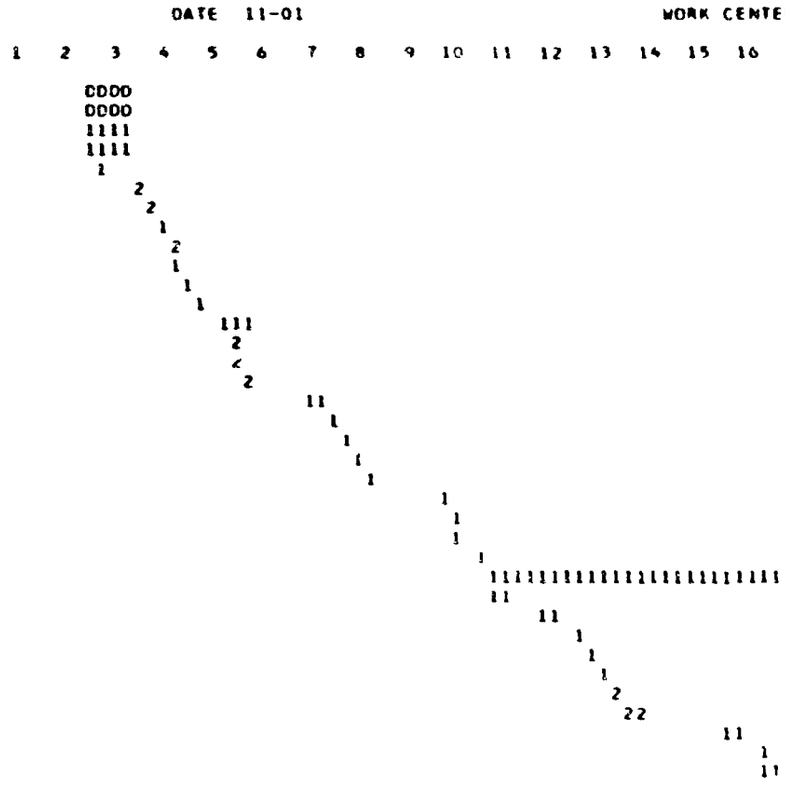


Fig. 7 -- Tail number and work center display program setup

```
                  DATE  09-01                 AIRCRAFT SERIAL NUMBER  0773  -

     1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24 WUC    WC     ET    TMH AWT W/M RPTNO

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN75140 N        24.0
UUU                                                                                                                  .7
1                                                                                                    0413C 12043     .1     .1 00S 00C 2231A
 2                                                                                                   0411D 13231     .2     .5 00S 000 2231B
  33                                                                                                 74190 14320     .5    1.5 GFB 730 2231C
    2                                                                                                01140 12043     .1     .3 00A 000 2231D
     222                                                                                             03200 12043     .7    1.5 00C 000 2231E
     2                                                                                               01310 12043     .3     .7 00A 000 2231F
              4444                                                                                   0137X 12061    1.0    4.0 00A 000 2231G
MISSION GO AT 0440 HOURS
                        22222                                                                        03100 12043    1.1    2.3 000 030 2231H
                              2                                                                      01310 12043     .2     .5 00A 000 2231J
                                22                                                                   01120 12043     .5    1.0 00A 000 2231K
                                  ****                                                                       147    1.0    NEVA01  C09/30
                                  FFFF                                                                       147    1.0
                                                                                                      INER NAV-UOK UHF/ADF-UOK SIGHT-UOK
                                                                                                       GUN POD-NU  AUT PIL-NU    WCS-UOK
                                      4                                                              01480 12043     .2    1.0 00A 000 2231A
                                      2                                                              01120 12043     .2     .5 00A 000 2231L
 RECONFGIURED FROM F-1 TO F-1 1/2 COMP 0915              32231                                       01480  0773
                                       2                                                             01310 12043     .1     .3 00A 000 2231M
                                        22                                                           74100 14320     .5    1.0 YDB 383 2231B
                                        1                                                            0413C 12043     .3     .3 00S 000 2231N
                                        1                                                            01140 12043     .2     .2 00A 000 2231P
                                         UUUUUUUUUUUUU                                                                  3.3
                                         22222                                                       03200 12043    1.1    2.3 00C 000 2231Q
                                          22222222                                                   74130 14320    2.0    4.0 RFB 029 2231C
                                               11                                                    01330 12043     .4     .4 00A 000 2231A
                                                333                                                  74130 14320     .7    2.2 CZB 029 2231C
                                                   22                                                13250 13370     .5    1.0 9ZB 020 2231C
                                                   222                                               74100 14320     .7    1.5 KFB 799 2231D
                                                      2                                              111AA 14320     .2     .5 QFB 300 2231E
                                                       7                                             74370 14320     .1     .3 HDB 759 2231F
                                                             44                                      0137X 12061     .6    2.3 00A 000 2231G
MISSION GO AT 1440 HOURS
                                                                   1                                 01310 12043     .3     .3 00A 000 2231M
LOAD CHANGED AND TAKE OFF TIME CHANGED TO 18003223?                                                  11000   HHQ            HI4EHE
                                                                         22                          01120 12043     .5    1.0 00A 000 2231J
                                                                         ****                                218    1.0    HATC01  A2C/00
                                                                           FFFFF                             218    1.3
TOT CHG 1430                       32231
                                                                                                      INER NAV-UOK UHF/ADF-UOK SIGHT-UOK
                                                                                                       GUN POD-NU  AUT PIL-NU    WCS-UOK
                                                                                   111111            03200 12043    1.5    1.5 00C 000 2231K
                                                                                   1                 0413C 12043     .3     .3 00S 000 2231L
                                                                                    4                0137X 12061     .3    1.3 00A 000 2231P
                                                                                    UUUUUUUUUUUUUUUUU                   4.3
                                                                                    2222             74100 14320     .9    1.8 YDB 255 2231A
                                                                                    1                01140 12043     .1     .1 00A 000 2231M
                                                                                     1               01300 12043     .2     .2 00A 000 2231N
                                                                                     11              76A00 14340     .5     .5 GOB 092 2231Q
                                                                                        22           74120 14320     .5    1.0 PFB C08 2231B
                                                                                         222         74120 14320     .8    1.7 AZB 008 2231B
                                                                                          DD         74120 14320     .5    ETH             2231C
                                                                                            22       74120 14320     .5    1.0 QFB T99 2231D
                                                                                               2     74130 14320     .2     .5 PFB 255 2231E
                                                                                       OCCDD74130 14320    1.2    ETR             2231F
                                                                                       2222274130 14320    1.2    2.5 CZB G29 2231E

                                                                                                              TOTAL  20.7  43.9

     1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24

12332422   4444     22222 2 22FFFF624444443655442222    44     1     22FFFFF 28543342222 222222  F--   9  N--  59   S--  28
```

Fig. 8 -- Tail number display

DATE 11-01 WORK CENTER 14120



24 WUC	TN	ET	TM/	AWT	H/P	RPTNO
71180	7710	1.0	ETR			2312F
71100	7710	1.0	ETR			2312G
71180	7710	1.0	1.0	828	799	2312D
71100	7710	1.0	1.0	828	799	2312E
04199	0838	.2	.2	005	000	2312K
71100	7710	.3	.3	008	799	2312P
71180	7710	.7	.5	008	799	2312Q
04199	0739	.2	.2	005	000	2312G
04199	0800	.1	.3	005	000	2312F
04199	7500	.1	.2	005	000	2312F
04199	7589	.2	.2	005	000	2312D
04199	0838	.2	.2	005	000	2312K
01377	0000	.6	.7	00A	000	2312B
04199	7629	.2	.5	005	000	2312F
04199	0839	.1	.2	005	000	2312[illegible]
04199	0927	.2	.5	005	000	2312[illegible]
04199	0800	.3	.3	005	000	2312Q
04199	0842	.2	.2	005	000	2312C
04199	0839	.1	.2	005	000	2312J
04199	7629	.1	.2	005	000	2312[illegible]
04199	0927	.2	.2	005	000	2312[illegible]
04199	0842	.2	.2	005	000	2312[illegible]
04199	0800	.2	.2	005	000	2312[illegible]
04199	0838	.2	.2	005	000	2312[illegible]
04199	7442	.1	.2	005	000	2312[illegible]
04199	0842	6.1	6.2	005	000	2312[illegible]
01377	0000	.4	.4	00A	000	2312[illegible]
01377	0000	.6	.6	00A	000	2312[illegible]
04199	0843	.1	.2	005	000	2312[illegible]
04199	7629	.1	.2	005	000	2312[illegible]
04199	0842	.1	.2	005	000	2312[illegible]
04199	7442	.3	.7	005	000	2312[illegible]
04199	0838	.4	.8	005	000	2312[illegible]
04199	7629	.5	.5	005	[illegible]	2312[illegible]
04199	0739	.1	.2	005	[illegible]	2312[illegible]
01377	0000	.7	.7	00A	000	2312[illegible]
04199	0843	.1	.2	005	000	2312[illegible]

Fig. 9 -- Work center display

PROGRAM RT003: COMPUTE ELAPSED TIME (CET)

Purpose

1. This program will process edited output data (tape D2 or a merged file of tape D2S from the Daily Edit Sequence) and
   a. Compute elapsed time (job time, delay time, flying time, status time, etc.).
   b. Convert Gregorian start date to Julian date.
2. The program can also be used as a general purpose record selector (of Oxnard type formats) by punching the desired code, reflected in Col. 80 of the data record, into Col. 3 of the tape input control card (format C13) and setting the appropriate switches.

Method

1. Elapsed time is calculated by first sensing for type of record. Some Oxnard formats, such as comments and sortie deviations (formats V and U), do not have stop times; therefore, the program bypasses the calculation. The start and stop times on other records are converted to minutes; the start minutes are subtracted from the stop minutes, and the result is divided by six to give an elapsed time figure in hours and tenths. The elapsed time is moved to Cols. 70-72 of the record.
2. The Gregorian date to Julian date conversion is accomplished by moving the start day to Cols. 67-69 (a zero is moved to Col. 67 to fill the field). The month is sensed and a value equal to the number of consecutive days through the last day of the preceding month is added to Cols. 67-69 to give Julian date.

   The reader will notice that 365 has been added to the Julian dates of January through May. The Rapid Roger exercise began in July 1966 and lasted until February 1967. Adding 365 to the early months of 1967 enabled sorting the data in sequence without having to resort to the inclusion of the year in the Julian date. The Julian date computation should be corrected before using on another exercise.

Operation

This operation is step 2 on the Recovery Sequence Flowchart.

1. Place control card (format C13), punched as follows, behind object program, as shown in Fig. 10:

Columns	Punch	Field Description
1-2	01	Count of input tapes
3	2	Card type to select and punch (code 2 is sortie card, format M).

2. Mount the input tape on unit 1.
3. Mount a scratch tape on unit 2.
4. Sense switches I/O, A, C, D, F--"on".
5. Load and go program and control card.
6. Program will
   a. Read tape on unit 1.
   b. Compute elapsed time; convert Gregorian date to Julian date.
   c. Punch sortie cards.
   d. Write all other records on unit 2.
7. After the input tape has been processed, program will
   a. Clear punch of all punched cards.
   b. Write an end-of-file on unit 2 (this is tape T1).
   c. Rewind and unload units 1 and 2.
   d. Print end-of-job message (the program produces no other printing).
   e. Halt at IC = 1473.
8. The sortie card deck is the input to program S/F/L (RT004).
9. Tape T1 is the input to program Recombine (RT005).

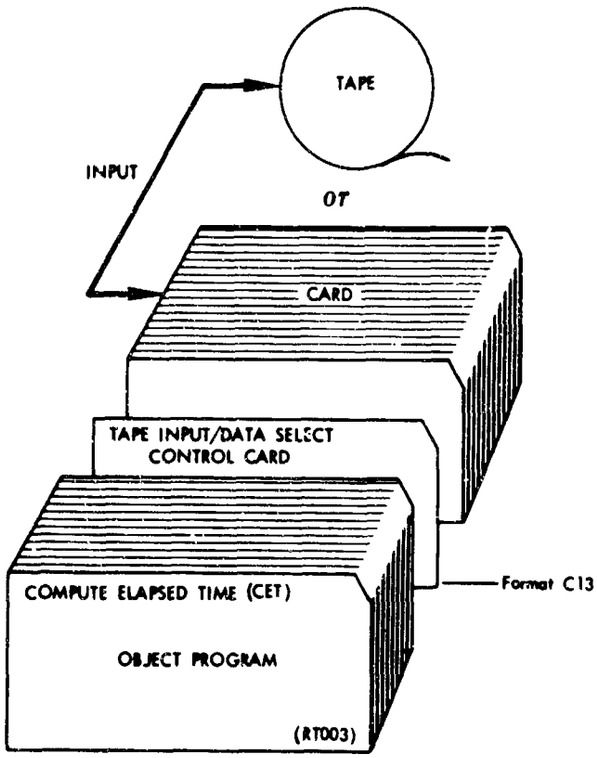


Fig. 10 -- Compute elapsed time program setup

PROGRAM RT004: SINGLE/FIRST/LAST (S/F/L) SORTIE CARDS

Purpose

This program, used only in the Recovery Sequence, will process a deck of sortie cards (format M, sorted in Tail Number Display Sequence) and

1. Make a single sortie card from the pairs of sortie cards resulting when a flight crosses midnight.
2. Determine, by tail number, the sequence of sorties flown each day.

Method

1. The deck of sortie cards processed by this program is obtained by processing the tail number display tape with the Compute Elapsed Time program (RT003). The sortie deck, as punched from the tape, will be in the sequence required by this program.
2. The program reads and loads the sortie cards in core until a change in tail number and date is sensed.
3. The set in core is then analyzed and coded as follows:

   S = Single sortie (indicating only one sortie flown by this tail number on this day).

   L = Last sortie (indicating this is the last of a minimum of two sorties flown for this tail number on this day).

   F = First (or all other sorties flown for this tail number on this day).

   In addition to the daily S/F/L code for the tail number, the set will also be numerically sequence coded (if three sorties are flown during the day, in addition to the F and L codes, the sorties will be coded 1 of 3, 2 of 3, and 3 of 3).
4. After this coding has been accomplished, and before the sortie set is punched, the touchdown time of the last sortie in the set is tested to see if it is equal to 2400. If the test is true, the takeoff time of the first sortie of the next set is tested to see if it is equal to 0001. If this test is also true, the pair of sortie cards are combined into a single sortie by taking the touchdown time of the second sortie and moving it to the touchdown time of the first sortie. The elapsed time is recomputed. The program then bypasses the second sortie card.
5. A new, sequenced sortie deck is punched by the program.

Operation

This operation is step 3 on the Recovery Sequence Flowchart.

1. Place sortie deck (format M, punched from tail-number display tape using program CET--step 2 on Recovery Sequence Flowchart) behind object program, Fig. 11.
2. Ready printer and punch.
3. Sense switches I/O, A--"on".
4. Load and go program and data deck.
5. Program will
   a. Read cards.
   b. Analyze and code data.
   c. Punch new sortie deck. (The new deck, in addition to the data contained in the input deck, will reflect the S/F/L code (Col. 63); the numeric sequence code (Cols. 73-74), cross-midnight flyers (combined in one record with flying time recomputed)).
6. When the reader stops, press start to process final cards.
7. Program will
   a. Clear punch of all punched cards.
   b. Print end-of-job message (the program produces no other printing).
   c. Halt at IC = 1062.
8. The new sortie deck is input to program Recombine (RT005).
9. The input deck can be discarded.

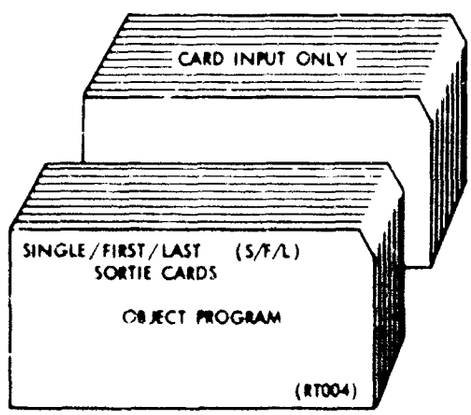


Fig. 11 -- Single/first/last (S/F/L) sortie cards program setup

PROGRAM RT005: RECOMBINE

Purpose

1. This program, used only in the Recovery Sequence, will
   a. Merge the sortie deck generated by program S/F/L with the sortie-free data tape (tape T1) generated by program Compute Elapsed Time (RT003--CET).
   b. Test for and eliminate duplicate records.
   c. Add a dummy sortie card to each tail number subset.
   d. Generate a tape (tape T2) used by the Clint program.

Method

1. The program merges the sortie deck with tape T1 by
   a. Reading a card, then reading a tape record and comparing the tail number, month, day and time. The card record is written on tape (tape T2) if the value of the card record is less than the value of the tape record from tape T1. High or equal values allow the record from tape T1 to be written on tape T2.
   b. As a record is read from tape T1, it is compared to the preceding record and tested for equality on all eighty record positions. If found to be equal, the record is printed and eliminated from the file.
   c. Before a record is written on tape T2, a test is made to see if the record about to be written has the same tail number as the previous record written. If tail numbers are unequal a dummy record, coded as a sortie, is written as the last record of the previous tail number subset.

Operation

This operation is step 7 on the Recovery Sequence Flowchart.

1. Place control card (format C9), punched with count of input tapes (count=01), behind object program, Fig. 12.
2. Place the sorted final sortie deck (processed on steps 3, 4, 5 and 6 on the Recovery Sequence Flowchart) behind the control card.
3. Mount the input tape on unit 1 (tape T1).
4. Mount a scratch tape on unit 2.
5. Sense switches I/O, A--"on".
6. Load and go program, control card and sortie deck.
7. Program will
   a. Read unit 1.
   b. Read cards.

c. Merge the tape records from unit 1 with the card records, writing a new file on unit 2 (tape T2). The sequence of the file is

Major	Col. 79	squadron
↓	Cols. 35-38	tail number
	Cols. 11-12	month
	Cols. 9-10	day
Minor	Cols. 13-16	time

d. Test a record before it is written on the tape on unit 2 for 80 column duplication. If it is identical to the previous record, it is eliminated from the file. All duplicate (eliminated) records are printed, as in Fig. 13.

e. After testing for a duplicate record, test for a change in tail number. Such a change will cause a "dummy" sortie record to be written as the last record of the previous tail number subset. (The dummy record is used when a switch option is selected in the Clint program.)

8. When the reader stops, press start to process last cards.

9. Program will
   a. Write an end-of-file on tape on unit 2. (This is tape T2.)
   b. Rewind and unload tapes on units 1 and 2.
   c. Print end-of-job message.
   d. Halt at IC = 1812.

10. File sortie deck for use in Manpower Utilization Sequence.

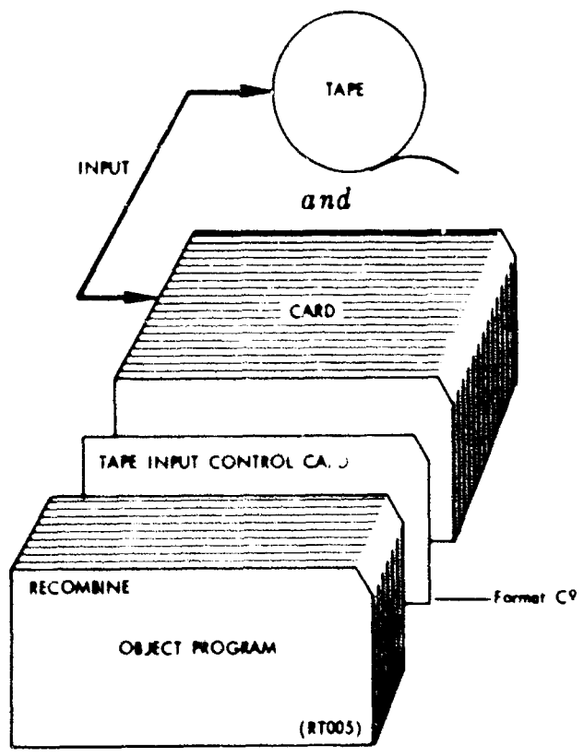


Fig. 12 -- Recombine program setup

```
DUPLICATES ELIMINATED WHEN GENERATING TAPE T2

131201301                                                  000080              V
132321001                                                  000080              V
132301401                                                  000010              V
134201001                                                  000015              V
134201201                                                  000010              V
134201501                                                  000020              V
134201501                                                  000020              V
134201401                                                  000040              V
134201401                                                  000030              V
134201501                                                  000050              V
134301201                                                  000080              V
134201601                                                  000020              V
134201801                                                  000030              V
134201701                                                  000025              V
134301101                                                  000080              V
134301101                                                  000080              V
134301101                                                  000080              V
133600901                                                  000010              V
133401401                                                  000040              V
133401701                                                  000020              V
143201301                                                  000040              V
121631501                                                  000020              V
143501101                                                  000120              V
143501801                                                  000010              V
132301201                                                  000005              V
131511101                                                  000080              V
152401501                                                  000040              V
133701601                                                  000050              V
133701101                                                  000020              V
133701101                                                  000010              V
133701601                                                  000060              V
133701001                                                  000010              V
133701201                                                  000010              V
133701201                                                  000010              V
133601801                                                  000010              V
133701501                                                  000020              V
133701801                                                  000020              V
133701801                                                  000060              V
133701801                                                  000020              V
133701801                                                  000050              V
133701801                                                  000040              V
133701801                                                  000040              V
134101201                                                  000060              V
134101201                                                  000020              V
133201801                                                  000010              V
133251001                                                  000770              V
134301601                                                  000160              V
134301701                                                  000050              V
F96UNOHH09012135QTAKE OFF TIME CHA0000NGED TO11000 2310                  32231 1H
F96UNOMN09012310DNO ACFT AVAIL FOR0000 LOADIN11000G                      32231 1H
238JLEHH10011900QT/O TIME CHANGED 0000TO 193011000                       32231 1H
R63EOEHH10012030QT/O TIME CHANGED 0000TO 210011000                       32231 1H
A72EHEHH10012035QT/O TIME CHANGED 0000TO 211011000                       32231 1H
R63EOEMN10012100DNO ACFT WITH ETIC0000S COMPA11000TABLE TO LOAD          32231 1H
 OZARKHH10012305QT/O TIME CHANGED 0000TO 234011000                       32231 1H
        09011740                  0823FP                                 32231 1G
        12011830                  0823FP                                 32312 1G
        12011830                  0823FP                                 32312 1G
        1001150010012136 U        0842                          01006632231 13
18011541180115431801155 7 1011618 0927  HYDRA12043ULIC MULE M   09018002J3    1F
   22   1801092518010940          7442                          38300332312 1M
        1801000118012400 N        7524       99999G             01824032312 13
        0901000109012400 N        7556       75140N             00924032231 13
        1001000110012400 N        7556       75140N             01024032231 13
        1201000112012400 N        7556       75140N             01224032312 13
        12011830                  7556FP                                32312 1G
   22   1701050517010520          7553                          38200332312 1M
        09011315                  7629FP                                32231 1G
   22   1701134017011355          7656                          38200332312 1M
        1501000115011642 N        7448       74190N             01516732312 23
        1301141813012400 N        7522       14550G             01309732312 23
412JASHH09011805QLOAD CHANGED AND 7589TAKE OF11000F TIME CHANGED TO 184532231 2H
        12010425                  7589FP                                32312 2G
        1301123013012400 N        7641       4114JG             01311532312 23
        0901000109012400 N        7680       111GAG             00924032231 23
```

Fig. 13 -- Duplicate records eliminated from file

PROGRAM RT006: FREQUENCY COUNTER (FREQ)

Purpose

This program is used to search a maximum of three fields of unknown and unsorted data (card or unblocked tape input) to determine the codes and the frequency of their occurrence in the file. The results are printed and/or punched. The punched output, by adding an additional value, may be used as input to the Chi-square program and/or, by reformatting, may be used as tables required by the Clint program.

Method

The program reads a control card (format C14) that sets up the location(s) of the field(s) to be searched. The table area for holding the codes is blank when the program starts. The code of the first record processed becomes the first member of the table. As each additional record is read, the program searches the table and when it finds the matching code, increases the count of the occurrences for that code. If the code is not found, it becomes the next member of the table. The program has the facility of counting a selected record type (identified in Col. 80) of a mixed format file of data by punching the desired code in Col. 80 of the control card and setting the appropriate sense switch.

If card input, samples may be stacked by separating each sample with a card having an 11-4-8 punch in Col. 1. Summaries are given for each sample.

Operation

This describes steps 8-13 on the Recovery Sequence Flowchart.

1. Punch the following control card (format C14):

Columns	Punch	Field Description
1-3	046	Location of high-order position
4-6	047	Location of low-order position
19-79	(see below)	Printout title
80	0	Record type to count

19-79 TWO-DIGIT SYSTEM COUNT--TAPE T2

2. Place the control card behind the object program, Fig. 14
3. Mount the input tape (tape T2) on unit 1.
4. Sense switches I/O, A, B, C, E--"on".
5. Load and go object program and control card.
6. Program will
   A. Read tape 1.
   b. Build a table of two-digit systems, with frequency counts, from the maintenance records (format K).
7. When unit 1 rewinds and unloads, turn switch G "on". Press start.
8. Program will
   a. Print and punch (in forma Z) the table of two-digit systems the program develops, Fig. 15.
   b. Print an end-of-job message.
   c. Halt at IC = 1842.

Note: The following steps describe processing of the punched output deck for use in the recovery sequence on the flowchart. Disposition of the punched output deck will depend on the user's need for having made the frequency count of a data element in a file.

9. Reproduce the punched output as follows:

Columns	into	Columns
26-27		1-2
Gangpunch "$" (11-3-8 punch)		80

10. Sort the reproduced deck on Col. 1.
11. Hold Col. 1 = 0 for step 14.
12. Group all others in a single deck.
13. Gangpunch a "1" in Col. 3 of the deck from step 12.
14. Combine the deck from step 11 with the deck from step 13 and sort:

    Cols. 1-2 N.

15. The sorted deck is the two-digit system table (format M3) used in the Clint program.

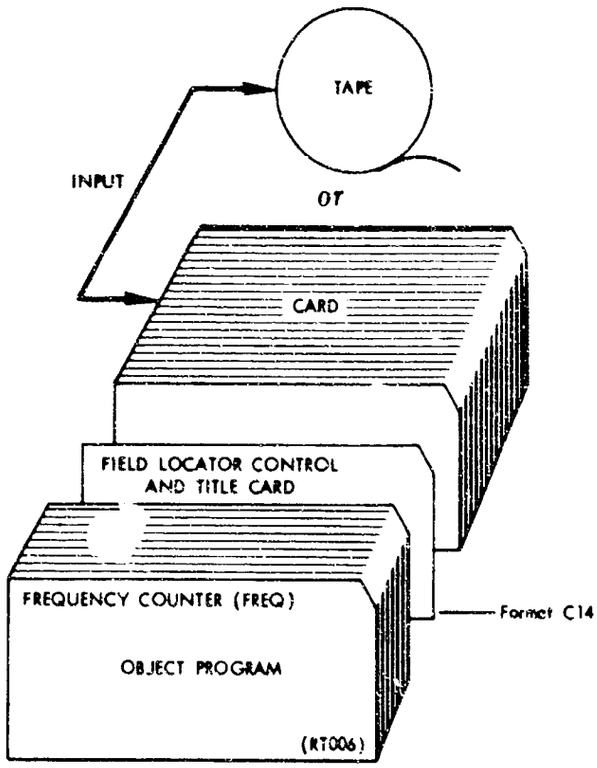


Fig. 14 -- Frequency counter (FREQ) program setup

TWO-DIGIT SYSTEM COUNT -- TAPE T2 DECK 1

FIELD	46- 47	
01	3484	.321
03	1211	.111
02	64	.006
04	1394	.128
11	866	.080
74	777	.072
13	504	.046
71	448	.041
91	24	.002
51	99	.009
12	202	.019
42	100	.009
44	76	.007
14	291	.027
06	52	.005
45	252	.023
07	48	.004
73	66	.006
52	141	.013
75	174	.016
09	41	.004
41	139	.013
46	139	.013
23	120	.011
76	33	.003
49	19	.002
77	3	.000
47	47	.004
93	20	.002
05	1	.000
72	21	.002
61	2	.000
96	1	.000
08	1	.000
69	1	.000

RECORDS - 10861

Fig. 15 -- Data file two-digit system frequency counter

PROGRAM RT007: CLINT (GENERATE 7 AND 8 CARDS) AND RT008: CLINT (GENERATE 9 CARDS)

Purpose

The pair of Clint programs are used to compute aircraft (7-card), system (8-card) and work center (9-card) summaries. The records, summarized by sortie, are the inputs used by most of the analysis programs. The data summarized on each of the records are shown in formats R1, R2 and R3 and are fully described in Vol. II.

Method

1. Sortie records (format M), on-aircraft maintenance records (format K) and status records (format Q) ordered in tail number display sequence (tape T2) are summarized by Clint to produce the 7, 8 and 9 cards.
2. Processing is initialized when the program senses the first sortie for an aircraft. The tail number, touchdown time and flying time are stored to control output of the sortie summary. The program then sweeps through the data summarizing the maintenance and status data, and when the next sortie record is encountered it outputs the summarized data of the previous sortie and reinitializes for summarizing the next sortie.
3. The program uses a table of work centers (format M1) and a table of two-digit systems (format M3) to control processing of the maintenance data. The computer processes only those data identified in both tables. Use of the tables allows a variation of systems and/or work centers to be processed for either recoveries or turnarounds.
4. The program always produces the aircraft record; however, to minimize data volume, the system and work center records are generated only when a maintenance action occurs.

Operation A

Operation A is RT007: Clint (generate 7 and 8 card) step 14 on the Recovery Sequence Flowchart.

1. Punch the lag/delay constant control card (format C1) as follows:

Columns	Punch	Field Description
1-6	99^999	Lag constant
7-12	999999	Delay constant
13-20	SAMPLE 1	Output file identification
80	"X" (11 Zone)	Control card identification

2. Place the following tables and control card, in the sequence listed, behind the lag/delay constant control card, Fig. 16:

   Two-digit system table (format M3)
   Work center table (format M1)
   Table loading stopper control card (format C4)

3. Place the combined deck between card numbers 0025 and 0026 of the object program (card numbers are punched in Cols. 72-75 in the program).

4. Place a tape input control card (format C9), punched with count of input tapes (count = 01), behind the last card of the object program.

5. Mount the input tape (tape T2) on unit 1.

6. Mount a scratch tape on unit 2.

7. Mount a scratch tape on unit 3.

8. Sense switches I/O, A, C, F--"on".

9. Program will
   a. Read unit 1.
   b. Write unit 2 (8 card--two-digit systems summary records--format R2).
   c. Write unit 3 (7 card--aircraft summary records--format R1).

10. After the input tape has been processed the program will
    a. Write an end-of-file on the tapes on units 2 and 3.
    b. Rewind and unload units 1, 2 and 3.
    c. Print an end-of-job message.
    d. Halt at IC = 3128.

Operation B

Operation B is RT008: Clint (generate 9 card) step 15 on the Recovery Sequence Flowchart.

1. Remove the tables and control cards from program used in Operation A (steps 1-3) and place them between card numbers 0021 and 0022 of the Clint 9-card (RT008) object program, Fig. 17.

2. Place the tape input control card behind the last card of the object program. (See step 4, Operation A.)

3. Follow steps 5-10 listed in Operation A with these changes:
   a. Scratch tape is not required on unit 3.
   b. The tape written on unit 2 contains the 9-card work center summary records (format R3).
   c. Program will halt at IC = 2918.

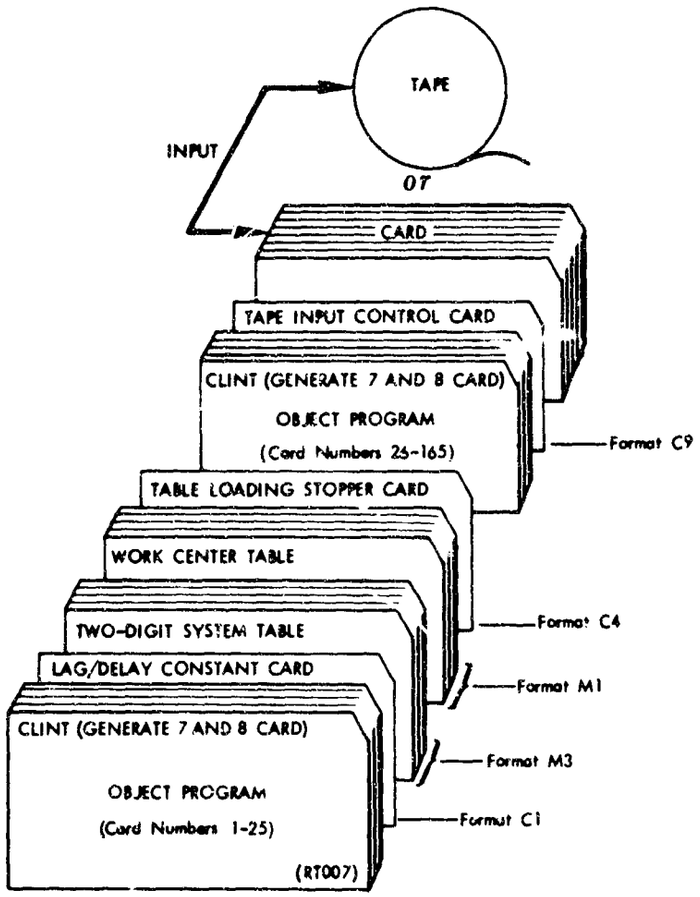


Fig. 16 -- Clint (generate 7 and 8 card) program setup

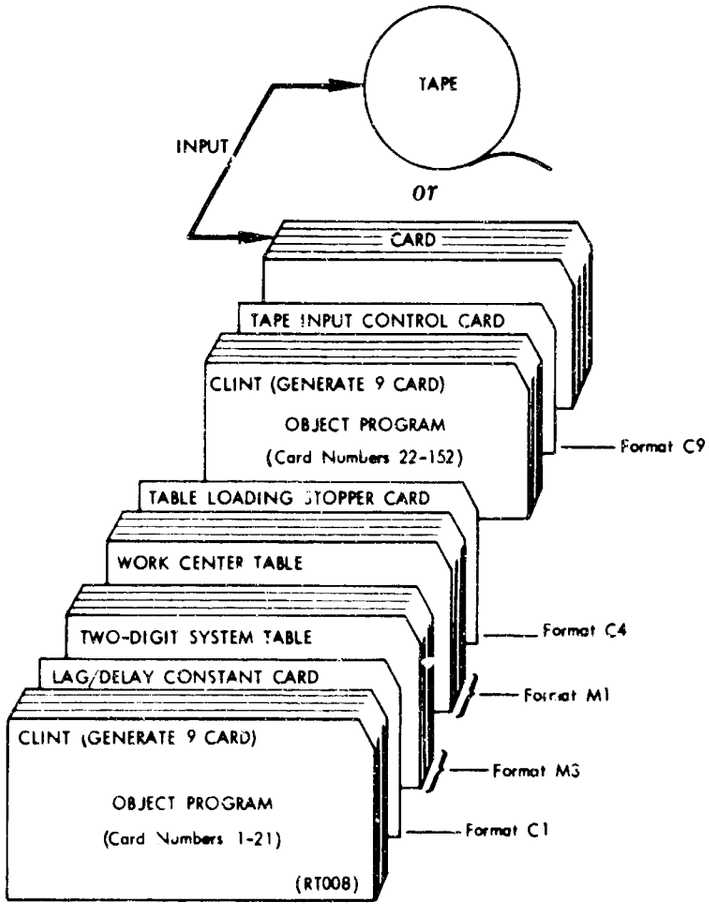


Fig. 17 -- Clint (generate 9 card) program setup

PROGRAM RT009: RECOVERY HISTOGRAM (RECSUM)

Purpose

This is a special purpose program that processes only Clint output. It generates a one-page general summary with detailed backup pages showing a pictorial and numerical summary of aircraft recovery and turnaround, as well as similar summaries of work center and work unit code data.

Method

1. The program requires:
   a. A general title card (format C10) to define the data sample.
   b. Two subtitle cards (format C11) to define the mnemonic codes appearing in both sides of the histogram.
   c. A field locator card (format C3). This control card will contain the locations of the major and minor control fields--the locations of the characters to be printed in the left and right histogram; the location of the data field the program is to treat in detail; the print position for printing of asterisks to identify the item being detailed. Data must be sorted by major and minor.
2. The program plots the mnemonics in the left and right histogram by converting the value of the item being detailed from hours and tenths to quarter-hour segments. The result of the computation is used as an index for locating the column in the matrices where the mnemonic will be plotted. The rows in the columns are searched until a blank cell is found for receiving the mnemonic. If all cells in a column are full, the mnemonic does not get plotted; however, a count is made of all items that exceed the bounds of the matrices.
3. While the program is computing and plotting the mnemonics, it is also summarizing other data from the records (such as man-hours, flying time and gross recovery). The summaries are used for the statistical printout below the histogram and, for selected minors, writing a summary tape.
4. When the program senses a change in minor control, the minor summary page is printed and all minor working cells are reset to receive the data from the next minor control group. The same procedure is followed when a change in major control is sensed.

Operation

This operation describes steps 1 and 2 on the Analysis Sequence Flowchart.

1. Sort the 7-card summary tape (generated on step 14 of the Recovery Sequence Flowchart) in the following sequence.

   Major Col. 2 record type
   Minor Col. 21 S/F/L sequence code

   The sorted output tape is tape T3.

2. Punch a general title card (format C10):

   Column
   1 ——————→ 80
   SAMPLE AIRCRAFT TURNAROUND TIME DISTRIBUTION--S/F/L

3. Punch two subtitle cards to define the mnemonics to be printed in the left and right histogram (format C11):

   Left histogram:

   Column
   15 ——————→ 80
   SINGLE, LAST AND ALL OTHER SORTIES

   Right histogram:

   Column
   15 ——————→ 80
   SORTIE TYPE

4. Punch a field locator control card (format C3):

Columns	Punch	
1-3	402	Major control--high-order position
4-6	402	Major control--low-order position
7-9	421	Minor control--high-order position
10-12	421	Minor control--low-order position
13-15	421	Location of left histogram character
16-18	416	Location of right histogram character
19-21	442	Location of data variable
22-24	235	Asterisk print location
25-26	01	Count of input tapes
80	$(11-3-8)	Card identity

5. Place the control cards, in the sequence as listed above, behind the object program, Fig. 18.

6. Mount the input tape (tape T3) on unit 1.

7. Sense switches I/O, A--"on".

8. Load and go object program and control card.

9. Program will
   a. Read tape.
   b. Print a one-page histogram for each change sensed in the minor control field (in this instance, for each S/F/L code).
   c. Print a one-page histogram for each change sensed in the major control field (in this instance, for each record type), Fig. 19.
   d. Rewind and unload the tape on unit 1 after all data have been processed.
   e. Print an end-of-job message.
   f. Halt at IC = 4233.

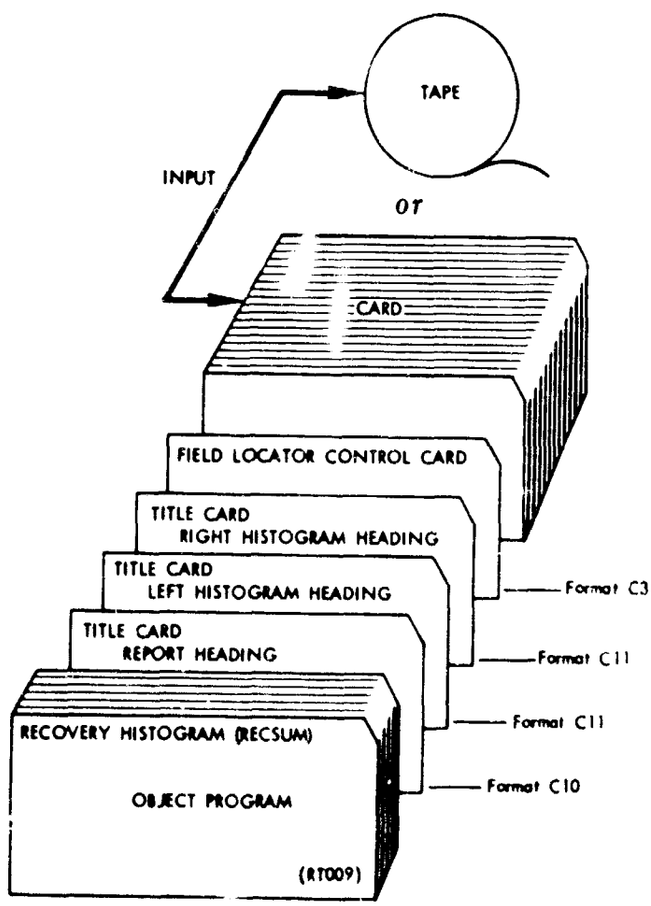


Fig. 18 -- Recovery histogram (RECSUM) program setup

```
MA OR--    7  C  S  2- 2          SAMPLE AIRCRAFT TUR.AROUND TIME DISTRIBUTION - S/F/L

                    SINGLE, LAST AND ALL O  R SORTIES                          SORTIE TYPE
 40                                                                  40
 39                                                                  39
 38                                                                  38
 37                                                                  37
 36                                                                  36
 35                                                                  35
 34                                                                  34
 33                                                                  33
 32                                                                  32
 31                                                                  31
 30                                                                  30
 29                L                                                 29                N
 28                L                                                 28                D
 27                L                                                 27                N
 26                F S                                               26                N D
 25                F S                                               25                D N
 24            L S FLS                                               24            N N NNN
 23            L S FLS                                               23            N N DND
 22            L S FLL                                               22            N D NNN
 21            F L FLL                                               21            D N DNN
 20            F L FLL L                                             20            D N NNN N
 19            F LLFLL L                                             19            N NNDNN N
 18            F LLFL  L S                                           18            D NNDNN N N
 17            F LLFF SL S                                           17            N NNNDNNN D
 16            F LLFFFSF S                                           16            D NNNDDDD N
 15            FLLFFFFLF L                                           15            NNNDNDDDD N
 14            FFFFFFFLF L                                           14            NDNNDDNDD D
 13            FFFFFFFLF L                                           13            DDDDNDDND D
 12            FFFFFFFLF L                                           12            NNNDDNDND D
 11           SFFFFFFFLF L SL                                        11           NDDNDNDNNN N DN
 10           LFFFFFFFFF L LLSS                                      10           NDDDNDDNDN D DDDD
  9           LFFFFFFFFFLF LLLL                                       9           NDNDDNDDDDND NNNN
  8           LFFFFFFFFFLF LLLL                                       8           NDNNDDDNDDDN NNNN
  7           FFFFFFFFFFLF LLLLLS  S                                  7           NNDDNDDDDDND NDNNDD  N
  6          SFFFFFFFFFFFF LLLLLFS S S              S                 6          NNNDDNDDDDDND NNDNNDD D N              D
  5          SFFFFFFFFFFFFSLFFFLFF L LSS            S                 5          DNNDDDDDDDNDDNNDDNNDD D NDD            D
  4          LFFFFFFFFFFFFLFFFFLFFLL LSS       S    L                 4          DDDDNDDDDDDDNNNDDDNNDNN NNN        D    N
  3          LFFFFFFFFFFFFFFFFFFFFFF LLL   S L SL LSLS               3          NDNDDDDNDNDDDNDDNDNNDNN NND   D D DD NDDD
  2        L FFFFFFFFFFFFFFFFFFFFFF FLFF LS LLLFLLSLS               2        N DNDNDNDDDDDDNDDNNNDDDNN DDNN DD NNDNDDDDN
  1       FFLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFLSFLFLFFLLFL F           1       NDNNNDDNDNCNDDNDDDNDDNDDDNDDCNDNNDDNDDDNNNDDD N

HOURS   *  1  2  3  4  5  6  7  8  9 10 11 12     HOURS   *  1  2  3  4  5  6  7  8  9 10 11 12
P--        7 26 46 55 64 69 73 75 76 79 81

   AVG--    8.01    SIGMA--      10.62    N--  464    STDERR--        .49    VARIANCE       112.88    TOTAL--    3716.8
 TOTAL SORTIES  480     16 SORTIES REQUIRED NO FIX TIME       BREAK-RATE--  97/100--- .967
 TOTAL MANHOURS--   11508.6  SATURATION INDEX--   3.1   AVG T/A ALL SORTIES---    7.74

 84 ITEMS GREATER THAN 12 HOURS
    OUT OF ROUNDS DATA ARE COMPUTED BUT NOT PLOTTED
```

FILE TOTALS

	LAG	DELAY	NET	GROSS	UNITS	MANHOURS	FLY-HRS	WRITE-UPS	BREAKS	NORS	NORM
TOTALS--	159.2	2193.4	3716.8	6069.4	8879	11508.6	661.0	1126	334	6247.3	2519.5
			****								
AVG--	.34	4.73	8.01	13.08	19.14	24.80	1.38	2.43	.72	13.46	5.43

Fig. 19 -- Aircraft turnaround time distribution

PROGRAM RT010: HOURLY FREQUENCY ACCUM/SELECT (HFA)

Purpose

This general purpose program is used to produce a summary card containing the maximum number of times an event happens each hour across a 24-hour period. Examples are the count of sortie touchdowns each hour, the number of men available each hour, and the maximum number of men working each hour.

Method

1. The program requires a control card (format C12) punched with the following: the code of the type of record being processed; the location of the controlling data field (such as work center or tail number); and, if there is a value to be summed, the location of the value (crew size is an example). The generated output may be coded in Col. 80 by punching the desired code in Col. 79 of the control card.

2. After reading and storing the control card, the program reads and processes the selected records by converting the start and stop times to minutes. The converted times are used as parameters for adding a value (from the data if the location is punched in the control card. A "1" is added if the field in the control card is blank) into a matrix representing the 1440-minute day. There are 1440, 4-position counters for accumulating the counts. The value is added to the minutes, starting and ending with the parameters of the start and stop times. As an example:

Start Time	Stop Time
1000	1200

will be converted to minutes

600	720

The value will be added in counters 600 through 720.

3. When a change in control is sensed, the program separates the matrix into 24 60-minute segments. Each minute in each segment is tested to find the largest value in that segment for moving to the output record. The generated output record then contains the largest value for each of the 24 hours in the control group. The program resets all of the counters to zero and continues to process the next group.

Operation

This operation describes steps 1 through 5 on the Manpower Utilization Sequence Flowchart. Generate sortie touchdown, manpower available and manpower utilized 24-hour summary file for manpower utilization report. (Note: This procedure will assume a number of daily work center display tapes have been merged or sorted together in work center display sequence to generate one output file known as tape W1.)

1. Punch control card (format C13):

Columns	Punch	Field Description
1-2	01	Count of input tapes
3	E	Card type to select and punch (Code E is the manpower available (format R))

2. Place the control card behind the Compute Elapsed Time object program, RT003.
3. Mount tape W1 on unit 1.
4. Sense switches I/O, A, D--"on".
5. Load and go the object program and control card.
6. Program will
   a. Read unit 1.
   b. Punch the manpower available file.
   c. Rewind and unload unit 1.
   d. Clear the punch of all punched cards.
   e. Print end-of-job message.
   f. Halt at IC = 1473.
7. Hold the punched data deck for step 24.
8. Punch control card (format C12):

Columns	Punch	Field Description
1-3	062	Work center field--high-order position
4-6	066	Work center field--low-order position
7-9	026	Crew size field--high-order position
10-12	026	Crew size field--low-order position
79	N	Output card identity code
80	0	Input card type to accumulate

9. Place the control card behind the Hourly Frequency Accum/Select object program, Fig. 20.
10. Mount tape W1 on unit 1.
11. Switches I/O, A, B--"on".
12. Load and go the object deck and control card.
13. Program will
    a. Read unit 1.
    b. Summarize and punch the Manpower Utilized file (a daily

summary card is punched for each work center with Cols. 1-54 in the same format as the manpower available (format R). The manpower utilization record will also contain man-hours expended punched in Cols. 59-64 and will be identified with an "N" in Col. 80).

c. Spread and print the hourly summary data (Fig. 21).
d. Rewind and unload unit 1.
e. Clear the punch of all punched cards.
f. Print end-of-job message.
g. Halt at IC = 1803.

14. Hold the punched data deck for step 24.

15. Obtain the sortie flown data deck (from step 7 on the Recovery Sequence Flowchart) and sort:

Major	Cols. 11-12	N	month
Minor	Cols. 9-10	N	day

17. Punch control card (format C12):

Columns		Field Description
1-3	Leave Blank	Item control (will generate a blank
4-6	Leave Blank	field, Cols. 1-5 of output).
7-9	Leave Blank	Field to accumulate (no entry in Cols.
10-12	Leave Blank	7-12 causes a "1" to be accumulated).
79	A	Output card identity code.
80	2	Input card type to accumulate.

18. Place the control card in front of the sortie deck.

19. Place the control card and sortie deck behind the Hourly Frequency Accum/Select object program.

20. Sense switches I/O, A "on".

21. Load and go the object program, control card and data deck.

22. Program will
    a. Read cards.
    b. Summarize and punch the Sortie Touchdown file. (A summary card is punched for each day with Cols. 6-54 in the same format as format R. Columns 1-5 will be blank. Flying time for all sorties for the day will be punched in Cols. 59-64. The summary card will be identified with an "A" in Col. 80.)
    c. Spread and print the hourly summary data (Fig. 22).
    d. Clear the punch of all punched cards.
    e. Print end-of-job message.
    f. Halt at IC = 1803.

23. Maintain the sequence of the punched data deck and hold for step 25.

24. Combine the Manpower Available file (Col. 80=E, from step 7) and the Manpower Utilized file (Col. 80=N, from step 14) and sort:

Major	Cols. 1-5	AN	work center
↓	80	A	card identity
	8-9	N	month
Minor	6-7	N	day

25. Place the Sortie Touchdown file (Col. 80=A, from step 23) in front of the sorted Manpower Available and Utilized file (from step 24).

26. The combined deck is the input to the Manpower Utilization program (RT011).

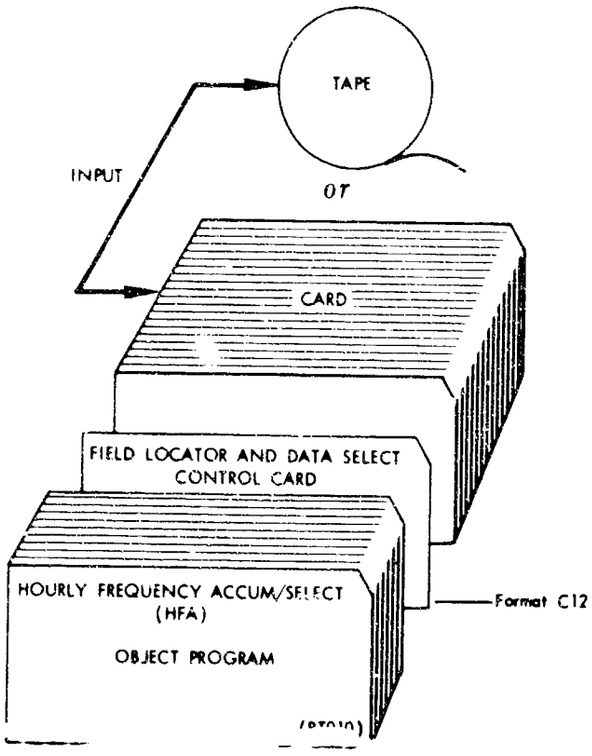


Fig. 20 -- Hourly frequence accum/select (HFA) program setup

MANPOWER UTILIZATION HOURLY SUMMARY

DATE	ORGN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	HOURS
1701	13320	5	5	5	5	9	6	5	1		3	3	3	2	2			4	4	2	2			3		49.8
1801	13320					2	2				1										2	2		2	2	8.1
0901	13330	3	5	5	4	6	6	5	6	1		3	3	3	5	3	3	6	6	6	5	7	5	5	3	89.1
1001	13330	4	5	5	3	2	2	3	5	5	3	4	4	4	1	3	4	4	4	5	6	7	3	2		70.0
1101	13330	6	3	4	4	4	1	7	3	2	2	1	1		2	3	1	2	3	1	3		1	2	2	42.0
1201	13330		2	4	2	2		2	2	4	3	5	5	2	2	2		4	2	4	3	6	6	4	4	50.3
1301	13330	2	2	1	2						2	2	2	1	1	2	2	3	2	2	2	5	6	6		28.1
1401	13330	5	2	2	2			2	2				1	1	1	1	1	5	3	3	5	2	3	6	5	34.5
1501	13330	3	5		2	5		1							2	2	4	4	4	2	3	3	7	5	3	42.2
1601	13330	5	4	4	4	2	2	3	4				4			2	2	4	3	4	4	5	5	3	2	47.7
1701	13330			2	1	1	1	2	1	1	2	3	2	2	4	5	3	4	4	9	6	6	4	4	2	53.5
1801	13330	6		2	2	5	6	5				3	2		1	1	1	5	3	2	3	3	6	3	3	42.7
0901	13340	3	1	1	1	1	2	2		3	1	1	1					4	6	5	6	4	4			31.0
1001	13340			2	1	2	1		1	1	1	3	3	2	2	4	5	5	5	5	6	6	6	6	2	51.9
1101	13340	7	4	3	2	4	5	5	5	3	6	6	7	8	5	2	4	4	4	6	6	5	7	7		88.5
1201	13340	1	1	1	1	1	2	5	4	6	6	7	7	5	2	7	10	5	5	5	5	9	5	7	7	92.9
1301	13340	2		2		1	1	4	6	6	6	6	4	3	5	5	4	6	1	5	4	6	6	6		68.9
1401	13340	4	1	4	4	2	2	3	3	4	4	4	4	5	5	7	3	2	4	4	4	9	5	3	3	76.1
1501	13340	2	4	4	2	3		2		1	1				3	3	3	2	4	5	2	7	8	7	5	53.3
1601	13340	4	5	5	5	6	6	6	5	8	9	9	10	10	6	6	2	7	8	10	12	11	9	10	8	152.8
1701	13340	5	6	7	5	4	6	7	7	9	8	8	5	4	7	3		8	6	5	6	6	8	6	3	113.5
1801	13340	7	5	5	6	4	6	5	6	11	6	4	4	5	6	6	5	7	8	6	5	8	8	3	2	113.3
0901	13360	2	7	4	4	1	2	2				2	1	1	2	1	1	2	2		2	2	2		3	24.3
1001	13360	2	4			3	3		4	2	1	3	2	1		2					3	2				19.4
1101	13360		4	2	2		1	1	1	2			3	3	1	2			2	4	1		1	2		17.0
1201	13360	2	3									2	2		2	2	1		1	3	2		2			12.2
1301	13360			2	2	4	2				1	2	2		1			2	4	2	2	2	1	2	2	20.7
1401	13360	4	5	2	3	4	4	3	3				1	1	1	1	3	3	2		2			3	5	36.1
1501	13360	4	4	4		4	5	5	1	1		1	1							2						22.1

Fig. 21 -- Manpower utilization hourly summary

SORTIE TOUCHDOWN HOURLY SUMMARY

DATE	ORGN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	[illegible]
0901					2	3	1		4	1	4	2	1		1	1		4	3		3	3		6		54.2
1001		2			2	4	2			2	5	3			2	4	7				2	2	4		2	62.7
1101		4	2		2	6			8		3			5			9		1	2	2		4	2	4	[illegible]
1201			4			7	1		4	2	2	4		2		2	4	4	1	2	4			3	4	68.8
1301			1	4	1		2		6	1		3	2	3		2	4	5		4	6	1	1	2		66.1
1401		1	3			2	6		4	3	4				3	2	8	2		1	1	2	6		2	71.8
1501			4		4	4			4	2	4	[illegible]	2	2		2	9		1	3		4		5	4	83.[illegible]
1601					4	4	2			5	7			2		6	3				4		4	4		64.2
1701		2		3	2	4	3		4	2	5		2	3	3	2	6		1	1	4	2	2	2	2	74.2
1801		2	2	4	2		4		4	2	4			1	2	2	7		1		4	2	4			63.4

Fig. 22 -- Sortie touchdown hourly summary

PROGRAM RT011: MANPOWER UTILIZATION

Purpose

This program is used to generate a detail printout, by work center for selected periods, showing on separate pages the counts, in a 24-hour spread, of the manpower available and the manpower utilized for each day in the period. A third page is generated showing summaries of the first two. Inputs to this program are generated by the Hourly/Frequency/Accum/Select Program (RT010).

Method

Three sets of records (manpower utilization, Col. 80 = N; manpower available, Col. 80 = E; and sortie touchdown, Col. 80 = A) are combined and sorted by date (minor), card type and work center (major). The records are read and detail listed spreading the hourly summaries across the page. Hourly values are summed to produce an average for each work center processed in the sample. The sums are divided by the count of input records to develop the average. The averages are printed at the end of each type of record and are also printed on a summary page for each work center. The summary page contains the hourly utilization rates (number of men utilized divided by number of men available), total number of sorties, total man-hours and man-hour utilization rate.

If desired, the off-equipment man-hours may be included in the summary. This is accomplished by adding a deck of work center off-equipment summary data (see format AA). One summary card is required for each work center for each day.

Operation

This operation describes step 7 on the Manpower Utilization Sequence Flowchart.

1. Punch title card (format C5):

Columns	Punch	Field Description
1	(11-3-8) punch	card identity
2-61	(see below)	title

2 ——————→ 30

SAMPLE--MANPOWER UTILIZATION

2. Place the following, in the sequence listed, behind the object program, Fig. 22:

   Work center master table (format M1)
   Title card (format C5)
   Data deck (from step 6 of the Manpower Utilization Sequence Flowchart)

3. Sense switbhes I/O, A--"on".

4. Load and go the object program, table, title card and data deck.

5. Program will
   a. Read cards.
   b. List each data card, Figs. 24-27.
   c. Print a summary line and eject to a new page on a change of card type.
   d. Eject and print a summary page on a change of work center code.

6. When reader stops, press start to process last cards.

7. Program will
   a. Print end-of-job message.
   b. Halt at IC = 4704.

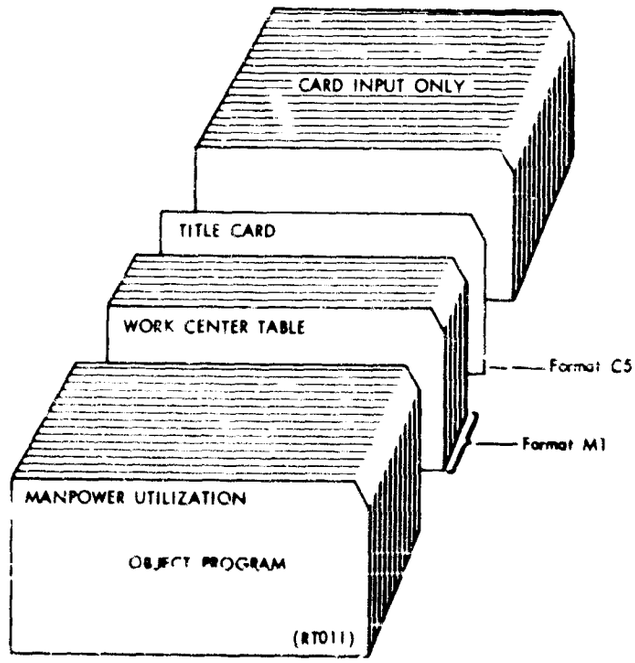


Fig. 23 -- Manpower utilization program setup

DAILY SORTIE TOUCHDOWNS, BY HOUR, FOR MONTH 01 SAMPLE - MANPOWER UTILIZATION

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
09/01				2	3	1		4	1	4	2	1		1	1		4	3		3	3		6		1.62
10/01	2			2	4	2			2	5	3			2	4	7				2	2	4		2	1.79
11/01	4	2		2	6			6		3			5			9		1	2	2		4	2	4	2.16
12/01		4			7			4	2	2	4		2		2	4	4	1	2	4			3	4	2.08
13/01		1	4	1				6	1		3	2	3		2	4	5		4	6	1	1	2		2.00
14/01	1	3			2			4	3	4					2	8	2		1	1	2	6		2	2.08
15/01		4		4	4			4	2	4	1	2	2		2	9		1	3				5	4	2.23
16/01				4	4				3	7			2		6	3				4		4	4		1.79
17/01	2		3	2	4	3		4	2	3		2	3	3	2	6		1	1	4	2	2	2	2	2.20
18/01	2	2	4	2		4		4	2	4			1	2	2	7		1		4	2	4			1.95
TOTAL	11	16	11	19	34	21		36	18	36	13	7	18	11	23	57	15	8	13	30	16	25	24	18	2.00
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	1.10	1.10	3.40					1.80	1.30		1.80		2.30		1.50		1.30		1.60		2.40				
		1.60	1.90	2.10		3.60		3.60		.70		1.10		5.70		.80		3.00		2.50		1.80			

Fig. 24 -- Manpower utilization: touchdown summary

DAILY MANPOWER AVAILABLE, BY HOUR, FOR MONTH 01 SAMPLE - MANPOWER UTILIZATION

WORK CENTER 12041 TESTSU FLIGHT LINE FLIGHT <A SECT I

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
09/01	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	10	10	10	10	10	10	10	10	12.66
10/01	14	14	14	14	14	14	14	16	16	16	16	16	16	16	16	16	10	10	10	10	10	10	10	10	13.41
11/01	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	10	10	10	10	10	10	10	10	12.66
12/01	13	13	13	13	13	13	13	16	16	16	16	16	16	16	16	16	11	11	11	11	11	11	11	11	13.45
13/01	13	13	13	13	13	13	13	15	15	15	15	15	15	15	15	15	13	13	13	13	13	13	13	13	13.75
14/01	13	13	13	13	13	13	13	16	16	16	16	16	16	16	16	16	12	12	12	12	12	12	12	12	13.79
15/01	13	13	13	13	13	13	13	15	15	15	15	15	15	15	15	15	11	11	11	11	11	11	11	11	13.08
16/01	14	14	14	14	14	14	14	15	15	15	15	15	15	15	15	15	11	11	11	11	11	11	11	11	13.37
17/01	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	11	11	11	11	11	11	11	11	12.33
18/01	14	14	14	14	14	14	14	12	12	12	12	12	12	12	12	12	11	11	11	11	11	11	11	11	12.25
TOTAL	135	135	135	135	135	135	135	46	146	146	146	146	146	146	146	146	110	110	110	110	110	110	110	110	13.07

1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
13.50	13.50	13.50	13.50	14.60	14.60	14.60	14.60	11.00	11.00	11.00	11.00											
13.50	13.50	13.50	14.60	14.60	14.60	14.60	14.60	11.00	11.00	11.00	11.00											

Fig. 25 -- Manpower utilization: manpower available

DAILY MANPOWER UTILIZED, BY HOUR, FOR MONTH 01 SAMPLE - MANPOWER UTILIZATION

WORK CENTER 12041 TESTSO FLIGHT LINE FLIGHT #A SECT I

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AV
09/01	3	6	7	5	4	5	4	15	10	9	3	8	5	6	11	7	4	9	6	9	10	5	9	9	7.00
10/01	4	3	9	9	8	7	5	11	9	12	7	10	6	6	9	9	8	6	6	8	7	7	6	8	7.50
11/01	6	8	12	3	4	6	8	13	10	11	9	15	9	10	9	7	8	9	4	9	5	4	7	6	8.00
12/01	9	5	6	10	2	9	13	5	14	15	8	7	11	15	10	14	12	13	8	9	8	8	10	8	9.54
13/01	12	5	8	12	8	7	[illegible]	11	11	7	15	10	8	11	10	4	6	8	9	3	8	3	9	4	8.08
14/01	4	5	2	3		11	12	8	10	11	9	9	7	6	9	9	13	14	11	9	9	7	5	3	7.[illegible]
15/01	7	7	4	1	3	8	5	13	8	15	14	11	14	15	11	9	12	7	8	12	3	6	5	7	8.54
16/01	5	11	10	5	6	15	12	9	14	20	13	12	10	10	10	11	17	10	5	3	8	5	9	8	10.12
17/01	8	7	3	10	11	8	11	18	21	16	8	10	7	13	6	12	9	5	5	8	7	10	6	6	9.37
18/01	14	11	9	8	3	6	8	10	10	11	8	8	3	8	8	1	14	9	6	6	7	7	6	3	8.08
TOTAL	76	68	75	66	49	82	83	113	117	126	94	100	80	100	93	93	103	90	68	76	72	63	72	62	8.40
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	7.60		7.50		4.90		8.30		11.70		9.40		8.00		9.30		10.30		6.80		7.20		7.20		
		6.80		6.60		8.20		11.30		12.60		10.00		10.00		9.30		9.00		7.60		6.30		6.20	

Fig. 26 - Manpower utilization: manpower utilized

WORK CENTER -12041- AVERAGES AND UTILIZATION RATES FOR MONTH 01 SAMPLE - MANPOWER UTILIZATION

TESTSO FLIGHT LINE FLIGHT =A SECT !

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
TOUCHDOWNS -AVG-	1.10	1.10	3.40					1.80	1.30		1.80		2.30		1.50		1.30		1.60		2.40			
		1.60		1.90		2.10		3.60		3.60		.70		1.10		5.70		.80		3.00		2.50		1.80
AVAILABLE -AVG-	13.50	13.50		13.50		13.50		14.60		14.60		14.60		14.60		14.60		11.00		11.00		11.00		11.00
		13.50		13.50		13.50		14.60		14.60		14.60		14.60		14.60		11.00		11.00		11.00		11.00
UTILIZED -AVG-	7.60	7.00		4.90		9.30		11.70		9.40		8.00		9.30		10.30		6.80		7.20		7.20		
		6.80		6.60		8.20		11.30		12.60		10.00		10.00		9.30		9.00		7.60		6.30		6.20
UTIL RATE	.56	.52		.36		.61		.80		.64		.55		.64		.94		.62		.65		.65		
		.50		.49		.61		.77		.86		.68		.68		.64		.82		.69		.57		.56

DATA DAYS THIS MONTH

FLYING - 10
AVAILABLE - 10
WORKING - 10

TOTAL SORTIES - 480

FORM 300 TOTAL MANHOURS - 1,293.1

MANHOURS PER SORTIE - 2.7

AFTO 211 TOTAL MANHOURS - 2.2

AVAILABLE MANHOURS - 3,139.0

AVG MANHOURS UTIL - .41

AVG ERS UTIL - .64

Fig. 27 -- Manpower utilization: summary

PROGRAM RT012: ANALYSIS OF VARIANCE (ANOVA)

Purpose

This general purpose program can be used to

1. Frequency count records: = "N" on the printout.
2. Accumulate a data field: = "TOTALS" on the printout.
3. Compute means (Total/N): = "MEANS" on the printout.
4. Compute break-rates, break averages and variances for samples and subsamples. Subsample means are tagged with asterisks to denote statistical significance.
5. Print a distribution of the subsamples grouped in half-sigma units from the sample means: = "FREQUENCY COUNTS" on the printout.

Method

1. The program processes either a card or unblocked tape input file sorted in a major (sample), minor (subsample) sequence.
2. Three title cards (format C21) may be used to describe the printout; however, only one title card is required. The remaining two cards are optional.
3. A field locator card (format C2) is required by the program to
   a. Identify the high- and low-order addresses of the major and minor control fields.
   b. Identify the high- and low-order address of the data field used in the computations. The program assumes the field to have one decimal place. Data samples that are whole numbers may be processed as one-position decimal numbers by punching any valid character in Col. 41 of this control card.
   c. Tell the program the count of pages if the option to print a sample of the input data is being executed.
   d. Tell the program the sortie count if break-rates or break averages are being computed for each subsample.
4. The program uses a work tape (on Unit 6) as intermediate storage; therefore, there is virtually no limit to sample or subsample size. As each record is read in it is frequency counted, summed, squared and summed (to get ΣX and ΣX^2), and written (stored) on the work tape.
5. When the program senses a change in the major control, it rewinds the work tape and proceeds to compute subsample means, N, raw score totals and variances, as well as a distribution of the subsamples.

6. Switch option allows
   a. Punching the results of computations for input to chi-square.
   b. Excluding zero data from the computations.
   c. Printing break-rates or break averages.

Operation

This operation describes step 3 on the Analysis Sequence Flowchart.

1. Punch the title card (format C21):

Card	Column 1	Columns 2-80
1	H	(Use for Title)

2. Punch a field locator card (format C2):

Columns	Punch	Field Description
1-9	Leave Blank	
10-11	02	Major control--high-order position
12	"X" (11 Zone)	
13-14	02	Major control--high-order position
15-19	Leave Blank	
20-21	21	Minor control--low-order position
22	"X" (11 Zone)	
23-24	21	Minor control--low-order position
25-29	Leave Blank	
30-31	38	Data variable--high-order position
32	"X" (11 Zone)	
33-34	42	Data variable--low-order position

3. Place the title cards and control card behind the object program, Fig. 28.
4. Mount the input tape (tape T3) on unit 2.
5. Mount a scratch tape on unit 6.
6. Sense switches I/O, A, E--"on".
7. Load and go object program, title and control cards.
8. Program will
   a. Read and block records from unit 2 and write them on unit 6.
   b. Rewind unit 6 when a change in the major control field has been sensed.
   c. Read unit 6; compute and print subsample means, N, raw score to totals and variances, and punch a summary card (format X) for each subsample, Fig [illegible].

d. Rewind unit 6 and repeat steps a, b and c until all data have been processed.
e. Rewind and unload the tapes on units 2 and 6 after all data have been processed.
f. Print end-of-job message.
g. Halt at IC = 5936.

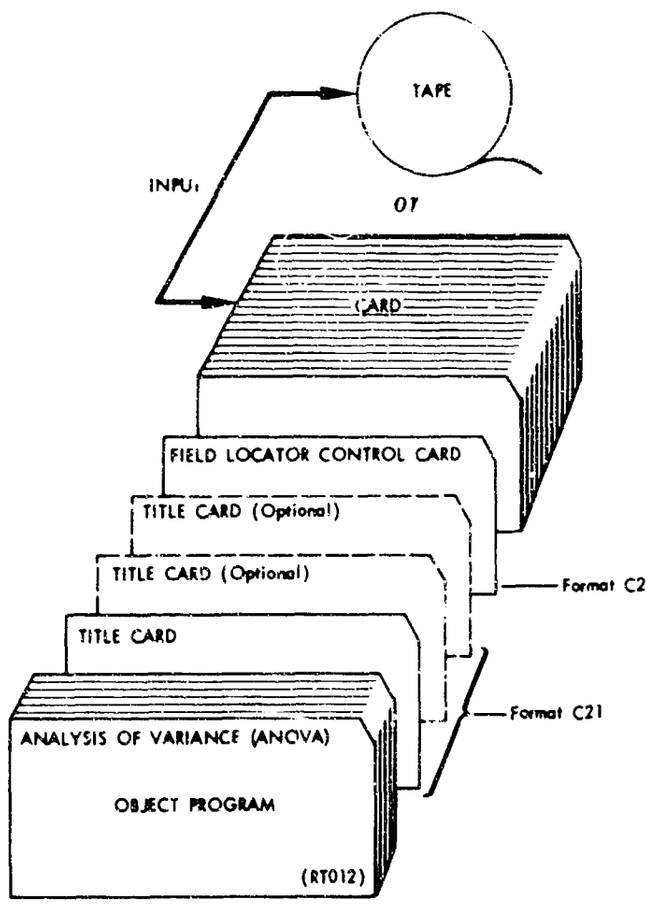


Fig. 28 -- Analysis of variance (ANOVA) program setup

SAMPLE FREQUENCY DISTRIBUTION

SAMPLE 7 CARD - SINGLE/FIRST/LAST SORTIE COMPARISON
02-02 21-21 38-42

CODE-- 7 NO SORTIE COUNT
SWITCHES A---C---E---- ON

FREQUENCY COUNTS

Z--	2-	1-	0	1	2	3	4	5
SIGMA	13.2-	2.6-	8.0	18.6	29.3	39.9	50.5	61.1
	7.9-	2.7	13.3	23.9	34.6	45.2	55.8	66.4

																MEANS	N	TOTALS	VARIANCE
SAMPLE 1--	F	190	41	6												4.08***	237	967.2	5.34
SAMPLE 2--	L	70	32	21	8	4	2			1		1				10.13*	142	1438.9	198.50
SAMPLE 3--	S	17	16	24	10	8	4	1	1	1		1	1			15.42***	85	1310.7	168.59
SAMPLE TOTALS		277	89	51	18	12	6	1	1	2		2	1			8.01	464	3716.8	
CUMULATIVE PERCENT		59	78	89	93	96	97	97	98	98	98	98	99	99					

OUT OF BOUNDS DATA NONE BELOW AND 4 ABOVE NOT PLOTTED

ANALYSIS OF VARIANCE

	SUM SQUARE	DF	MEAN SQUARE	F
BETWEEN	8965.8154	2	4482.9077	47.6058
WITHIN	43411.0750	461	94.1672	
TOTAL	52376.8903	463	113.1250	

Fig. 29 -- Analysis of variance

PROGRAM RT013: CHI-SQUARE*

Purpose

This program is used to generate a printout showing statistical comparisons among frequency data. It computes

1. Chi-square for both dichotomous and nondichotomous data (under sense switch control).
2. An approximated probability (alpha) level.
3. Observed frequency means.

Method

1. The program requires a title card (format C15) and a field locator control card (format C16). Information punched in the control card locates the column positions of the base-line, observed frequency, category identification and major control. Data must be sorted by major; various sub-sortings are optional. These four elements of data are required to produce the Chi-square printout.
2. The program assumes the base-line and observed frequency to be equal to or less than six digits with no decimal position allowed. The category identifier is assumed to be three characters.
3. The program reads and stores the base-line, observed frequency and category identifier for each member in the sample (sample size is limited to 200 members). The mean for each record is computed when it is being processed. The mean for the record is stored for printing and summed for developing the unweighted grand mean. The base-line and observed frequencies are summed to obtain totals for the sample. When all records have been read and stored, the program
   a. Computes the weighted mean for the sample.
   b. Converts the mean of each member to Z-scores for plotting the category identifier.
   c. Computes the theoretical frequency for each member in the sample.
   d. Computes D2/FT (observed minus theoretical squared).
   e. Computes Chi-square for the sample.
   f. Tests and identifies numbers that are statistically significant.

---

*A. Sweetland, Some Statistical Methods for Maintenance Analysis, The RAND Corporation, RM-4443-PR, April 1966.

Operation

This operation describes step 4 on the Analysis Sequence Flowchart.

1. Punch the title card (format C15) using Cols. 1-79. Col. 80 must contain a "12" zone punch.

2. Punch the field locator control card (format C16):

Columns	Punch	Field Identification
1-3	401	Base-line count--high-order position
4-6	404	Base-line count--low-order position
7-9	409	Observed count--high-order position
10-12	412	Observed count--low-order position
13-15	416	Category identifier--high-order position
16-18	418	Category identifier--low-order position
19-21	473	Major control--high-order position
23-24	477	Major control--low-order position
80	"11" Zone Punch	

3. Place the title card and control card behind the object program, Fig. 30.

4. Place the punched output (format X) from the Analysis of Variance program behind the control card.

5. Sense switches I/O, A--"on".

6. Load and go object program, title card, control card.

7. Program will read cards and load all data variables in core.

8. When reader stops, press start to process last cards.

9. Program will
   a. Print the results of the Chi-square computation, Fig. 31.
   b. Print an end-of-job message.
   c. Halt at IC = 1483.

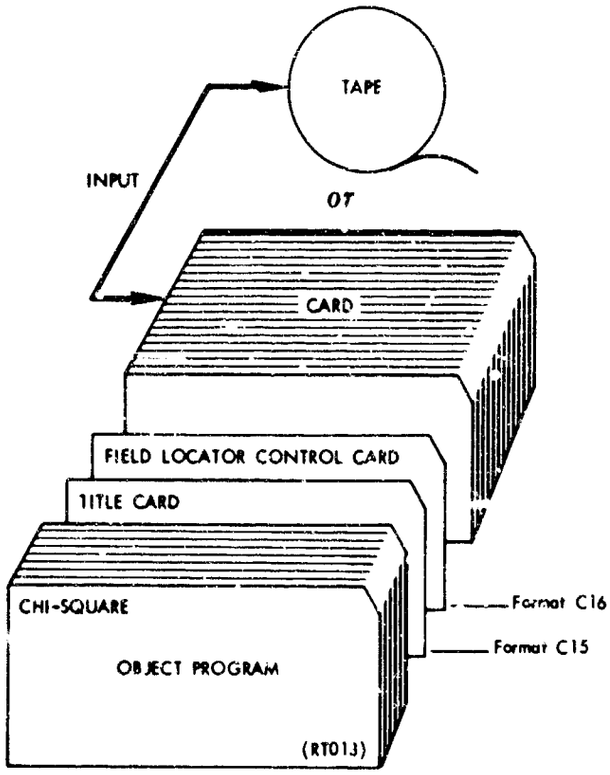


Fig. 30 -- Chi-square program setup

SAMPLE 7 CARD - SINGLE/FIRST/LAST SORTIE COMPARISON

	BASE-LINE	FO	FT	D2/FT	MEANS	-3	-2	-1	0	1	2	3	4	5
												7	-MAJOR-	
	242	237	234.42	.91	.979		.		. F		.		.	
	143	142	138.52	2.79	.993		.		. L		.		.	
	94	85	91.06	12.86***	.904*		. S		.		.		.	
TOTAL	479	464												

WEIGHTED GRAND MEAN-- .969

CHI-SQUARE-- 16.56 .959 -UNWEIGHTED-

DF -- 2

THE PROBABILITY IS BEYOND THE 0.001 LEVEL. THE DISTRIBUTION IS NOT HOMOGENEOUS.

Fig. 31 -- Chi-square

PROGRAM RT014: CORRELATION MATRIX

Purpose

This program will correlate 2 to 12 variables and will print an N x N matrix of Pearson product-moment correlation coefficients, Fig. 33c. The program also prints two sets of means and standard deviations, Fig. 33b: one based on all of the data records, and the other based on data greater than zero. If desired, a test for and printout of questionable independent variables may be generated, Fig. 33d.

Method

1. The program requires
   a. A general title card (format C18) to describe the printout.
   b. A field locator card (format C17) for each variable being processed. The card may also contain a title to describe the variable on the printout, Fig. 33a.
   c. A stopper card (format C19) to indicate the loading of the field locator table has ended.
   d. A dependent variable selector card (format C20) if the test for questionable independent variables is being made. This card is optional.
   e. All input data to be one decimal place and all variables to be on the same record. Variables that are whole numbers will be handled as one-position decimal by the program if Col. 18 in the field locator card is punched with any valid character. (The computer left adjusts the data field by position when Col. 18 is punched.)
   f. Sorting of the input file is unnecessary.
2. Calculation of the correlation coefficient, "r", is based on the following equation:

$$r_{xy} = \frac{\sum XY - \frac{(\sum X)(\sum Y)}{N}}{\sqrt{\left[\sum X^2 - \frac{(\sum X)^2}{N}\right]\left[\sum Y^2 - \frac{(\sum Y)^2}{N}\right]}}$$

3. As each record is read, the variables are transferred to a work area where
   a. X-variables are summed.
   b. X-variables are squared and summed.
   c. Y-variables are summed.
   d. Y-variables are squared and summed.

4. When all the data have been read in, the program computes and prints
   a. Two sets of means and standard deviations--one based on all records, the other based on data greater than zero.
   b. The correlation matrix, plus its mirror image.
   c. If the switch is set, the results of the dependent variable test.

Operation

This operation describes step 5 on the Analysis Sequence Flowchart.

1. Punch title card (format C18):

Column	Punch	Field Designation
1	","(0-3-8 Punch)	Card identity
2-80	(see below)	Title

SAMPLE 7-CARD SUMMARY FILE

2. Punch field locator control cards (format C17) as shown below.

VARIABLE NUMBER	MATRIX COLUMN HEADING	FIELD LOCATION HIGH ORDER Position	FIELD LOCATION LOW ORDER Position	Whole number shift		CARD IDENTITY
01 02	04 05 06 07 08 09	11 12 13	14 15 16	18	19 20 21 22 23 24 25 26	80
01	LAG	028	032			
02	DELAY	033	037			
03	NET	038	042			
04	GRØSS	043	047			
05	NØRS	048	052			
06	NØRM	053	057			
07	UNITS	058	060	S	HIFT 1	
08	MAN HR	061	065			
09	FLY HR	066	068			

3. Punch table loading stopper card (format C19):

Columns	Punch	Field Description
1	*(11-4-8 Punch)	Card identity

4. Punch dependent variable selector card (format C20):

Columns	Punch	Field Description
1	"=" (3-8 Punch)	Card identity
2-3	03	First variable to test
4-5	08	Second variable to test

5. Place the title card, variable field selector cards, stopper card and dependent variable selector card, in the order listed, behind the object program, Fig. 32.

6. Mount input tape (tape T3) on unit 1.

7. Sense switches I/O, A, C, E--"on".

8. Load and go the object program and control cards.

9. Program will
   a. Read the tape on unit 1 to end-of-file.
   b. Print two sets of means and standard deviations for each variable.
   c. Print the correlation matrix.
   d. Print the results of the dependent variable test for each variable selected.
   e. Rewind and unload the input tape.
   f. Print an end-of-job message.
   g. Halt at IC = 7400.

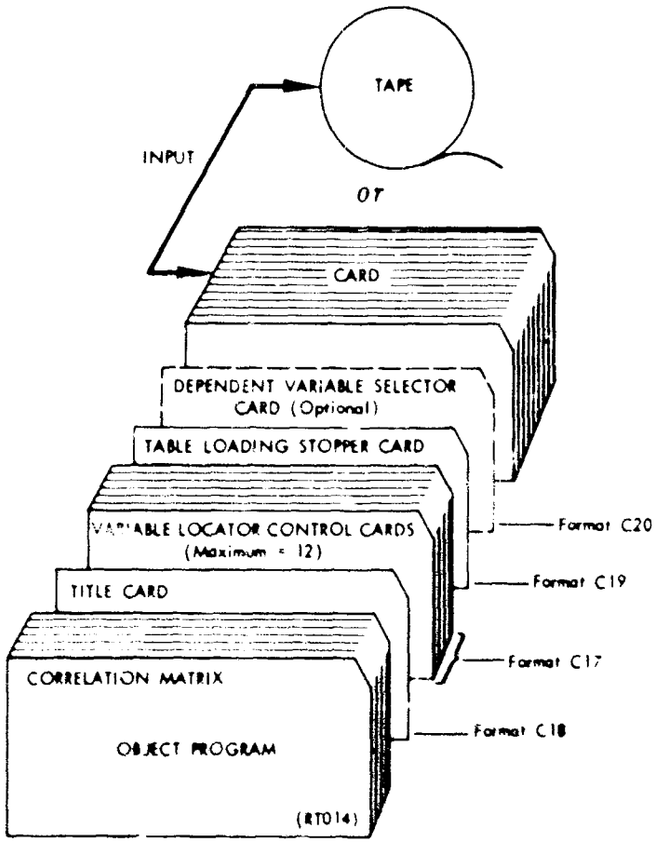


Fig. 32 -- Correlation matrix program setup

SAMPLE 7-CARD SUMMARY FILE

01 LAG	028-032	
02 DELAY	033-037	
03 NET	038-042	
04 GROSS	043-047	
05 NORS	048-052	
06 NORM	053-057	
07 UNITS	058-060	SHIFT 1
08 MAN HR	061-065	
09 FLY HR	066-068	

Fig. 33a -- Correlation matrix: field locator control cards

SAMPLE 7-CARD SUMMARY FILE

	01 LAG	02 DELAY	03 NET	04 GROSS	05 NORMS	06 NORM	07 UNITS	08 MAN HR	09 FLY HR
MEANS	.332	4.570	7.743	12.645	13.015	5.249	18.498	23.976	1.377
SIGMA	3.852	8.903	10.553	18.000	53.087	11.167	17.063	34.109	.424
N	480	480	480	480	480	480	480	480	480

COMPUTATION EXCLUDING VARIABLES = 0

MEANS	.482	4.918	8.010	13.081	41.373	9.544	19.136	24.803	1.409
SIGMA	4.641	9.144	10.636	18.152	88.423	13.637	16.999	34.396	.374
N	330	446	464	464	151	264	464	464	469

Fig. 33b -- Correlation matrix: means and standard deviations

SAMPLE 7-CARD SUMMARY FILE

	01 LAG	02 DELAY	03 NET	04 GROSS	05 NORS	06 NORM	07 UNITS	08 MAN HR	09 FLY HR
01		.018-	.024-	.192	.071	.016-	.029-	.024-	.175
02	.018-		.642	.869	.705	.541	.547	.510	.016
03	.024-	.642		.900	.360	.790	.896	.938	.199-
04	.192	.869	.900		.576	.726	.787	.794	.104-
05	.071	.705	.360	.576		.245	.291	.299	.203
06	.016-	.541	.790	.726	.245		.621	.624	.104-
07	.029-	.547	.896	.787	.291	.621		.889	.036-
08	.024-	.510	.938	.794	.299	.624	.889		.002
09	.175	.016	.199-	.104-	.203	.104-	.036-	.002	

Fig. 33c -- Correlation matrix: Pearson product moment correlation coefficients

SAMPLE 7-CARD SUMMARY FILE

DV = 03

R	03X08 =	.938	
	08X01 =	.024-	
	08X02 =	.510	
	08X04 =	.794	
	08X05 =	.299	
	08X06 =	.624	
	08X07 =	.889	
	08X09 =	.002	
R	03X04 =	.900	
	04X01 =	.192	
	04X02 =	.869	
	04X05 =	.576	
	04X06 =	.726	
	04X07 =	.787	
	04X08 =	.794	
	04X09 =	.104-	
R	03X07 =	.896	
	07X01 =	.029-	
	07X02 =	.547	
	07X04 =	.787	
	07X05 =	.291	
	07X06 =	.621	
	07X08 =	.889	
	07X09 =	.036-	
R	03X06 =	.790	
	06X01 =	.016-	
	06X02 =	.541	
	06X04 =	.726	
	06X05 =	.245	
	06X07 =	.621	
	06X08 =	.624	
	06X09 =	.104-	

SAMPLE 7-CARD SUMMARY FILE

DV = 03

R	03X02 =	.642	
	02X01 =	.018-	
	02X04 =	.869	*
	02X05 =	.705	*
	02X06 =	.541	
	02X07 =	.547	
	02X08 =	.510	
	02X09 =	.016	
R	03X05 =	.360	
	05X01 =	.071	
	05X02 =	.705	*
	05X04 =	.576	*
	05X06 =	.245	
	05X07 =	.291	
	05X08 =	.299	
	05X09 =	.203	
R	03X09 =	.199-	
	09X01 =	.175	
	09X02 =	.016	
	09X04 =	.104-	
	09X05 =	.203	*
	09X06 =	.104-	
	09X07 =	.036-	
	09X08 =	.002	
	09X09 =	.	
R	03X01 =	.024-	
	01X02 =	.018-	
	01X04 =	.192	*
	01X05 =	.071	*
	01X06 =	.016-	
	01X07 =	.029-	*
	01X08 =	.024-	
	01X09 =	.175	*

Fig. 33d -- Correlation matrix: dependent variable test

PROGRAM RT015: AGE DISPLAY

Purpose

This program produces a printout designed to show flight-line AGE utilization (both active and standing). It is in a format similar to the tail number and work center displays; however, instead of using just a start and stop time, this program also uses a spot and remove time to compute standing or inactive time.

Method

1. This program processes one type of record, format S, with Col. 80=F.
2. The spot, start, stop and remove times are converted to quarter-hour segments, as in the tail number and work center displays, for plotting the status of equipment. The "A" printed on the display shows when AGE is being used. The dots show the time the equipment was standing by the aircraft not being used.
3. The summary line shows the count of the quarter-hour segments in which an "A" appears.

Operation

1. Punch control card (format C13):

Columns	Punch	Field Description
1-2	01	Count on input tapes
3	F	Card type to select and punch (code F is AGE utilization in detail, format S)

2. Place the control card behind the Compute Elapsed Time object program (RT003).
3. Mount tape T2 on unit 1.
4. Sense switches I/O, A, D--"on".
5. Load and go object program and control card.
6. Program will
   a. Read unit 1.
   b. Punch AGE utilization file.
   c. Rewind and unload unit 1.
   d. Clear the punch of all punched cards.
   e. Print end-of-job message.
   f. Halt at IC = 1473.

7. Sort the punched deck:

Major	Cols. 65-66	N	AGE code
↓	Cols. 11-12	N	start--month
	Cols. 9-10	N	--day
Minor	Cols. 13-16	N	--clock time

8. Place the sorted deck behind the AGE Utilization Display object program (RT015), Fig. 34.

9. Sense switches I/O, A, B--"on".

10. Load and go object program and data deck.

11. Program will
    a. Read and print the data deck in display format, Fig. 35.
    b. Print a summary line and eject to a new page on each change in AGE code or date.

12. When reader stops, press start to process last cards.

13. Program will
    a. Print an end-of-job message.
    b. Halt at IC = 2224.

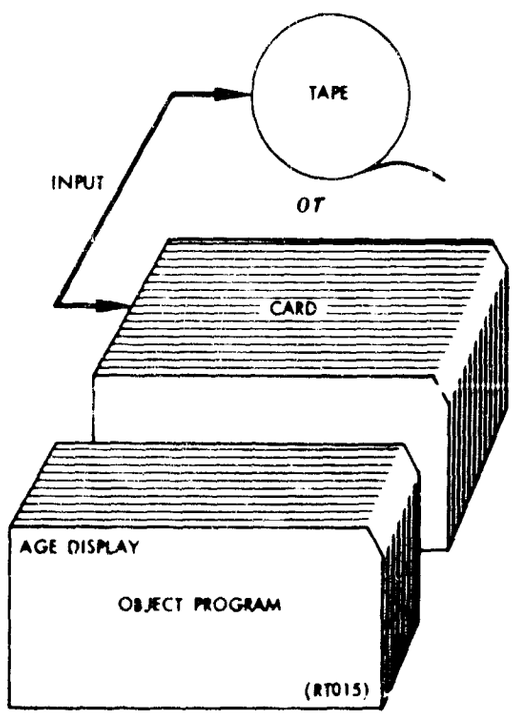
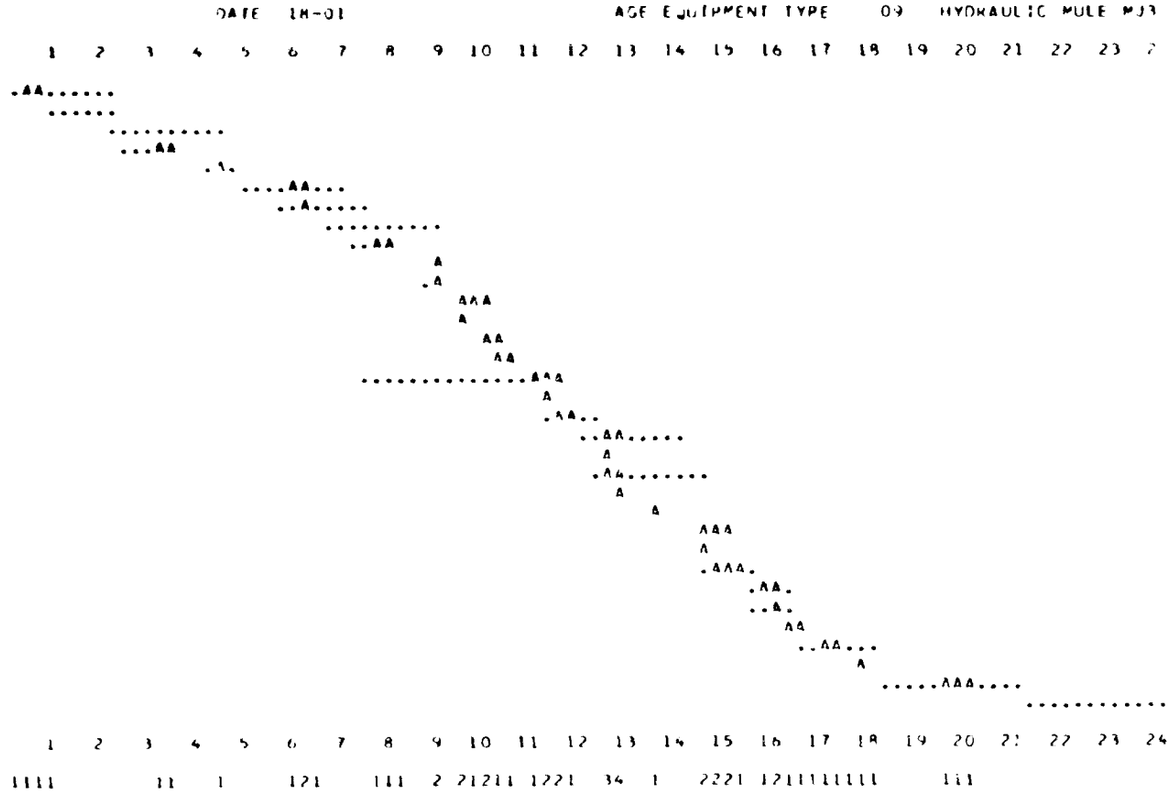


Fig. 34 -- AGE display program setup

DATE 18-01 AGE EQUIPMENT TYPE 09 HYDRAULIC MULE M33



WC	ACFT TN	AGE TN
12042	0838	09
12042	7556	02
12052	0800	06
12052	7647	02
12052	7647	02
12042	0739	02
12052	0843	06
12042	0851	04
12052	7448	09
12052	7448	09
12041	0842	10
12042	7556	04
12041	0842	10
12052	7448	09
12041	0842	10
12052	0800	06
12041	0842	10
12041	0842	10
12052	0843	06
12042	7556	04
12052	7448	09
12042	7647	02
12042	7647	02
12042	0851	06
12042	7556	04
12042	7556	04
12 43	0727	01
12042	7556	09
13340	0851	06
12043	0727	01
12042	0851	06
13346	7667	01
12043	7442	01

Fig. 35 -- AGE display

PROGRAM RT016: DEVIATION-DEGRADATION (DEVDEG)

Purpose

This program is used to list the edited output (Col. 80 = H, format U) of the form 308, showing in detail the call number, date, time, work unit code, deviation code, call sign and verbal comment. The program prints a frequency count when a change in control is sensed on the deviation code.

Method

The mission deviation-degradation file, Col. 80 = H, is sorted on deviation code (Cols. 7-8) and listed to produce a detailed print-out and frequency count by deviation code.

Operation

1. Punch control card (format C13):

Columns	Punch	Field Description
1-2	01	Count of input tapes
3	H	Card type to select and punch (code H is deviation/degradation comment, format U)

2. Place the control card behind the Compute Elapsed Time object program (RT003).
3. Mount tape T2 on unit 1.
4. Sense switches I/O, A, D--"on".
5. Load and go the object program and control card.
6. Program will
   a. Read unit 1.
   b. Punch deviation/degradation comment file.
   c. Rewind and unload unit 1.
   d. Clear the punch of all punched cards.
   e. Print end-of-job message.
   f. Halt at IC = 1473.
7. Sort the punched data deck:

Columns		Field Description
7-8	AN	Deviation/degradation code

8. Place the sorted deck behind the DEVDEG object program, Fig. 26.

9. Sense switches I/O, A, B--"on".
10. Load and go the object program and data deck, Fig. 37.
11. Program will
    a. Read and list the data deck.
    b. Print a frequency count (card count) on each change in deviation/degradation code.
12. When reader stops, press start to process last cards.
13. Program will
    a. Print an end-of-job message.
    b. Halt at IC = 337.

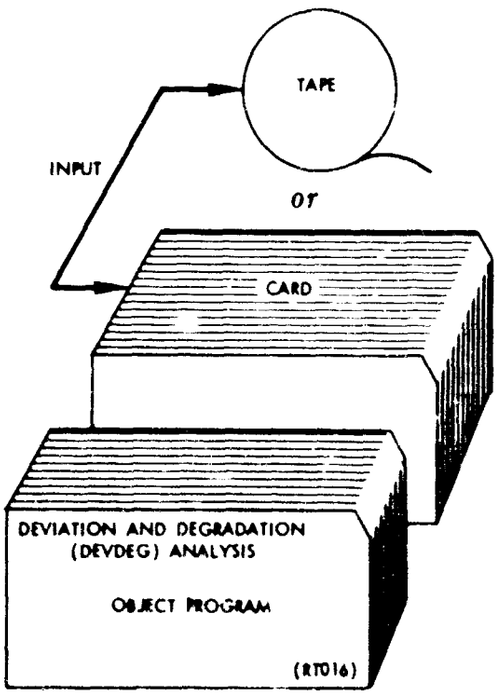


Fig. 36 -- Deviation and degradation (DEVDEG) analysis program setup

DEVIATION AND DEGRADATION ANALYSIS

TAIL	DATE	HRMN	#/O/C	SYM	-CALL-	
0838	1201	1840	41564	AIR	WASP	T E FLAP BARBER POLES AT 310 KNOTS
0839	1801	2110	41500	AIR	NATE	BLC LITE ON TAKE OFF
7687	0109	1110	41000	AIR	NICK42	SMOKE IN COCKPIT
7710	0809	1840	71400	AIR	CHICAG	INS PROBLEM/NO SPARE
0735	2010	0900	23000	AIR	KODAK	AUX AIR DOOR OPEN
0814	0210	1815	14000	AIR	KNIFE	F LIGHT CONTROL VIBRATIONS
7500	1309	2020	45000	AIR	HUDSON	CENTER LINE TANK DOES NOT FEED
						7
7645	1909	1850	11000	BUD	LOVER	SYMPATHY WITH 7710
7650	3008	2040	11000	BUD	KODAK	SYMPATHY FOR 7687
7650	[illegible]09	1940	11000	BUD	ROSCO	SYMPATHY WITH 7687
7641	509	2035	11000	BUD	HURRIC	SYMPATHY ABORT
7642	1808	0001	11000	BUD	FALCON	SYMPATHY ABORT
7586	2608	1730	11000	BUD	MIDGET	SYMPATHY ABORT
						6
7522	0412	0230	23000	GND	ACORN	HIGH OIL PRESS NO #2 ENG 0927 SPARE
7642	1212	2035	51000	GND	BUTCH	NO POWER TO ATTITUDE INDICATOR SPARED 7499
7623	2212	1130	46000	GND	SWORD	DUE TO C/L TANK LEAK SPARED BY 0842
7532	0310	0630	46000	GND	OMAHA	NO BOOST PUMP PRESSURE
7496	2210	0740	23000	GND	DEVIL	FUEL LEAK IN ENGINE COMPT
7496	0810	1015	74000	GND	VEGAS	RADAR INOP
0720	1108	1305	13400	GND	HAMBON	LH BRAKE LOCKED ON TAXI ROLL
0720	0708	1240	12350	GND	RIG	COULD NOT CLOSE AFT CANOPY
0720	2308	0700	46000	GND	VESPA	LT DROP TANK LEAKING
0720	1009	1425	13250	GND	GATOR	BLEW RT MAIN TIRE
0779	0909	0415	13440	GND	ZIPPER	LEFT BRAKE LOCKED ON TAXI
0779	2109	2055	13000	GND	FRESNO	RUDDER FLUTTER
						12
7650	1209	1245	11000	HHQ	CLIPPE	TAKE OFF TIME DELAY 20 MINUTES
7645	2808	1720	11000	HHQ	ROSCOE	TIME CHG DELAY 40MIN
7642	0808	1445	11000	HHQ	VESPA	CANCELLED BY HIGHER HEADQUARTERS
7642	1708	0550	11000	HHQ	MUSKRA	TIME READJUSTED TO 0630
7641	1809	1935	11000	HHQ	ROSCOE	LATE DUE TO CENTER LINE TANK LOOSE
7680	1709	2030	11000	HHQ	DORF	LATE TAKE OFF DUE TO ABORT OF 7586
						6
7640	2308	1750	46000	HND	BUCKSH	RT TANK WONT TAKE FUEL
7626	1109	2030	23000	HND	CLIPPE	OIL LEAK/NO SPARE
7643	2808	1325	41500	HND	SWORD	BLC LITE CAME ON
7686	2109	0410	74000	HND	WINDSO	BOTH SCOPES BLANK
7687	2608	2155	75000	HND	HUDSON	ACFT NOT LOADED
7642	0701	1145	11000	HND	DUTCH	NO ACFT AVAILABLE
0841	7312	1355	01480	HND	RIP	TANK CHANGE
7710	1909	1850	74000	HND	LOVER	CENTER LINE BREACH STRIPPED
						8
7659	1409	0430	11000	OPS	CLEVEL	CANX BY COL CLARK

Fig. 37 -- Deviation and degradation analysis

PROGRAM RT017: FORM 305 GENERATOR

Purpose

This program is used to generate form 305 (Manpower Availability). The program lists the 2-digit work center code, the 5-digit work center code, and the name of each work center involved.

Method

For each work center, a card is provided with the name of the work center and its corresponding 2-digit and 5-digit codes keypunched in Cols. 01-48.

Operation

1. Place the work center table (format M1) behind the form 305 Generator object program, Fig. 38.
2. Sense switches I/O, A--"on".
3. Load and go the object program and control cards.
4. Program will
   a. Read cards
   b. Print the form 305, Fig. 39.
5. When the reader stops, press start to process last card.
6. Program will halt at IC = 337.

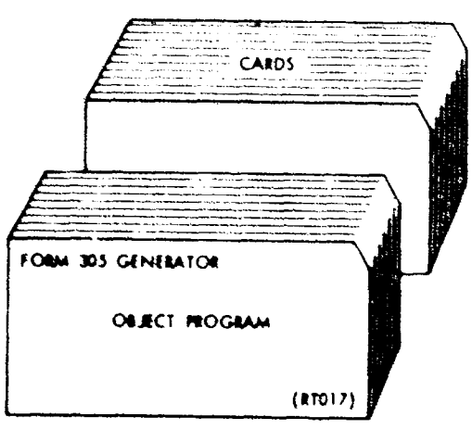


Fig. 38 -- Form 305 generator program setup

MANPOWER AVAILABILITY

DAY-	MONTH-	DAY SHIFT ON	DAY SHIFT OFF SKILL LEVEL 9	7	5	3	NIGHT SHIFT ON	NIGHT SHIFT OFF SKILL LEVEL 9	7	5	3	GRAVE-YARD ON	GRAVE-YARD OFF SKILL LEVEL 9	7	5	3
			10-11	12-13	14-15	16-17		18-19	20-21	22-23	24-25		26-27	28-29	30-31	32-33
92	13410 FM REPAIR AGE	-	-	-	-	/		-	-	-	/		-	-	-	
61	13411 FM MINOR MAINTENANCE	-		-		/		-	-	-	/		-	-	-	
33	13420 FM INSPECTION/SERVICE AGE	-	-	-		/		-	-	-	/		-	-	-	
32	13421 FM DAILY INSPECTION	-	-	-	-	/		-	-	-	/		-	-	-	
16	13430 FM PICK-UP/DELIVERY AGE	-	-	-	-	/		-	-	-	/		-	-	-	
	13500 FM BASE FLT AND TRANSIENT ALERT SUPV	-	-	-	-	/			-	-	/		-	-	-	
	13510 FM BASE FLIGHT	-	-	-	-	/		-	-	-	/		-	-	-	
	13520 FM TRANSIENT MAINTENANCE	-	-	-	-	/		-	-	-	/		-	-	-	
	14000 CAE COMMANDER	-	-	-	-	/		-	-	-	/		-	-	-	
	14010 CAE SQUADRON ADMINISTRATION	-	-	-	-	/		-	-	-	/		-	-	-	
	14020 CAE MAINTENANCE SUPERVISION	-	-	-	-	/		-	-	-	/		-	-	-	
63	14029 CAE DIAGNOSTICS	-	-	-	-	/		-	-	-	/		-	-	-	
17	14100 CAE COMMUNICATION/NAVIGATION BRANCH	-	-	-	-	/		-	-	-	/		-	-	-	
14	14110 CAE RADIO	-	-	-	-	/		-	-	-	/		-	-	-	
64	14120 CAE RADAR	-	-	-	-	/		-	-	-	/		-	-	-	
22	14130 CAE INERTIAL NAVIGATION	-		-	-	/		-	-	-	/		-	-	-	
	14300 CAE ELECTRONICS BRANCH	-	-	-	-	/		-	-	-	/		-	-	-	
20	14320 CAE WEAPONS CONTROL	-	-	-	-	/		-	-	-	/		-	-	-	
21	14330 CAE GUIDANCE/AUTO PILOT	-	-	-	-	/		-	-	-	/		-	-	-	
	14340 CAE ECM	-	-	-	-	/		-	-	-	/		-	-	-	
08	14350 CAE INSTRUMENT SHOP	-	-	-	-	/		-	-	-	/		-	-	-	
	14400 CAE PROTO MAINTENANCE	-	-	-	-	/		-	-	-	/		-	-	-	
	14520 CAE PMEL	-	-	-	-	/		-	-	-	/		-	-	-	
	15000 MUNITIONS MAIN NANCE SUPERVISION	-	-	-	-	/		-	-	-	/		-	-	-	
	15010 MUNITIONS MAINTENANCE ADMINISTRATION	-	-	-	-	/		-	-	-	/		-	-	-	
	15030 MUNITIONS QUALITY CONTROL	-		-	-	/		-	-	-	/		-	-	-	
	15050 MUNITIONS WEAPONS STANDARDIZATION	-	-	-	-	/		-	-	-	/		-	-	-	

Fig. 39 -- Form 305 (manpower available)

PROGRAM RT018: MANPOWER MATRIX

Purpose

This program prints a frequency distribution of hourly events for a 24-hour period. The pictorial display, Fig. 41, is a useful tool for assisting management in determining preferred distributions of resources over a 24-hour period. Distributions are displayed vertically to show the ebb and flow of daily events.

Although this program was designed to display manpower data, its use was extended with the development of the Hourly Frequency Accumulate Select program (RT010). The inputs to the Manpower Matrix program are the summary cards created by program RT010; therefore, a variety of types of data can be selected from the file (i.e., the reformatted or Oxnard format file) and pictorially displayed. The data displayed in the sample printout, Fig. 41, are the manpower utilization data displayed in Fig. 25.

Method

1. The program requires a title card (format C5) to define the data sample.
2. The program accepts as input the 24-hour spread summary card (format W) generated by the Hourly Frequency Accumulate Select program (RT010). The input deck must be ordered on Cols. 1-5.
3. The program is constructed of a 45 by 48 array (45 rows for an item value range of 0 to 44; 24 columns of 2 positions each for frequency counting the hourly number of occurrences). Counts are made in the appropriate item and hour cell of the array by selecting an hourly field from the input card and multiplying its value by 48. The product is then used as the index value to locate the cell in the array.
4. When a change in control is sensed (Cols. 1-5) the contents of the array are printed and cleared (Fig. 41).

Operation

This operation describes steps 8 and 9 on the Manpower Utilization Sequence Flowchart.

1. Maintain the sequence of the Manpower and Sortie summary deck and sort Col. 80 (AN).

2. Hold aside cards not punched with Col. 80=N.

3. Call Col. 80=N cards deck M1.

4. Punch a title card (format C5) as follows:

Columns	Punch	Field Description
1	$(11-3-8 punch)	Card identity
2-29	(See below)	Title

2 ⟶ 29

9 JANUARY THROUGH 18 JANUARY

5. Place data deck M1 (from step 3 above) behind the title card.

6. Place the deck behind the Manpower Matrix object program, Fig. 40.

7. Sense switches I/O, A--"on".

8. Load and go object program and data deck.

9. Program will
   a. Read cards.
   b. Develop frequency counts based on the value contained in each of the 24-hourly fields on the card.
   c. Card count the cards to show how many days are in the sample.
   d. Print and clear the array when a change in work center code (Cols. 1-5) is sensed, Fig. 41.

10. When the reader stops, press start to process the last cards.

11. Program will
    a. Print an end-of-job message.
    b. Halt at IC = 1041

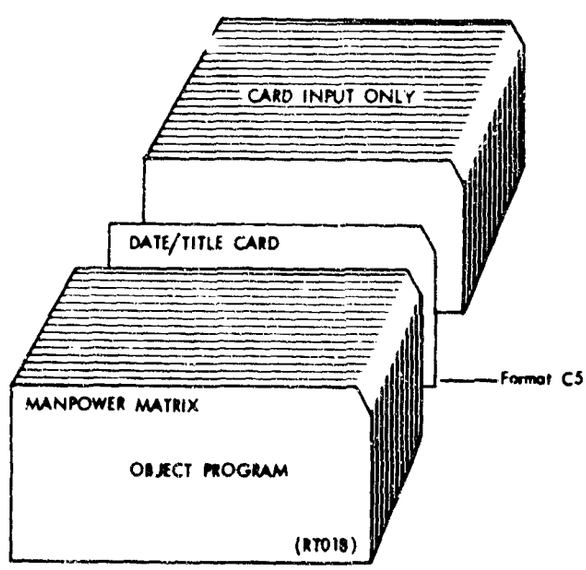


Fig. 40 -- Manpower matrix program setup

9 JANUARY THROUGH 18 JANUARY PREPARED FOR WORK CENTER 12041 PAGE 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
44																									44
43																									43
42																									42
41																									41
40																									40
39																									39
38																									38
37																									37
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24																									24
23																									23
22																									22
21									1																21
20										1															20
19																									19
18								1																	18
17																	1								17
16										1															16
15						1		1		2	1	1		2											15
14	1								2		1		1			1	1	1							14
13							1	2			1			1			1	1							13
12	1		1	1			2			1		1				1	2			1					12
11		2			1	1	1	2	1	3		1	1	1	2	2			1						11
10			1	2				1	4			3	1	2	3			1			1	1	1		10
9	2		2	1		1		1	1		2	1	1		3	3	1	3	1	4	1		3	1	9
8	1	1	1	1	2	2	2	1	1	1	3	2	1	1	1		2	1	2	2	3	1		3	8
7	1	2	1			2				1	1	1	2			2		1			3	3	1	1	7
6	1	1	1		1	2							1	3	1		1	1	3	1		2	3	2	6
5		3		2		1	3	1					1					1	2		1	1	2		5
4	2		1		2		1									1			1			1		1	4
3	1	1	1	2	2						1		1							2	1	1		2	3
2			1		1																				2
1				1																					1
0					1																				0
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	

10 DAYS INCLUDED ON THIS PAGE

Fig. 41 -- Manpower matrix: manpower utilization

Appendix A

KEYPUNCH FORMATS AND LIST OF FORMS AVAILABLE FOR RAND/TAC SYSTEM

For the reader's convenience, this appendix lists the forms included in Appendixes B through G of Volume I for the RAND/TAC system. Also included in this appendix are the Keypunch Formats.

Operations Forms

CD form 101	Sortie Debriefing
CD form 101	Debriefing of Combat
CD form 101	Degradation Factors During Flight to and from Target
CD form 101	Degradation Factors During Combat
CD form 101	Combat Crewmembers' Comments and Recommendations
CD form 101	BDA
CD form 102	Joint Services Anti-Aircraft Fire Incident and Damage Report
CD form 103	FAC Poststrike Debriefing Checklist

Maintenance Forms

MIP form 305 test/ RR form 300 test	Maintenance Data Collection Record
RAND form 300	Maintenance Data Collection Record
RAND form 302	Sorties Flown, Scheduled or Scrambled
RAND form 303	Aircraft Status Summary
RAND form 305	Manpower Availability
RAND form 306	AGE Utilization
RAND form 307	Mission Go
RAND form 308	Deviations/Degradations
RAND form 309	General Purpose Information Record
RAND form 30D	F-4C

Supply Forms

CD form 303	Record of Cannibalization
CD form 401 (Part A)	Demand Register
CD form 401 (Part B)	Demand Register
CD form 402	Receipt or Cancellation Register
CD form 403	NORS Register

Personnel Forms

CD form 200	Personnel Data Worksheet
CD form 201	Personnel Information Data
CD form 202	Supervisor's Information Data
CD form 204	Aircrew Experience Record

Facilities Forms

Form F-1	Airfield Facilities Survey--Monthly
Form F-2	Airfield Operations, Safety and Weather Survey--Daily
Form F-3	Motor Pool Survey--Weekly
Form F-4	Electrical Power Generation Survey--Monthly
Form F-5	POL Facilities Survey--Monthly
Form F-6	Munitions Facilities Survey--Monthly
Form F-7	Supply Facilities Survey--Monthly
Form F-8	Maintenance Facilities Survey--Weekly

Keypunch Formats

Edit Program Input

F Format A	Debrief Summary
Format B	Form 300 (On-aircraft maintenance)
Format C	Sortie-Scheduled and/or Flown
Format D	Status Card
Format E	Manpower Available
Format F q	AGE Utilization
Format G	Mission Go
Format H	Deviation/Degradation
Format I	General Purpose Comment

Edit Program Output

Format J	Debrief Summary
Format K	On-Aircraft Maintenance
Format L	On-Aircraft Work Delay
Format M	Sortie Flown
Format N	Sortie Scheduled, Not Flown
Format P	Sortie Comment
Format Q	Aircraft Status
Format R	Manpower Available
Format S	AGE Utilization
Format T	Mission Go
Format U	Deviation/Degradation Comment
Format V	General Purpose Comment

Program Output Summary Cards

Format W	24-hour Spread
Format X	Analysis of Variance
Format Y	RECSUM
Format Z	Frequency Count
Format AA	Off-Equipment (AFTO 211) Manhour

Program Control Cards

Format C1	Lag/Delay
Format C2	Analysis of Variance
Format C3	Aircraft Histogram
Format C4	Table Loading Stopper
Format C5	Manpower Utilization Title Card

Keypunch Instructions and Formats (Continued)

Program Control Cards (Continued)

Format C6	Edit Program Gangpunch Master Card
Format C7	Display Program Date Select
Format C8	Display Program Tape Output
Format C9	Tape Input
Format C10	General Title Card
Format C11	Histogram Title Card
Format C12	Field Selector
Format C13	Compute Elapsed Time Program--Code Selector
Format C14	Frequency Count (FREQ) Field Locator Card
Format C15	Chi-Square Title Card
Format C16	Chi-Square Field
Format C17	Correlation Field Designation
Format C18	Correlation General Title Card
Format C19	Correlation Field Designation Table Stopper Card
Format C20	Correlation Independent Variable Test Control Card
Format C21	Analysis of Variance Header Card

Master Tables

Format M1	Work Center Master
Format M2	Tail Number Master
Format M3	2-Digit System Table
Format M4	Edit Program AGE Table

Clint Program Summary Records

Format R1	Aircraft
Format R2	2-Digit System
Format R3	Work Center

Combat Dragon Card Form 101 Operations Cards

Format CD1	Sortie Debriefing
Format CD2	Debriefing of Combat
Format CD3	En Route Degradation Factors
Format CD4	Degradation Factors on Target
Format CD5	Flight Crew Comments and Recommendations
Format CD6	BDA
Format CD7	Battle Damage Assessment Remarks

Combat Dragon Supply Edit Output Cards

Format CD8	Demands, Receipts, and Cancellations
Format CD9	Cannibalization Tape Format
Format CD10	NORS

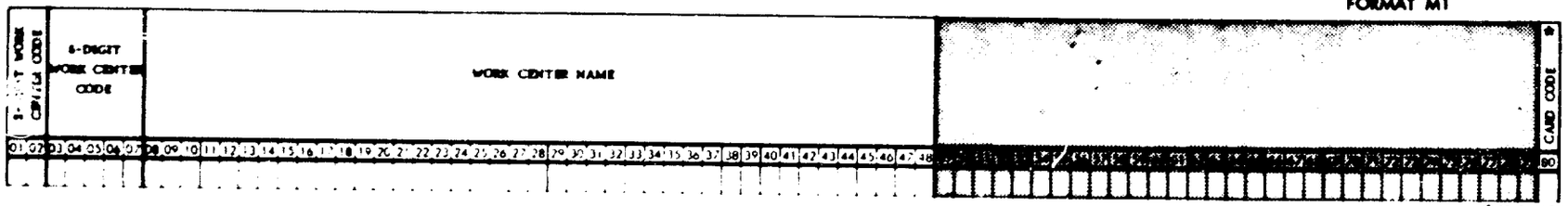
Combat Dragon Supply Edit Input Cards

Format CD11	Demands, Receipts, and Cancellations
Format CD12	Cannibalization Card Format
Format CD13	NORS

MASTER TABLES

WORK CENTER MASTER

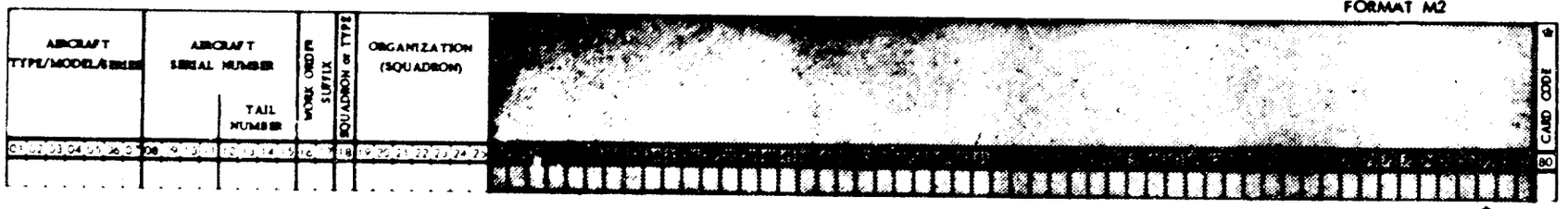
FORMAT M1



* 12 PUNCH

TAIL NUMBER MASTER

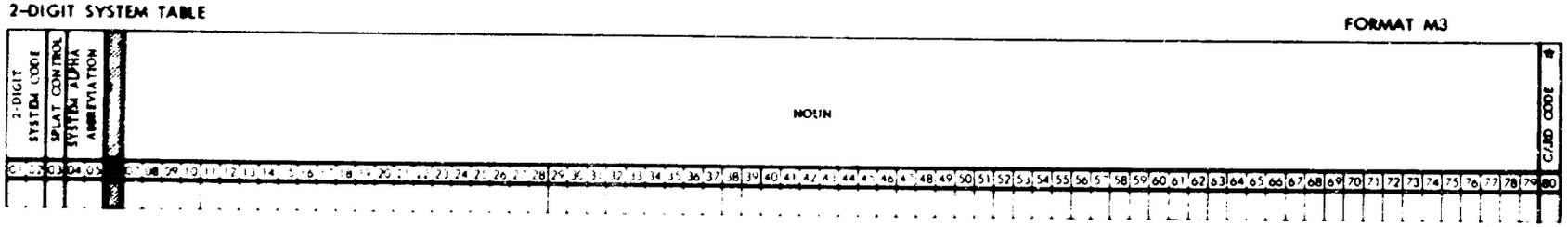
FORMAT M2



* 11 PUNCH

2-DIGIT SYSTEM TABLE

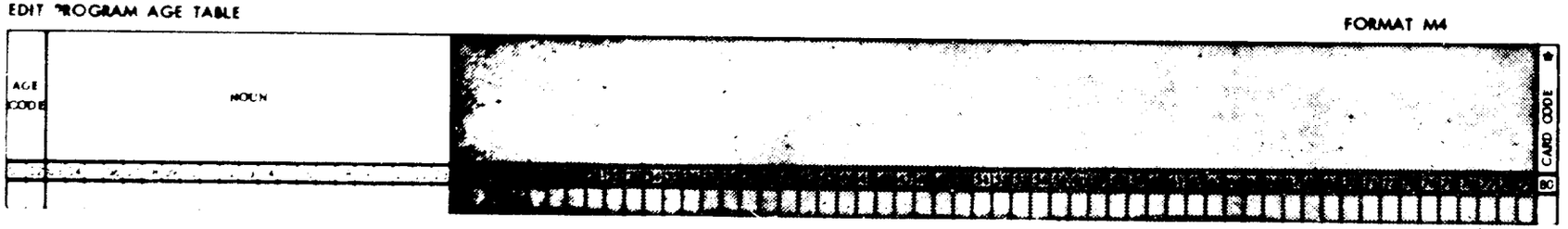
FORMAT M3



* 11-3-8 PUNCH

EDIT PROGRAM AGE TABLE

FORMAT M4

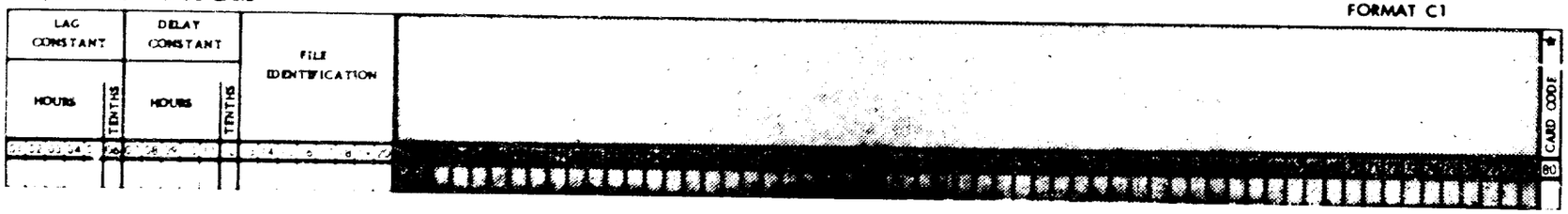


* 0-1 PUNCH

PROGRAM CONTROL CARDS

LAG/DELAY CONTROL CARD

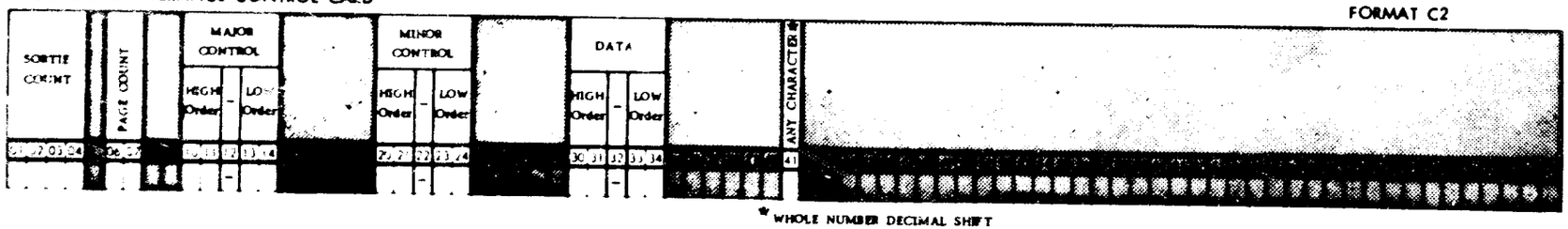
FORMAT C1



* 11 PUNCH

ANALYSIS OF VARIANCE CONTROL CARD

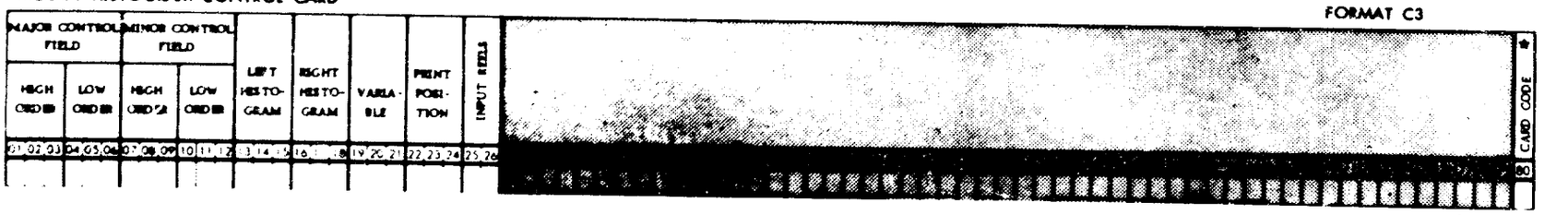
FORMAT C2



* WHOLE NUMBER DECIMAL SHIFT

AIRCRAFT HISTOGRAM CONTROL CARD

FORMAT C3



* 11-3-8 PUNCH

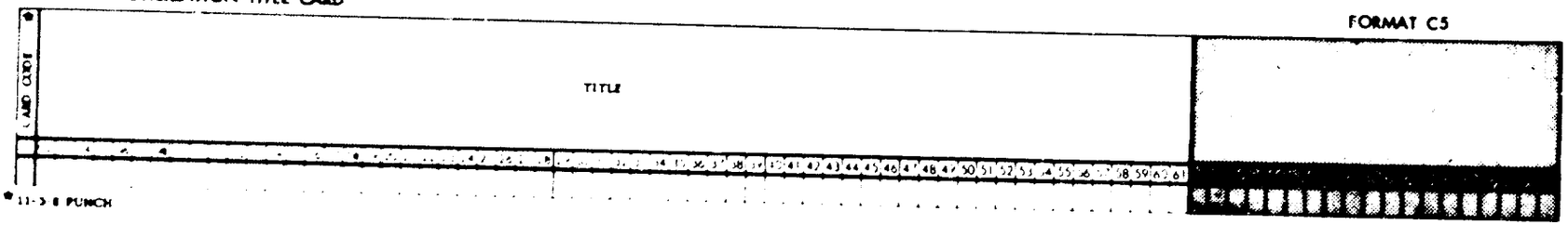
PROGRAM CONTROL CARDS

TABLE LOADING STOPPER

FORMAT C4

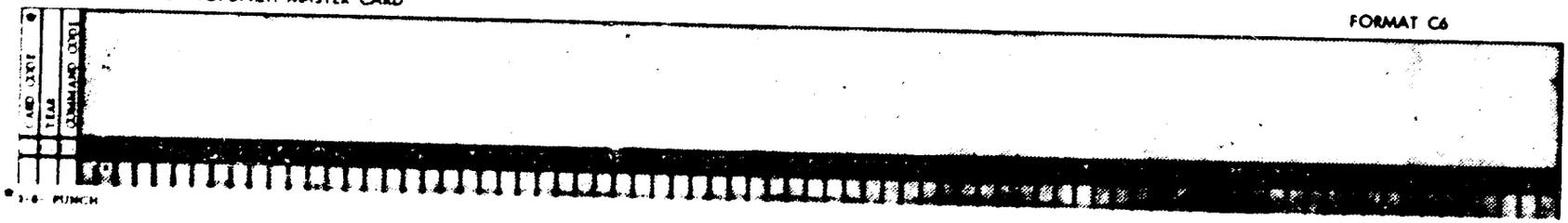
MANPOWER UTILIZATION TITLE CARD

FORMAT C5



EDIT PROGRAM GANGPUNCH MASTER CARD

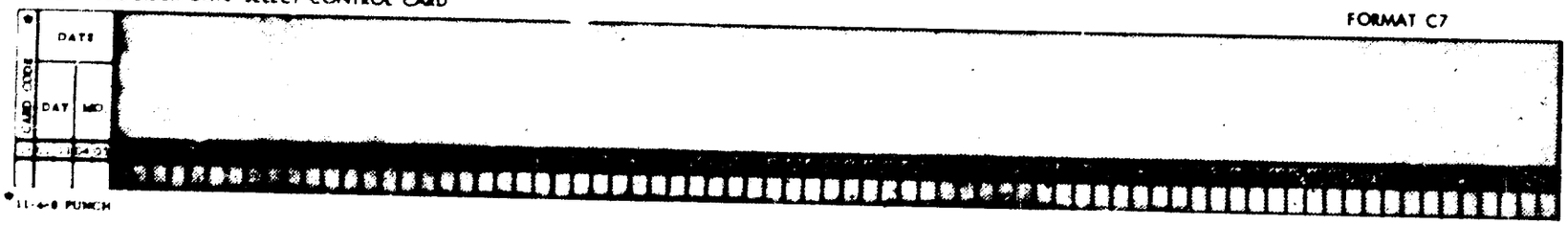
FORMAT C6



PROGRAM CONTROL CARDS

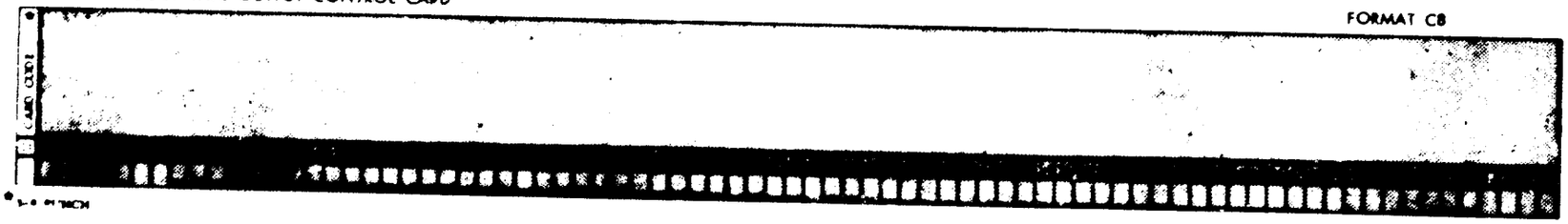
DISPLAY PROGRAM DATE SELECT CONTROL CARD

FORMAT C7



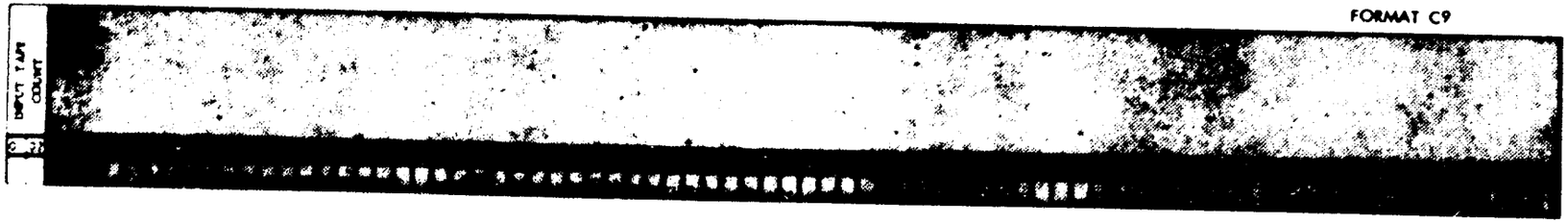
DISPLAY PROGRAM TAPE OUTPUT CONTROL CARD

FORMAT C8



TAPE INPUT CONTROL CARD

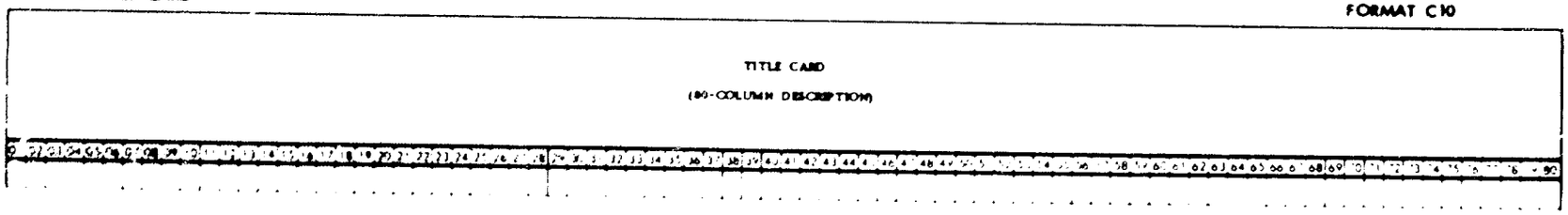
FORMAT C9



PROGRAM CONTROL CARDS

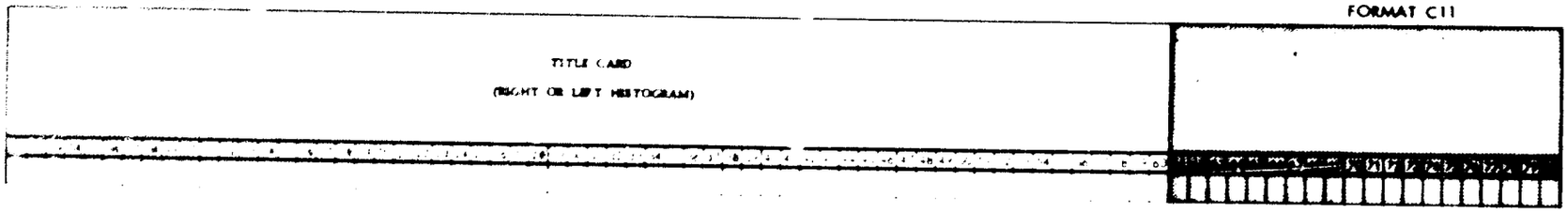
GENERAL TITLE CARD

FORMAT C10



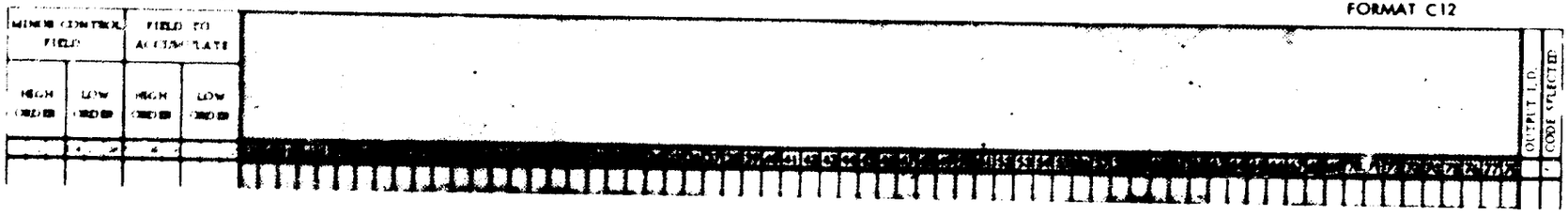
HISTOGRAM TITLE CARD

FORMAT C11



FIELD SELECTOR CONTROL CARD

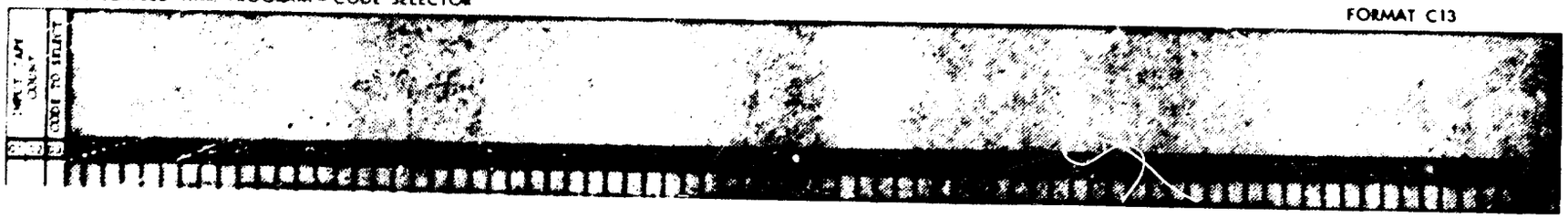
FORMAT C12



PROGRAM CONTROL CARDS

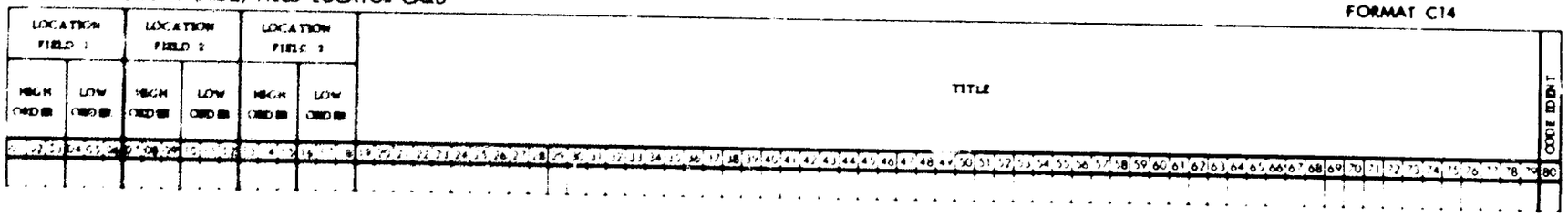
COMPUTE ELAPSED TIME PROGRAM - CODE SELECTOR

FORMAT C13



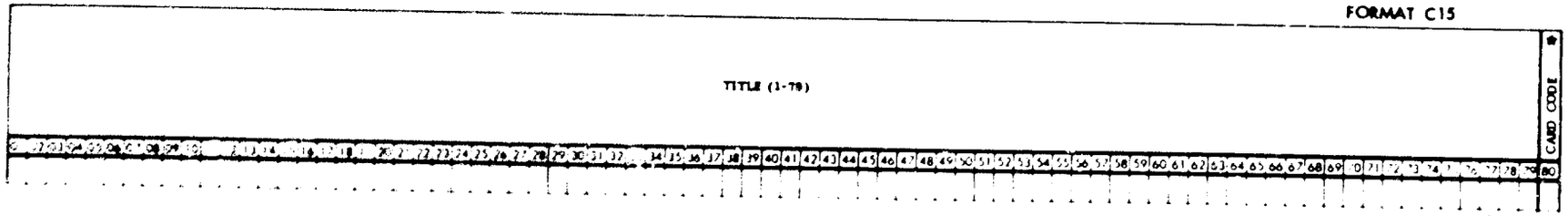
FREQUENCY COUNT (FREQ) FIELD LOCATOR CARD

FORMAT C14



CHI-SQUARE TITLE CARD

FORMAT C15



*12 PUNCH

PROGRAM CONTROL CARDS

CHI-SQUARE FIELD CONTROL CARD

FORMAT C16

LOCATION OF BASE-LINE COUNT		LOCATION OF OBSERVED FREQUENCY COUNT		LOCATION OF CATEGORY IDENTIFICATION		LOCATION OF MAJOR CONTROL		INPUT TAPE COUNT		CARD CODE*
HIGH ORDER	LOW ORDER	HIGH ORDER	LOW ORDER	HIGH ORDER	LOW ORDER	HIGH ORDER	LOW ORDER			
01,02,03	04,05,06	07,08,09	10,11,12	13,14,15	16,17,18	19,20,21	22,23,24	25,26		80

* 11 PUNCH

CORRELATION FIELD DESIGNATION CONTROL CARD

FORMAT C17

VARIABLE NUMBER	MATRIX COLUMN HEADINGS	FIELD POSITION		ANY CHARACTER*
		HIGH ORDER	LOW ORDER	
01,02	04,05,06,07,08,09	11,12,13	14,15,16	18

* WHOLE NUMBER DECIMAL SHIFT

CORRELATION GENERAL TITLE CARD

FORMAT C18

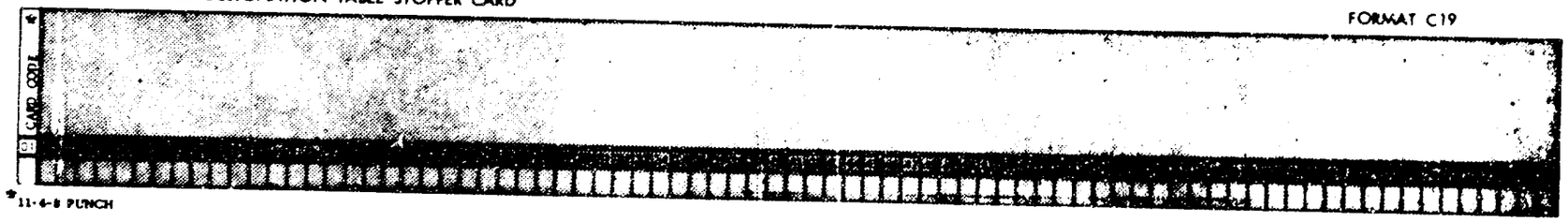
CARD CODE*	TITLE
01	02,03,04,05,06,07,08,09,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80

* 0-1-8 PUNCH

PROGRAM CONTROL CARDS

CORRELATION FIELD DESIGNATION TABLE STOPPER CARD

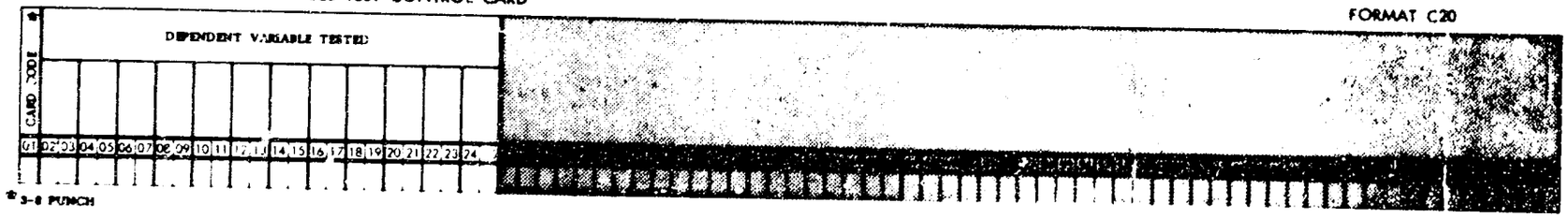
FORMAT C19



*11-4-8 PUNCH

CORRELATION DEPENDENT VARIABLE TEST CONTROL CARD

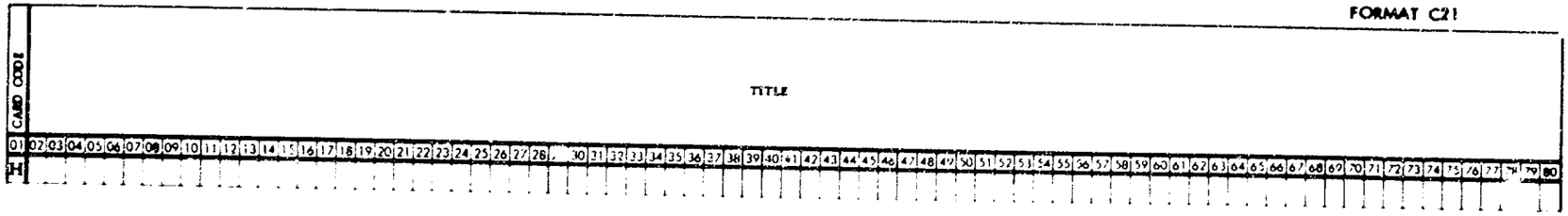
FORMAT C20



*3-8 PUNCH

ANALYSIS OF VARIANCE HEADER CARD

FORMAT C21



EDIT PROGRAM INPUT

DEBRIEF SUMMARY

FORMAT A

DATE		AIRCRAFT TAIL NUMBER	MISSION NUMBER	CHOCK TIME		SYSTEM FUNCTIONING (BLANK = USED AND OK; 1 = USED – MALFUNCTION; 2 = NOT USED)	COMMENTS OR ADDITIONAL CODES	CARD CODE
DAY	MO.			HR.	MIN.			
01 02	03 04	05 06 07 08	09 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
								D

FORM 300 (ON-AIRCRAFT MAINTENANCE)

FORMAT B

AIRCRAFT TAIL NUMBER	SUFFIX	DATE		BASIC WORK CENTER	REPORT		WORK ORDER PREFIX	START TIME		STOP TIME		CREW SIZE	WORK UNIT CODE	ACTION TAKEN	WHEN DISCOVERED	HOW MALFUNCTION	UNITS PRODUCED	ASSISTING WORK CENTER	AFTO 211 ACTION	AIRFRAME HOURS	SYMBOL	MISSION DAY	MISSION NUMBER	LOCAL USE	CARD CODE
		DAY	MO.		NUMBER	LINE		HR.	MIN.	HR.	MIN.														
01 02 03 04	05 06	07 08	09 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	80
																									0

SORTIE — SCHEDULED AND/OR FLOWN

FORMAT C

DATE		MISSION NUMBER	LOAD CONFIGURATION	SCHED. TAKEOFF		SCHED. DURATION		AIRCRAFT TAIL NUMBER	ACTUAL TAKEOFF TIME		CHOCK TIME		COMMENTS	CARD CODE
DAY	MO.			HR.	MIN.	HR.	MIN.		HR.	MIN.	HR.	MIN.		
01 02	03 04	05 06	07 08	09 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
														2

EDIT PROGRAM INPUT

STATUS CARD

FORMAT D

AIRCRAFT TAIL NUMBER	STATUS CODE	INTO STATUS		OUT OF STATUS		NORS WORK UNIT CODE	NORS G N CODE	JULIAN DATE		CARD CODE
		HRS.	TENTHS	HRS.	TENTHS			YEAR	DAY	
										3

MANPOWER AVAILABLE

FORMAT E

DATE		WORK CENTER	AVAILABLE												FIRST SHIFT				SECOND SHIFT				THIRD SHIFT				CARD CODE
			FIRST SHIFT				SECOND SHIFT				THIRD SHIFT				START		STOP		START		STOP		START		STOP		
			SKILL LEVEL				SKILL LEVEL				SKILL LEVEL																
DAY	MO.		9	7	5	3	9	7	5	3	9	7	5	3	HR.	MIN.	HR.	MIN.	HR.	MIN.	HR.	MIN.	HR.	MIN.	HR.	MIN.	80
																											5

AGE UTILIZATION

FORMAT F

DATE		EQUIP-MENT		AIRCRAFT TAIL NUMBER	USING WORK CENTER	SPOT TIME		START TIME		STOP TIME		REMOVE TIME		CARD CODE
DAY	MO.	TYPE	NUMBER			HR.	MIN.	HR.	MIN.	HR.	MIN.	HR.	MIN.	80
01 02	03 04	05 06	07 08	09 10 11 12	13 14 15 16 17	18 19	20 21	22 23	24 25	26 27	28 29	30 31	32 33	6

EDIT PROGRAM INPUT

MISSION GO

FORMAT G

DATE		AIRCRAFT TAIL NUMBER	TIME			CARD CODE
DAY	MO.		HR.	MIN.		

DEVIATION/DEGRADATION

FORMAT H

DATE		AIRCRAFT TAIL NUMBER	MISSION NUMBER	SCHED. TAKEOFF		DEVIATION CODE	WORK UNIT CODE	COMMENTS OR ADDITIONAL CODES	CARD CODE
DAY	MO.			HR.	MIN.				

GENERAL PURPOSE COMMENT

FORMAT I

DATE		AIRCRAFT TAIL NUMBER	MISSION NUMBER	TIME		COMMENTS	CARD CODE
DAY	MO.			HR.	MIN.		

EDIT PROGRAM OUTPUT

DEBRIEF SUMMARY — FORMAT J

INERTIAL NAV	UHF-ADF	SIGHT	GUNPOD	AUTOPILOT	WCS		TIME					TAIL NUMBER		SQUADRON	CARD CODE
							DAY	MO.	HR.	MIN.					
															M

ON-AIRCRAFT MAINTENANCE — FORMAT K

	START TIME				STOP TIME					CREW SIZE		BASIC WORK CENTER	WORK ORDER PREFIX	TAIL NUMBER	WORK ORDER SUFFIX	MAN NUMBER	WORK UNIT CODE	ACTION TAKEN	WHEN DISCOVERED	HOW MALFUNCTION	UNITS	LABOR HOURS		ASSISTING WORK CENTER		REPORT NUMBER	SQUADRON	CARD CODE
	DAY	MO.	HR.	MIN.	DAY	MO.	HR.	MIN.														HOURS	TENTHS					
																											79	80
																												G

ON-AIRCRAFT WORK DELAY — FORMAT L

	START TIME				STOP TIME					BASIC WORK CENTER	WORK ORDER PREFIX	TAIL NUMBER	WORK ORDER SUFFIX		WORK UNIT CODE		WHEN DISCOVERED	DELAY CODE		ASSISTING WORK CENTER		REPORT NUMBER	SQUADRON	CARD CODE
	DAY	MO.	HR.	MIN.	DAY	MO.	HR.	MIN.																
	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24		28 29 30 31 32	33 34	35 36 37 38	39 40		46 47 48 49 50		52	53 54 55		62 63 64 65 66		73 74 75 76 77 78	79	80
																								1

EDIT PROGRAM OUTPUT

SORTIE FLOWN

FORMAT M

SCHEDULED TAKEOFF				ACTUAL TAKEOFF				LANDING				SCHED. FLY TIME		TAIL NUMBER	DEVIATION CODE	CREW		LOAD CONFIGURATION	MISSION	SQUADRON	CARD CODE
DAY	MO.	HR.	MIN.	DAY	MO.	HR.	MIN.	DAY	MO.	HR.	MIN.	HR.	MIN.			1	2				
01 02	03 04	05 06	07 08	09 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	2

SORTIE SCHEDULED, NOT FLOWN

FORMAT N

SCHEDULED TAKEOFF				SCHEDULED TAKEOFF				SCHED. FLY TIME		TAIL NUMBER	DEVIATION CODE	CREW		LOAD CONFIGURATION	MISSION	SQUADRON	CARD CODE
DAY	MO.	HR.	MIN.	DAY	MO.	HR.	MIN.	HR.	MIN.			1	2				
01 02	03 04	05 06	07 08	09 10	11 12	13 14	15 16	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	S

SORTIE COMMENT

FORMAT P

MISSION CODE	Load Configuration	TIME				Last 2 digits of Load Configuration	CREW 1	CREW 2	COMMENTS (1)	TAIL NUMBER	COMMENTS (cont.)	COMMENTS (cont.)	SQUADRON	CARD CODE
		DAY	MO.	HR.	MIN.									
01 02 03 04 05 06	07 08	09 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	B

EDIT PROGRAM OUTPUT

AIRCRAFT STATUS

FORMAT Q

(shaded)	INTO STATUS				OUT OF STATUS				(shaded)	STATUS CODE	(shaded)	TAIL NUMBER	(shaded)	NORS WORK UNIT CODE	N or G	(shaded)	SQUADRON	CARD CODE
	DAY	MO.	HR.	MIN.	DAY	MO.	HR.	MIN.										
	09 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24		26		35 36 37 38		46 47 48 49 50	51		79	80
																		3

MANPOWER AVAILABLE

FORMAT R

WORK CENTER	DATE		(shaded)	MANPOWER AVAILABLE BY HOUR																								(shaded)	CARD CODE
	DAY	MO.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
01 02 03 04 05	06 07	08 09		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		80
																													E

AGE UTILIZATION

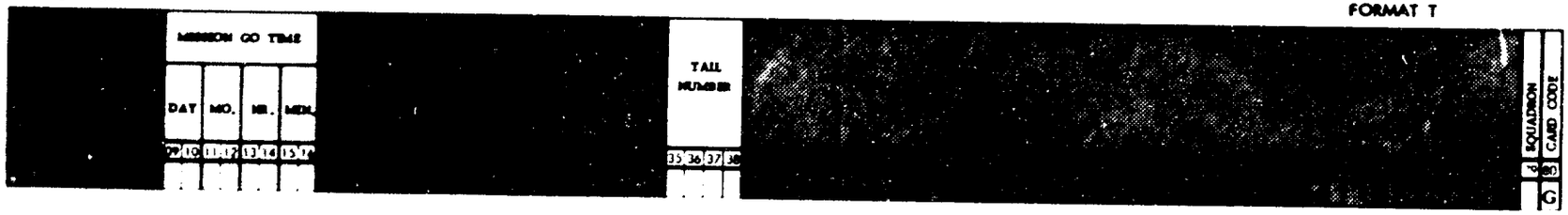
FORMAT S

SPOT TIME				START TIME				STOP TIME				(shaded)	QUANTITY	AGE TAIL NUMBER	REMOVE TIME		(shaded)	TAIL NUMBER	SUFFIX	NOUN	WORK CENTER	NOUN (cont.)	(shaded)	AGE CODE	(shaded)	NOUN (cont.)	(shaded)	SQUADRON	CARD CODE
DAY	MO.	HR.	MIN.	DAY	MO.	HR.	MIN.	DAY	MO.	HR.	MIN.				HR.	MIN.													
01 02	03 04	05 06	07 08	09 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24		26	27 28	29 30	31 32		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		65 66		73 74 75 76 77		79	80
																													F

EDIT PROGRAM OUTPUT

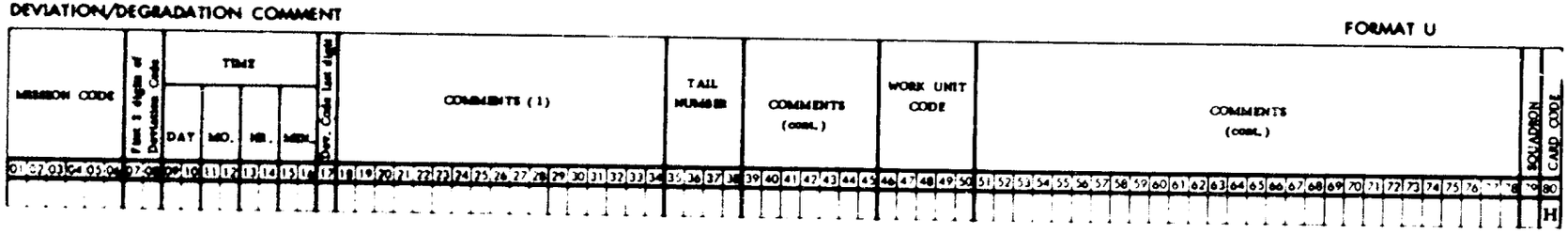
MISSION GO

FORMAT T



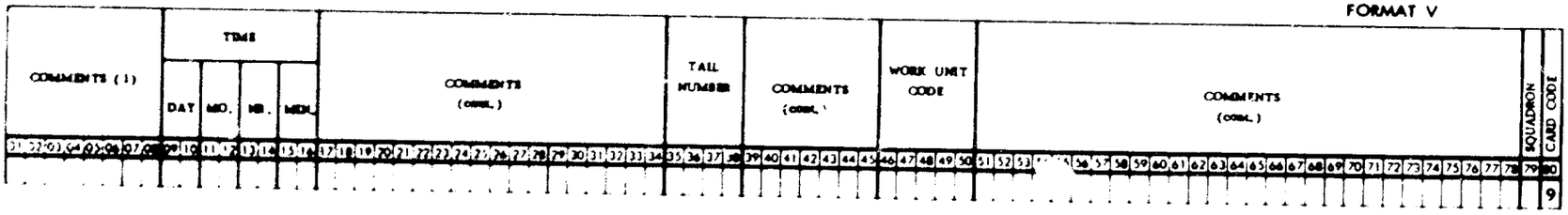
DEVIATION/DEGRADATION COMMENT

FORMAT U



GENERAL PURPOSE COMMENT

FORMAT V



PROGRAM OUTPUT SUMMARY CARDS

24-HOUR SPREAD SUMMARY CARD

FORMAT W

WORK CENTER OR AGE CODE	DATE			24-HOUR SPREAD																							MANHOURS			
	DAY	MO.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	HOURS	TENTHS	PRI/SEC	CARD CODE

ANALYSIS OF VARIANCE OUTPUT SUMMARY

FORMAT X

WRITE COUNT		FREQUENCY COUNT	MINOR CONTROL CODE		MAJOR CONTROL CODE

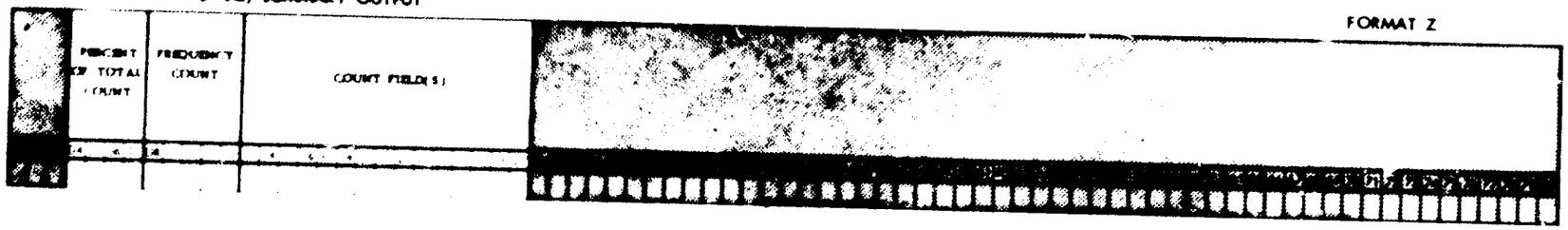
RECSUM PROGRAM SUMMARY

FORMAT Y

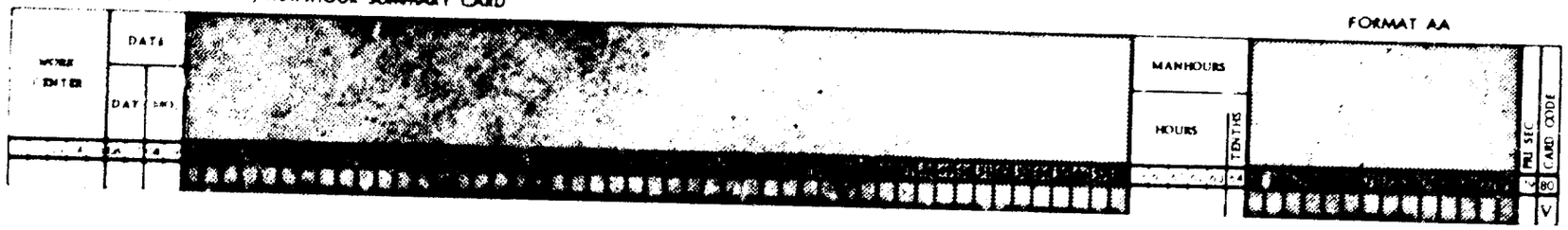
MAJOR CODE	MINOR CODE	COUNT (ALL RECORDED)	COUNT (ZERO DATA OMITTED)	LAG	DELAY	NET FIX	GROSS FIX	MANHOURS	HORS	NORM	FLYING HOURS	UNITS	BREAKS	WRITE-UPS

PROGRAM OUTPUT SUMMARY CARDS

FREQUENCY COUNT (FREQ) SUMMARY OUTPUT



OFF-EQUIPMENT (AFTO 211) MANHOUR SUMMARY CARD



CLINT PROGRAM SUMMARY RECORDS

AIRCRAFT — FORMAT R1

SQUADRON & TYPE	CARD CODE	TAIL NUMBER	SORTIE TOUCHDOWN TIME					SHIFT	LOAD CONFIGURATION	W R M	S Y L	NORS CODE		LAG		DELAY		FIX		RECOVERY		NORS		NORM		UNITS	MANHOURS		FLY TIME		RUN IDENTIFICATION
			YEAR	MO.	DAY	HR.	MIN.							HOURS	TENTHS	HOURS	TENTHS	HOURS	TENTHS	HOURS	TENTHS	HOURS	TENTHS	HOURS	TENTHS		HOURS	TENTHS	HRS.	TENTHS	
	7																														

2-DIGIT SYSTEM — FORMAT R2

SQUADRON & TYPE	CARD CODE	TAIL NUMBER	SORTIE TOUCHDOWN TIME					SHIFT	LOAD CONFIGURATION	W R M	S Y L	NORS CODE	2-DIGIT SYSTEM		LAG		DELAY		FIX		RECOVERY			UNITS	MANHOURS		FLY TIME		RUN IDENTIFICATION
			YEAR	MO.	DAY	HR.	MIN.								HOURS	TENTHS	HOURS	TENTHS	HOURS	TENTHS	HOURS	TENTHS			HOURS	TENTHS	HRS.	TENTHS	
	8																												

WORK CENTER — FORMAT R3

SQUADRON & TYPE	CARD CODE	TAIL NUMBER	SORTIE TOUCHDOWN TIME					SHIFT	LOAD CONFIGURATION	W R M	S Y L	NORS CODE	WORK CENTER	LAG		DELAY		FIX		RECOVERY			UNITS	MANHOURS		FLY TIME		RUN IDENTIFICATION
			YEAR	MO.	DAY	HR.	MIN.							HOURS	TENTHS	HOURS	TENTHS	HOURS	TENTHS	HOURS	TENTHS			HOURS	TENTHS	HRS.	TENTHS	
	9																											

Appendix B

COMBAT DRAGON OPERATIONS AND SUPPLY EDIT PROGRAMS

This appendix describes two programs required to edit data punched from Combat Dragon form 100 (operations) and forms 303, 401, 402 and 403 (supply). The forms are described in Volume 1 of this series.

This documentation was extracted from Volume IV of the Combat Dragon exercise final report.

Although not shown in the program deck setup, each program should be preceded by the TAC conventional self-loading date card.

PROGRAM A9C02: CD FORM 101 Z CARD EDIT

Purpose

This program audits the data keypunched from the Combat Dragon Form 101 (Col. 80=Z, Col. 79=N through T) and provides a listing of all input data cards with applicable field headings.

Erroneous records are denoted by the word "ERROR" printed to the right with asterisks printed below the individual fields containing errors. The program checks the validity of the following data entries: mission number, tail number, dates, times, mission types, target types, ordnance codes, weather, air speeds, altitude, scores, and so on.

Method

The program requires that the input data be sorted in the sequence listed in the operating procedure. Sense switch settings allow for the following options:

1. Audit only (switches I/O, A and C "on")--generates printout of all data cards.
2. Audit current data and generate new data tape (switches I/O, A, B--"on")--generates printout of all data cards and writes all error free records on tape.
3. Audit current data and update previous cumulative tape (switches I/O, A--"on")--generates printout of all data cards and updates the previous cumulative data tape. The cumulative data tape, mounted on unit 2, is copied onto the tape on unit 1 before auditing and writing of the current day's data.

All code tables required for the audit are built into the program.

Operation

1. Sort the Col. 80=Z, Col. 79=N through T daily input cards:

Major	9-10	N	month
	7-8	N	day
	1-2	N	CDM number
	3-6	N	tail number
	79	AN	card code
	26	N	(varies by card type)
Minor	78	AN	sequence code

2. Sense switches I/O, A, B, D--"on".

3. Mount a tape on unit 1.
4. Place input data behind object program.
5. Load and go program and data deck.
6. Program will
   a. Read cards.
   b. Perform edit of each card.
   c. Print all cards with applicable field headings.
   d. Print a line containing asterisks locating a column or field in error.
   e. Write all error-free records on the tape on unit 1.
7. When the reader stops, press start to process last card.
8. Program will
   a. Write an end-of-file on the tape on unit 1.
   b. Rewind and unload unit 1.
   c. Print end-of-job message.
   d. Halt at IC = 2907.

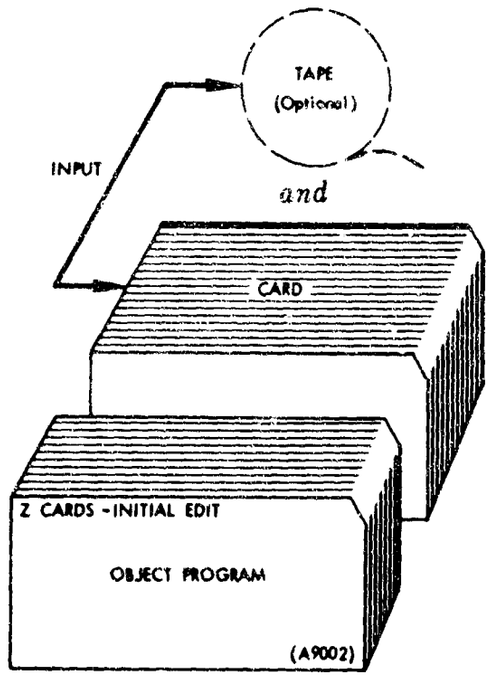


Fig. 42 -- CD101 Z cards (initial edit) program setup

```
                                                                                                                                  PAGE    1
CDM TAIL DATE FRAGN CALL... F/   A/G-ABORT   RECOVER DIVERTO ..ENROUTE.. CT OPS     G S ..ORD-JETTISONED...                      CARD
                    ...SIGN /I    RSN TIME  RSN TIME          NT NR CT CR    SUPPORT C C NOC NOC NOC NOC NOC                     IDENT
 01 4510 1508 00001 COMD001 11   A WX 1400                                                                                          NZ
                                                ** ****          *  *  *  *  *          *   *** *** *** *** ***                    ERROR
 01 4510 1508 00001 COMD001 11   A WX 1400   NO 1100 BORDER   T  R  U  F  F POTLUCK N N 1CA 1CA 1CA 1CA 1CA                          NZ
                                TYPE-REMARKS OF DEGRADING FACTORS DURING FLIGHT TO AND FROM TARGET                                IDENT
 01 4510 1508 00001 COMD001 11    12 GROUNDED                                                                                        OZ
                                    .....UTM. COORDINATES..... RF CT FC TA TR TU OA CH AC T T T                                    CARD
                                PDS 1ST-TGT. 2ND-TGT. 3RD-TGT.                                  1 2 3                             IDENT
 01 4510 1508 00001 COMD001 11   SDP 01000200                   01 02 03 04 05 06 07 08 09 A                                        PZ
                                    **        ******** ********                                  * *                                ERROR
                                TYPE-REMARKS OF DEGRADATION FACTORS DURING COMBAT                                                 IDENT
 01 4510 1508 00001 COMD001 11    11 CLOUD COVER                                                                                     QZ
                                TYPE-PILOTS COMMENTS AND RECOMMENDATIONS                                                          IDENT
 01 4510 1508 00001 COMD001 11    10 IMPAIRED VISIBILITY ON ROLL                                                                     RZ
                                N TY C .ORD-EXPENDED. STRUCTS SAMPANS TARGET( SEC ...DUDS.... TOT TGT BOMROC-HANG                 CARD
                                     T NO NO NO NO NO DES DAM DES DAM COV ORD EXP NOF NOF NOF KBA ELE OS OS OS OS                 IDENT
 01 4510 1508 00001 COMD001 11   1 HT 1 6I 5W 4H 3V 2K  05  10  00  00 085 098  01 000 000 000  02 020 00 00 00 00                     SZ
 01 4510 1508 00001 COMD001 11   8 PB 8 6I 5W 4H 3V 2K                                653 IWV ABC                                     SZ
                                * ** *                  **  **  **  ** *** ***  **  ** *   **   ** *** ** ** ** **                 ERROR
                                OTHER BATTLE DAMAGED ASSESMGNT REMARKS                                                            IDENT
 01 4510 1508 00001 COMD001 11       MISSION SUCCESSFUL                                                                                TZ
```

```
READ      9 CARDS
FOUND     3 CARDS IN ERROR
READ        RECORDS FROM TAPE 2
WROTE       RECORDS TO TAPE 1


  END OF JOB
```

Figure 43

PROGRAM D9001: SUPPLY U/X/W CARD EDIT

Purpose

This program audits the data keypunched from COMBAT DRAGON forms 303 (col 80=W), 401 and 402 (col 80=U) and 403 (col 80=X) and provides a listing of all input data cards with applicable field headings. Erroneous records are denoted by the word "ERR" printed to the right with mnemonics printed below the individual fields containing errors. The program checks the validity of the following data entries: FSN, stock number, unit of issue, account number, shops, Julian dates, tail numbers, AGE equipment, engines, work unit codes, document numbers, time of demand, dates, and times received or canceled. In addition, the program computes elapsed times for all items received, canceled or on suspense and, on and off time for NORS. "From" and "to" actions are checked on cannibalization records.

Method

The program requires that each type of data be sorted in the sequence listed in the operating procedure. Only error-free non-suspense records are written on the tape output file. Sense switch options are the same as listed for program A9001.

1. Audit only (switches I/0, A and C "on")--generates printout of all data cards.
2. Audit current data and generate new data tape (switches I/0, A, B--"on")--generates printout of all data cards and writes all error free records on tape.
3. Audit current data and update previous cumulative tape (switches I/0, A--"on")--generates printout of all data cards and updates the previous cumulative data tape. The cumulative data tape, mounted on unit 2, is copied onto the tape on unit 1 before auditing and writing of the current day's data.

As with program A9001, all code tables required for the audits are built into the program.

Operation

1. Order each input data type as follows:

Column 80	Sort	
U	23-36	AN
W	31-44	AN
X	23-36	AN

2. Combine the 3 decks in this order: U, W, X.
3. Sense switches I/O, A, B--"on".
4. Mount a tape on unit 1.
5. Place input data behind object program.
6. Load and go program and data deck.
7. Program will
   a. Read cards.
   b. Perform edit of each card.
   c. Print all cards with applicable field headings.
   d. Print a line containing asterisks locating a field or column in error.
   e. Write all error-free records on the tape on unit 1.
8. When the reader stops, press start to process last card.
9. Program
   a. Write an end-of-file on the tape on unit 1.
   b. Rewind and unload unit 1.
   c. Print an end-of-job message.
   d. Halt at IC = 2630.

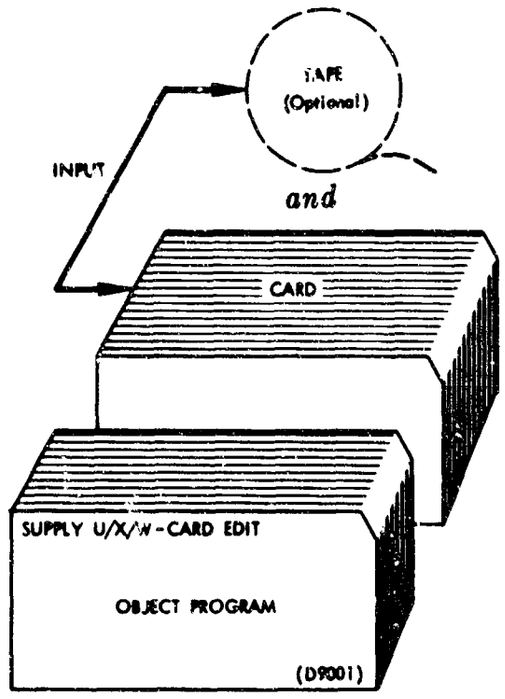


Fig. 44 -- Supply U/X/W (card edit) program setup

DEMAND REGISTER / RECEIPT OR CANCELLATION / ON-NORS OR OFF-NORS / CANNIVALIZATION * U/X/W EDIT PROCESSED ON

PAGE 1

....STOCK NUMBER.... FSC. PR FIIN... ADD.	QTY REQ	U/ /I	.SUPPLY DOCUMENT NUMBER. SVS ACC SHOP JULIAN S-N.	DEL PRI	TAIL NR.	EQUIP TYPE.	MX-DOC NUMBER	W/U/C	MSN-NUMBER DY MO CDM	F/ /K	TIME A DFMA V	RCPT/CANX C JULI TIME	ELAPS TIME	I D U
1560 0277020 SE	001	EA	X 465 PF 7282 0010	03	4504	A37A	12995C	11227	09 10 74		0925 B	7336 1200 F	5[illegible]	U
1560 P4 0116004	001	EA	X 465 PF 7282 0078	03	4504	A37A	12994A	11319	09 10 74		0830 G	7336 2400 P	111.5	U
5821 2170457	002	EA	X 465 MX 7275 0146	02	4514	A37A	15181J	65[illegible]11	02 10 [illegible]9		1120 H	7336 2400 I F	076.6	U ERR
2915 8242716	001	EA	X 465 PF 7282 0092	03	4504	A37A	12994C	46233	09 10 74		0850 G	7336 1200 C	599.1	U

....STOCK NUMBER.... FSC. PR FIIN... ADD.	QTY REQ	W-U-C FOR	PART FOR TAIL NR.	.SUPPLY DOCUMENT NUMBER. SVS ACC SHOP JULIAN S-N.	PART TAIL N.	DM	MX-CTL-ACTION JULIAN TIME	..FOR. RPT NR	.FROM. RPT NR	CANN S-N.	EQUIP TYPE.	I D W ERR
5895 90[illegible]96 FA	01	EEEEE	674522	X 465 MX 7219 0064	674527		7234 2230	15219A	15323[illegible]	00[illegible]	A37	
5895 9001196 FA	01	65111	674522	X 465 MX 7219 0064	674527		7234 2230	15219A	15323[illegible]	00[illegible]	A37	W
6115 NC 405144P SE	01	42111	674520	X 465 MX 72[illegible]3 0142	248062		7234 1800	14591P N	676123	020	J85	W ERR

....STOCK NUMBER.... FSC. PR FIIN... ADD.	QTY REQ	.SUPPLY DOCUMENT NUMBER. SVS ACC SHOP JULIAN S-N.	TAIL NR.	EQUIP TYPE.	W/U/C	..ON-NORS.. JULIAN TIME	..OFF-NORS.. JULIAN TIME		CODE	I D
6680 6635732	001	X 465 EE 7216 0122	4520	A37A	EEEEE	7216 1345	7228 0930	A	283.7	X ERR
6680 6635732	001	X 465 MX 7216 0122	4520	A37A	63211	7216 1345	7228 0930	A	283.7	X
2995 9417436 PL	001	X 465 ES 7216 0172	4622 ****	A37A	2388M	7214 1000	7233 1130	A	457.5	X ERR
2995 9417436 PL	001	X 465 ES 7216 0172	4522	A37A	2388M	7214 1000	7233 1130	A	457.5	X
2915 8422574	001	X 465 MX 7218 0019	4518	A37A	46211	7220 1600	7228 0930	C	185.5	X ERR
2915 8422574	001	X 465 MX 7218 0019	4518	A37A	46211	7220 1600	7228 0930	G	185.5	X

READ 13 CARDS
FOUND 6 CARDS IN ERROR
READ RECORDS FROM TAPE 2
WROTE 7 RECORDS TO TAPE 1

END OF JOB

Figure 45

COMBAT DRAGON CARD FORM 101 OPERATIONS CARDS

SORTIE DEBRIEFING — FORMAT CD1

Field	Card Columns
CDM	01–02
TAIL NUMBER	03–06
DATE: DAY	07–08
DATE: MO.	09–10
FRAG NUMBER	11–15
CALL SIGN	16–22
PILOT	23–24
ABORT TYPE	25
ABORT REASON	26–27
TIME OF ABORT: HR.	28–29
TIME OF ABORT: MIN.	30–31
RECOVERY	32
DIVERSION	33
TIME OF DIVERSION: HR.	34–35
TIME OF DIVERSION: MIN.	36–37
DIVERTED LOCATION	38–44
NAV TO TARGET	45
NAV RETURN	46
COMM TO TARGET	47
COMM RETURN	48
COMM ON TARGET	49
OPERATION SUPPORTED	50–56
GUN CAMERA	57
STRIKE CAMERA	58
ORDNANCE JETTISONED (N, T, S/A)	59–61
ORDNANCE JETTISONED (N, T, S/A)	62–64
ORDNANCE JETTISONED (N, T, S/A)	65–67
ORDNANCE JETTISONED (N, T, S/A)	68–70
ORDNANCE JETTISONED (N, T, S/A)	71–73
CARD CODES	79–80: N Z

DEBRIEFING OF COMBAT — FORMAT CD2

Field	Card Columns
CDM	01–02
TAIL NUMBER	03–06
DATE: DAY	07–08
DATE: MO.	09–10
FRAG NUMBER	11–15
CALL SIGN	16–22
PILOT	23–24
FIRST TARGET	25
SECOND TARGET	26
THIRD TARGET	27
UTM COORDINATES: FIRST TARGET	28–35
UTM COORDINATES: SECOND TARGET	36–43
UTM COORDINATES: THIRD TARGET	44–51
RENDEZVOUS WITH FAC	52–53
COMMUNICATION WITH FAC	54–55
FAC CONTROL	56–57
TARGET ACQUISITION	58–59
TARGET RETENTION	60–61
TACTICS USED	62–63
ORDNANCE ADEQUACY	64–65
COMMUNICATIONS	66–67
AIRCRAFT PERFORMANCE	68–69
TACTIC TARGET 1	70
TACTIC TARGET 2	71
TACTIC TARGET 3	72
CARD CODES	79–80: P Z

EN ROUTE DEGRADATION FACTORS — FORMAT CD3

Field	Card Columns
CDM	01–02
TAIL NUMBER	03–06
DATE: DAY	07–08
DATE: MO.	09–10
FRAG NUMBER	11–15
CALL SIGN	16–22
PILOT	23–24
IDENTIFICATION NUMBER	25–26
COMMENTS	27–77
SEQUENCE CODE	78
CARD CODES	79–80: O Z

COMBAT DRAGON CARD FORM 101 OPERATIONS CARDS

DEGRADATION FACTORS ON TARGET

FORMAT CD4

CDM	TAIL NUMBER	DATE		FRAG NUMBER	CALL SIGN	PILOT	IDENTIFICATION NUMBER	COMMENTS	SEQUENCE CODE	CARD CODES	
		DAY	MO.								
01 02	03 04 05 06	07 08	09 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
										Q	Z

FLIGHT CREW COMMENTS AND RECOMMENDATIONS

FORMAT CD5

CDM	TAIL NUMBER	DATE		FRAG NUMBER	CALL SIGN	PILOT	IDENTIFICATION NUMBER	COMMENTS	SEQUENCE CODE	CARD CODES	
		DAY	MO.								
01 02	03 04 05 06	07 08	09 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
										R	Z

BDA

FORMAT CD6

CDM	TAIL NUMBER	DATE		FRAG NUMBER	CALL SIGN	PILOT	TARGET NUMBER	TARGET TYPE	COMMAND CORPS CTZ	ORDNANCE EXPENDED	STRUCTURES DESTROYED	STRUCTURES DAMAGED	SAMPANS DESTROYED	SAMPANS DAMAGED	PERCENT TARGET COVERED	PERCENT ORDNANCE ON TARGET	SECONDARY EXPLOSIONS	DUDS			KBA	TARGET ELEVATION	HUNG ORDNANCE		SEQUENCE CODE	CARD CODES	
		DAY	MO.															NO.	TYPE	FUSE							
01 02	03 04 05 06	07 08	09 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
																										S	Z

BATTLE DAMAGE ASSESSMENT REMARKS

FORMAT CD7

CDM	TAIL NUMBER	DATE		FRAG. NUMBER	CALL SIGN	PILOT	COMMENTS	SEQUENCE CODE	CARD CODES	
		DAY	MO.							
01 02	03 04 05 06	07 08	09 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
									T	Z

COMBAT DRAGON SUPPLY EDIT OUTPUT CARDS

DEMANDS, RECEIPTS, AND CANCELLATIONS: CD Forms 401, 402, June 1967

FORMAT CD8

STOCK NUMBER				QUANTITY	UNIT OF ISSUE	SUPPLY DOCUMENT NUMBER					DELIVERY PRIORITY	TAIL NUMBER	EQUIPMENT TYPE	MAINTENANCE DOCUMENT NUMBER	WORK UNIT CODE	MISSION NUMBER			FILL OR KILL	TIME OF DEMAND	AVAILABILITY	RECEIPT OR CANCEL				
FSC	PREFIX	FIIN	Additional			SERVICE	ACCOUNT	SHOP	JULIAN DATE	SERIAL NUMBER						DAY	MO	CDM				JULIAN DATE	CLOCK TIME	CODE	U
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

CANNIBALIZATION TAPE FORMAT

FORMAT CD9

STOCK NUMBER				QUANTITY	CANNIBALIZATION SERIAL NUMBER	SUPPLY DOCUMENT NUMBER					TAIL NUMBER PART FOR	EQUIPMENT TYPE	TAIL NUMBER PART FROM	WORK UNIT CODE	MAINTENANCE REPORT NUMBER FOR TO AIRCRAFT	MAINTENANCE REPORT NUMBER FOR FROM AIRCRAFT	TIME OF MAINTENANCE CONTROL ACTION			
FSC	PREFIX	FIIN	Additional			SERVICE	ACCOUNT	SHOP	JULIAN DATE	SERIAL NUMBER							JULIAN DATE	CLOCK TIME		W
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

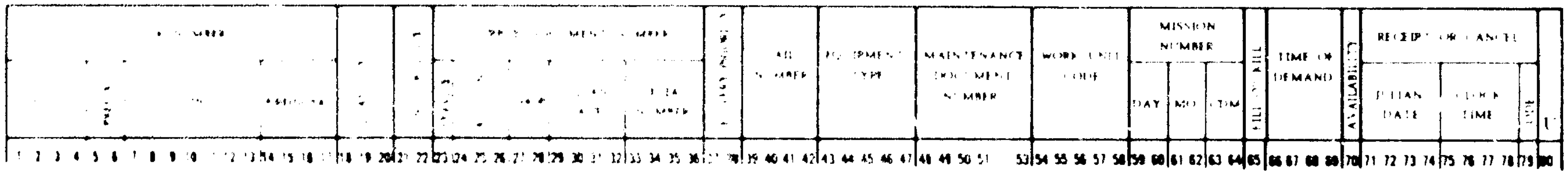
NORS CD Form 403, June 1967

FORMAT CD10

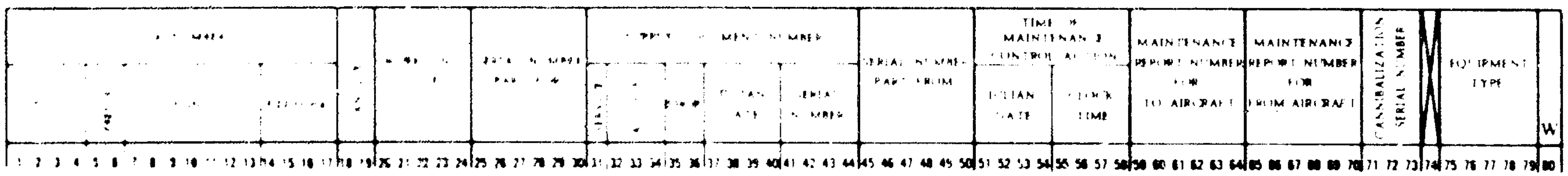
STOCK NUMBER				QUANTITY		SUPPLY DOCUMENT NUMBER						TAIL NUMBER	EQUIPMENT TYPE		WORK UNIT CODE		IN NORS			NO NORS			
FSC	PREFIX	FIIN	Additional			SERVICE	ACCOUNT	SHOP	JULIAN DATE	SERIAL NUMBER							JULIAN DATE	CLOCK TIME		JULIAN DATE	CLOCK TIME	CANCEL	N
1 2 3 4	5 6	7 8 9 10 11 12 13	14 15 16 17	18 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

COMBAT DRAGON SUPPLY EDIT INPUT CARDS

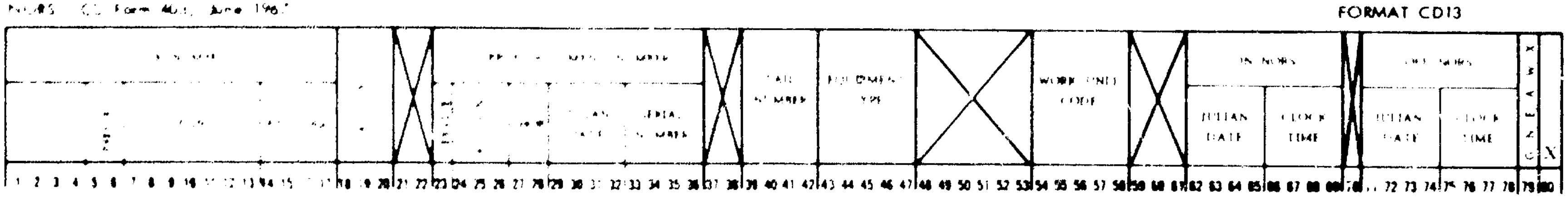
DEMANDS, RECEIPTS, AND CANCELLATIONS CD Forms 401, 402, June 1967 — FORMAT CD11



CANNIBALIZATION CARD FORMAT — FORMAT CD12



NORS CD Form [illegible], June 1967 — FORMAT CD13



Appendix C

DESCRIPTION OF TAPES AVAILABLE

The Autocoder source and object programs described in this volume are available on tape and can be obtained by sending a request for the "RAND/TAC Program Package" to: The RAND Corporation, 1700 Main Street, Santa Monica, California, 90406, Attention--Program Librarian, Computer Sciences Department. The request should be accompanied by a 2400 foot reel of magnetic tape. Specify the desired track and tape density. If not specified, a 556BPI 7-track tape will be returned. Appropriate information for retrieving the program decks from the tape file will also be furnished.

The following is a complete list of the RAND/TAC programs cataloged on the tape:

RT001	Maintenance, Operations, AGE and Manpower Data Edit
RT002	Daily Tail Number and Work Center Displays
RT003	Compute Elapsed Time
RT004	Single/First/Last Sortie
RT005	Recombine
RT006	Frequency Counter
RT007	Clint (generate 7 and 8 cards)
RT008	Clint (generate 9 cards)
RT009	Recovery Histogram
RT010	Hourly Frequency Accumulate and Select
RT011	Manpower Utilization
RT012	Analysis of Variance
RT013	Chi-square
RT014	Correlation Matrix
RT015	AGE Display
RT016	Deviation-Degradation
RT017	Form 305 Generator
RT018	Manpower Matrix
A9001	Combat Dragon Operations Edit
D9001	Combat Dragon Supply Edit

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VOLUME IV--THE SYSTEM SOFTWARE

4. AUTHOR(S) (Last name, first name, initial)

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10. ABSTRACT

A description of the Rand/Tactical Air Command system for the collection, processing, and analysis of data, as implemented on an IBM 1401 computer, in the management and evaluation of aircraft operations and support at base level. The fourth volume in the series documenting the system presents the eighteen computer programs written for the system, with detailed outlines of the purpose, method, operation, program setup, and sample printout of each of the programs. The descriptions are intended to assist the programmer to identify procedures and in general to understand the analyst's intent, as reflected by the functions of the programs. Companion volumes in the series are Vol. I: Data Collecting and Editing (RM-5666-PR); Vol. II: The Analysis Programs and Procedures (RM-5667-PR); and Vol. III: The Analysis Design and Methods (RM-5668-PR).

11. KEY WORDS

Aircraft
Tactical Air Command (TAC)
Operations analysis
Maintenance
Materials
Information systems
Information processing
Evaluation methods
Rand/TAC Information and Analysis System