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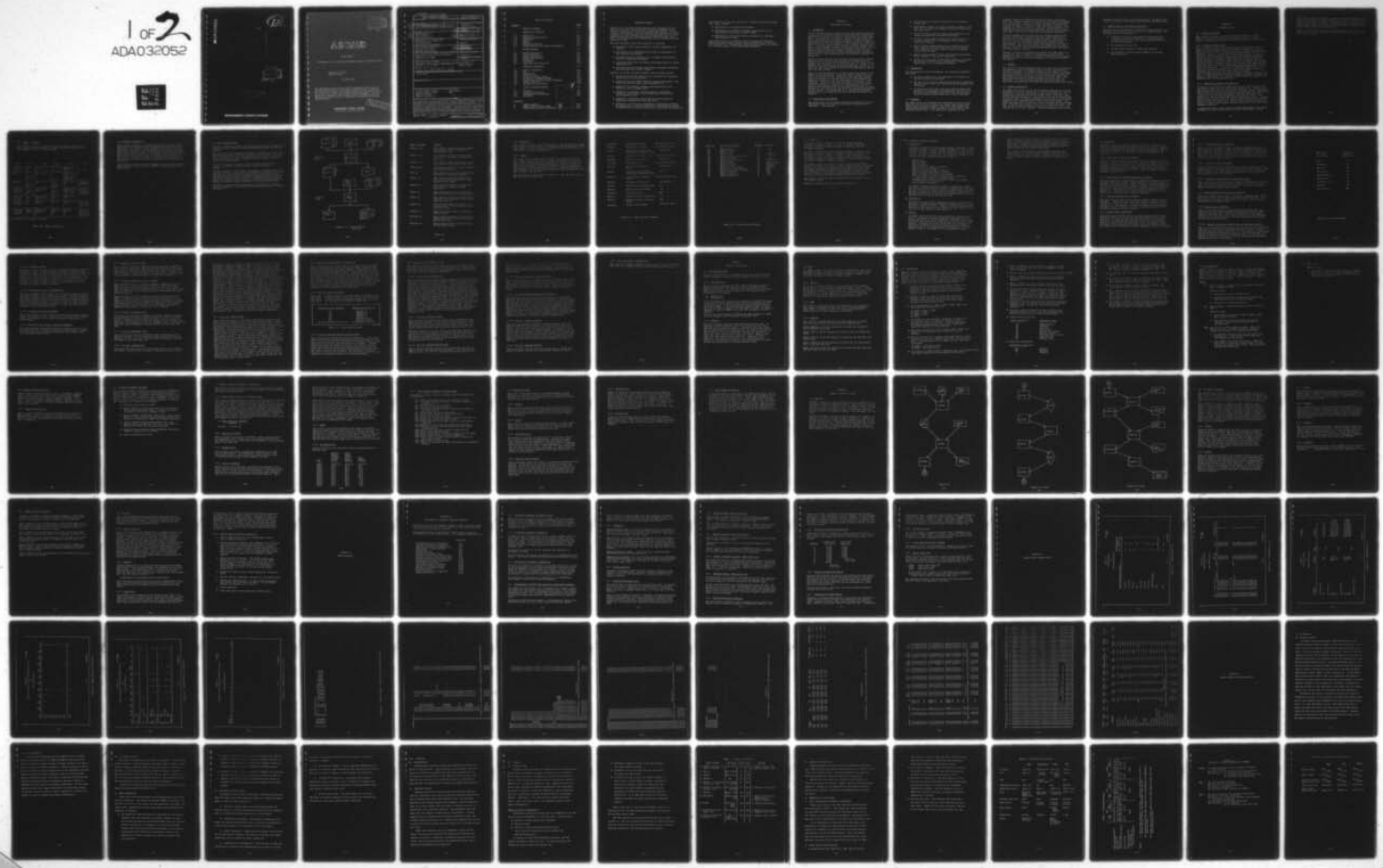

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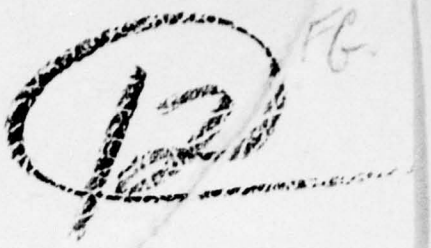

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ASQMD

FINAL REPORT

Development of the Automated Squadron Manpower Document System

Kenneth B. Rhodes
James M. Ladd

30 June 1976

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This study of aircraft squadron manpower was performed for the Chief of Naval Operations (OP-124) to develop standards and an automated procedure for computing manpower requirements. In the process of development, many new standards were approved by OP-124 to systematize the computations that had previously relied on considerable application of manpower analyst experience and judgment. These standards were incorporated into the automated system developed by MSS. Under this contract, a complete system was developed, tested, documented and delivered to the Manpower Requirements Branch of the Office of the Deputy Chief of Naval Operations (Manpower).

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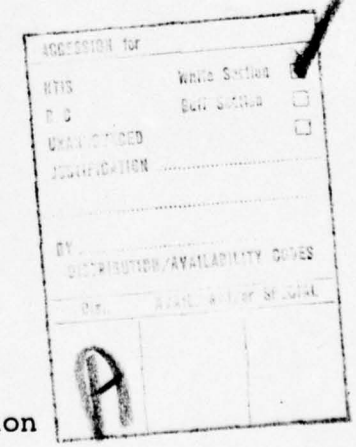
TABLE OF CONTENTS

SECTION		PAGE
	EXECUTIVE SUMMARY	ii
1	DEVELOPMENT OVERVIEW	1-1
1.1	Background	1-1
1.2	Functional Requirements	1-2
1.3	Assumptions	1-2
1.4	Approach	1-2
1.5	Results	1-3
1.6	System Capabilities	1-3
1.7	Recommendations for Further Development	1-4
2	SYSTEM SUMMARY	2-1
2.1	System Application	2-1
2.2	System Operation	2-3
2.3	System Configuration	2-4
2.4	System Organization	2-5
2.5	Performance	2-8
2.6	Data Base	2-14
2.7	Input/Process Description	2-18
3	OPERATING PROCEDURES	3-1
3.1	Pre-run Procedures	3-1
3.2	TSO	3-2
3.3	Limitations	3-3
3.4	Program Errors	3-6
3.5	Billet Title File Updates	3-8
3.6	Processing NAVMMACLANT Tapes	3-9
3.7	Miscellaneous Computational Procedures	3-10
3.8	Special Features	3-13
3.9	Recompiling the Program	3-15
4	1000/4A INTERFACE SYSTEM	4-1
4.1	Overview	4-1
4.2	Program Descriptions	4-5
4.3	Catalogued JCL Procedures	4-7
4.4	Run Steps	4-8
APPENDIX		
A	ASQMD Standards	A-1
B	Sample ASQMD Program Output	B-1
C	ASQMD Program Computer Selection	C-1



EXECUTIVE SUMMARY

This study of aircraft squadron manpower was performed for the Chief of Naval Operations (OP-124) to develop standards and an automated procedure for computing manpower requirements. In the process of development, many new standards were approved by OP-124 to systematize the computations that had previously relied on considerable application of manpower analyst experience and judgment. These standards were incorporated into the automated system developed by MSS.

The tasks performed during the study were as follows:

- Developed a system design based on existing standards and methods
- Coordinated with NAVMMACLANT and OP-124 in development of new standards and methods
- Surveyed available computers for a suitable cost-effective site for classified processing
- Identified additional refinements and capabilities for future implementation
- Designed interface between requirements (manpower documents) and authorizations (1000/2 system).

Benefits to the Navy accruing directly from the study include:

- Selection of the PRC computer site (including the knowledge gained during the site survey)
- Capability to print SQMDs (Squadron Manpower Documents) from billet and workload data (since September 1975)
- Capability to generate manpower requirements data automatically (since December 1975)
- Capability to generate complete manpower requirements documents automatically, with minimal user intervention (since February 1976)
- Capability to generate authorizations directly from requirements computations (since May 1976)
- Capability to utilize the requirements computation process as an analyst tool to assess alternatives (evaluating the impact of hypothetical operational conditions on manpower requirements).

Other benefits to the Navy, gained as a result of having performed this study, include:

- Development of new manpower standards
- Development of extensive knowledge transferrable to the Navy Manpower Requirements System (NMRS)
- Development of the authorization interface as a technique transferrable to NMRS.

Under this contract, a complete system, the Automated Squadron Manpower Document (ASQMD) system, was developed, tested, documented, and delivered to the Manpower Requirements Branch of the Office of the Deputy Chief of Naval Operations (Manpower).

SECTION 1

Development Overview

1.1 BACKGROUND

In this development effort, Management Science Systems conducted a study of Navy aircraft squadron manning and the methodologies employed to determine the manpower requirements for these squadrons. This study was intended to serve as the functional basis for the development of an automated system to compute manpower requirements and produce manpower documents which would meet the standards previously established for the production of such documents. The pilot program which emerged from this contract was entitled the Automated Squadron Manpower Document (ASQMD) program. After its development and testing, the ASQMD would serve as an interim source of Squadron Manpower Documents until the Navy Manpower Requirements System (NMRS) development had reached the point where it could adequately meet the document production requirements.

During the early phases of the squadron manning study it became apparent that there were many portions of the SQMD creation process that had never been systematized, but had relied on the judgment and experience of the senior personnel. Because of the necessity to automate these "experience/judgment" decisions, it was clear that the programming job would be considerably greater than had been planned.

During this beginning phase, a problem arose with regard to the NMRS computer processing. Since the manpower requirements are driven by the ROC and POE information, and since that information is classified, it was decided that the NMRS development should be shifted to a secure sight where it could be run when completed. Because of the time pressure of the project, MSS conducted a survey of computers available for the SQMD project and reported findings, along with a recommendation, to the Manpower Requirements Branch of the Office of the Chief of Naval Operations. The results of that study are included as Appendix C to this report. The recommendation to use Planning Research Corporation as the computer site for the ASQMD development was adopted.

1.2 FUNCTIONAL REQUIREMENTS

The requirements for the ASQMD system evolved during the early development cycle and remained relatively straight-forward throughout. They include:

A. Produce Squadron manpower documents for all aircraft communities.

B. Distinguish between the various aircraft classes to provide for the unique requirements and billets associated with each class.

C. Produce manpower documents which look identical to the documents produced by non-automated methods.

D. Provide a system output which may be used directly as an input transaction to the Manpower Authorization (OPNAV Form 1000/2).

E. Provide enough system flexibility to permit user overrides, changes, and additions, while retaining sufficient simplicity to ensure that the user can operate it with relative ease.

F. Ensure responsiveness to short turn-around requirements while retaining a low cost of operation.

G. Produce an audit trail of workload, referred to as Working Papers, to permit manual validation of program computations for all documents produced.

1.3 ASSUMPTIONS

For the purposes of this development, the following assumptions were made:

A. All data necessary for the computation of Manpower Requirements would be available.

B. All data to be used for system inputs would be considered accurate and no input data editing would be designed into the system.

C. In view of the fact that this pilot program would serve primarily as development of methodology, and would only be involved in document production on an interim basis, internal program documentation would not be required.

1.4 APPROACH

The ASQMD system was developed and implemented in steps to provide for the inclusion of additional system requirements which would emerge during development. The first step involved the design and programming of the capability to print SQMD's from directed billets only. This permitted a check-out of the

document layouts and validated the directed billet procedures. Next, the existing manpower standards were analyzed and automated. As a result of this step is was determined that many "standards" were not actually documented, but were procedures normally followed by the manpower analysts. Thus, this step resulted in the formalizing of a number of new standards. The following step entailed the design and programming of the capability to generate basic SQMD's in order to verify the computational procedures.

With the document layout validated, the standards computerized, and the computational procedures verified, the capability to generate SQMD's with analyst changes was added. This required the inclusion of many programmed exceptions, special cases, as well as a set of overrides to permit operator manipulations, where needed. The next step added a TSO capability to allow the user to edit input files and operate the system from the OPNAV offices. This move from a batch environment made the responsiveness requirement a reality.

Finally, a program was developed to convert the ASQMD system output into an input transaction to the Manpower Authorization (OPNAV Form 1000/2). Thus, an interface between the requirements document and the authorization document for an aircraft squadron was created.

1.5 RESULTS

As a result of this development effort, the user has an operational program which has been thoroughly tested and its computational features validated. The ASQMD program has been used in a production mode successfully and will be the source of SQMD's until NMRS becomes operational. Much of the billet derivation methodology developed for the ASQMD is now being built into the NMRS. Document production with the ASQMD has been both timely and cost-effective. The introduction of the TSO portion provided the user with the flexibility he needed to update and control the system.

1.6 SYSTEM CAPABILITIES

The ASQMD system meets all of the functional requirements outlined in Section 1.2 above. Additionally, the system allows the user to effectively alter anything on the output side he requires. Any information pertaining to billets or hours for a given work center can be altered as necessary. Department titles can be changed and, in certain cases, an entire department with divisions can be added. External to the ASQMD program is the TSO data base system. This system has been effective and the cost of operation and maintenance low. All ASQMD data resides in mini-files on TSO disk packs. The user is able to add new files and delete or change existing files through the use of TSO commands. These files produce only a small

overhead charge but yield a great flexibility. Historical versions of the data can be easily maintained and used when needed.

1.7 RECOMMENDATIONS FOR FUTURE DEVELOPMENT

Among the system improvements and expansions which would be consistent with the planned utilization of the ASQMD program, the following should be considered:

A. A file of billets for each squadron containing only essential, relevant information. It should contain a coded prefix so that like squadrons/communities can be easily aggregated.

B. An organized file of POEs.

C. An input EDIT routine to verify data validity.

D. A controller to allow multiple ASQMD's on the same batch execution.

SECTION 2

System Summary

2.1 SYSTEM APPLICATION

This section describes in non-technical terms the uses of the ASQMD by OP-124F in supporting its various functions for which manpower requirements determination and documentation is necessary.

2.1.1 Purpose of the System

The functions of OP-124F include documenting the manpower requirements of existing Navy aircraft squadrons and predicting the requirements of squadrons under hypothetical Projected Operational Environments (POE's). In the first case, survey data exist or are acquired, maintenance data from the MDCS are analyzed, and quantitative/qualitative manpower requirements estimates are documented in the form of a draft SQMD. The draft SQMD is reviewed by the Fleet commanders and several OPNAV offices, and changes may be made to reflect the non-standard requirements of the particular squadron. After all changes have been entered and approved, the SQMD is finalized and promulgated. In the second case, the hypothetical POE's are used to generate hypothetical draft SQMD's, based on the same standards that would be used for an actual squadron.
Both of these functions have been performed by manual analysis until now. The ASQMD replaces the manual analysis required to develop the manpower requirements, and also the manual process of producing the document from the requirements data.

2.1.2 Additional Features and Functions

In addition to producing the SQMD automatically from the POE input, the ASQMD provides the user with other capabilities. Various standards can be modified by user overrides on input, thereby automating (to a large degree) the processing of non-standard data. The process of deriving the manpower requirements from the input data is reflected in a set of "working papers" which display many of the crucial data elements and steps in the computation process. Various print options give the user the choice of what data he will receive out of a given execution (e.g., the user may specify printing only Section II and VI of the SQMD, thereby getting just the quantitative manpower summaries).

In addition to the central process of the ASQMD program, the system includes data files, maintenance utilities, a procedure library,

and a remote terminal capability. These features allow the user to maintain and display the data library and to execute the ASQMD program in a combination of modes: Local batch entry and output at the main computer site; remote batch entry from a dial-up RJE device, with either local or remote output; on-line (TSO) entry, with either local, remote batch, or on-line output.

The user can display, add, delete, or change data files either in batch or on-line mode, using the IBM OS utilities or (under TSO on-line) TSO commands.

2.2 SYSTEM OPERATION

As described in 2.1.2, the ASQMD can be operated in a variety of modes. The chart below (Table 2-1) shows the relations between input, output, and user operating method.

Type Run	Input Mode	Input Data	Output Mode	Output Data	Notes
1. Add new data file; replace file	RJE (A) Local (A)	Card data and control statements	Same as input	Control listing only or data set listing	
2. Change data file	TSO (P)	Control statements and change data	Same as input	Control and change listing	
	RJE or Local (A)	Same		Same as above or complete data set listing	
3. Display data set	TSO (A)	Control statements only	TSO (U)	Data set listing	TSO output is acceptable for small data set
	RJE or Local (A)		RJE or Local (A)		
4. Execute ASQMD with summary output, standard input	TSO (P)	Few control statements and input data cards	TSO (A)	Listing of control statements, some input data, and summary outputs	TSO may be preferred if all outputs but desired summaries are suppressed
	RJE or Local (A)		RJE or Local (P)		
5. Execute ASQMD with extensive input	RJE or Local (A)	Few control cards many input data cards	RJE or Local (A)	Level desired by user	
6. Execute ASQMD with classified input data	Local only	Control cards data cards	Local only	Level desired by user	Classified run requires exclusive control of computer at run time
7. Execute ASQMD with standard input, extensive output	TSO (P) RJE (A) Local (A)	Few control statements and input data cards	RJE or Local RJE Local	Full output listing	Using batch entry print at same site; using TSO entry, route print Local or Remote

key: P = Preferred A = Acceptable U = Undesirable

Table 2-1: Modes of Operation

2.3 SYSTEM CONFIGURATION

Under current operation, the ASQMD is located in the IBM 370/155 computer of the Planning Research Corporation's Computer Center (PRC-CCI). The system has been developed and tested by Management Science Systems at the MSS remote batch terminal, using both Singer and UniTech terminals for batch RJE, operating under IBM 360/370 OS/MVT HASP emulators. The system has also been tested by MSS and OP-124F using TSO through portable dial-up terminals. The system has been run locally at the PRC-CCI installation in a secure mode (all non-secure devices and exterior communications disabled).

Input and output devices can be combined in the various ways indicated in Table 2-1 by use of the "ROUTE" statement in the input control set.

2.4 SYSTEM ORGANIZATION

The system consists of input data files, file maintenance procedures, a user procedure library, a central processing program, and TSO procedures.

The input data files (described in detail in Section 2.6) store the data required for resolution of standards. They include maintenance data, staffing tables, special characteristics, billet titles, pay grade distributions, NEC's, computational coefficients, and directed billet requirements.

The file maintenance procedures allow the user to add, delete, change, and display the various files stored in the data library.

The ASQMD program is the heart of the system. It accepts input and control statements from the user, reference data in the files in the data library, and develops the minimum qualitative/quantitative manpower requirements for the squadron, based on approved standards and computational methods. Further, it accepts user overrides to modify the computation process or the resulting computed billets to conform to known or expected anomalies in the data or standards.

The overall organization of the system is depicted (at the macro level) in Figure 2-1. The various utilities and programs are listed in Table 2-2.

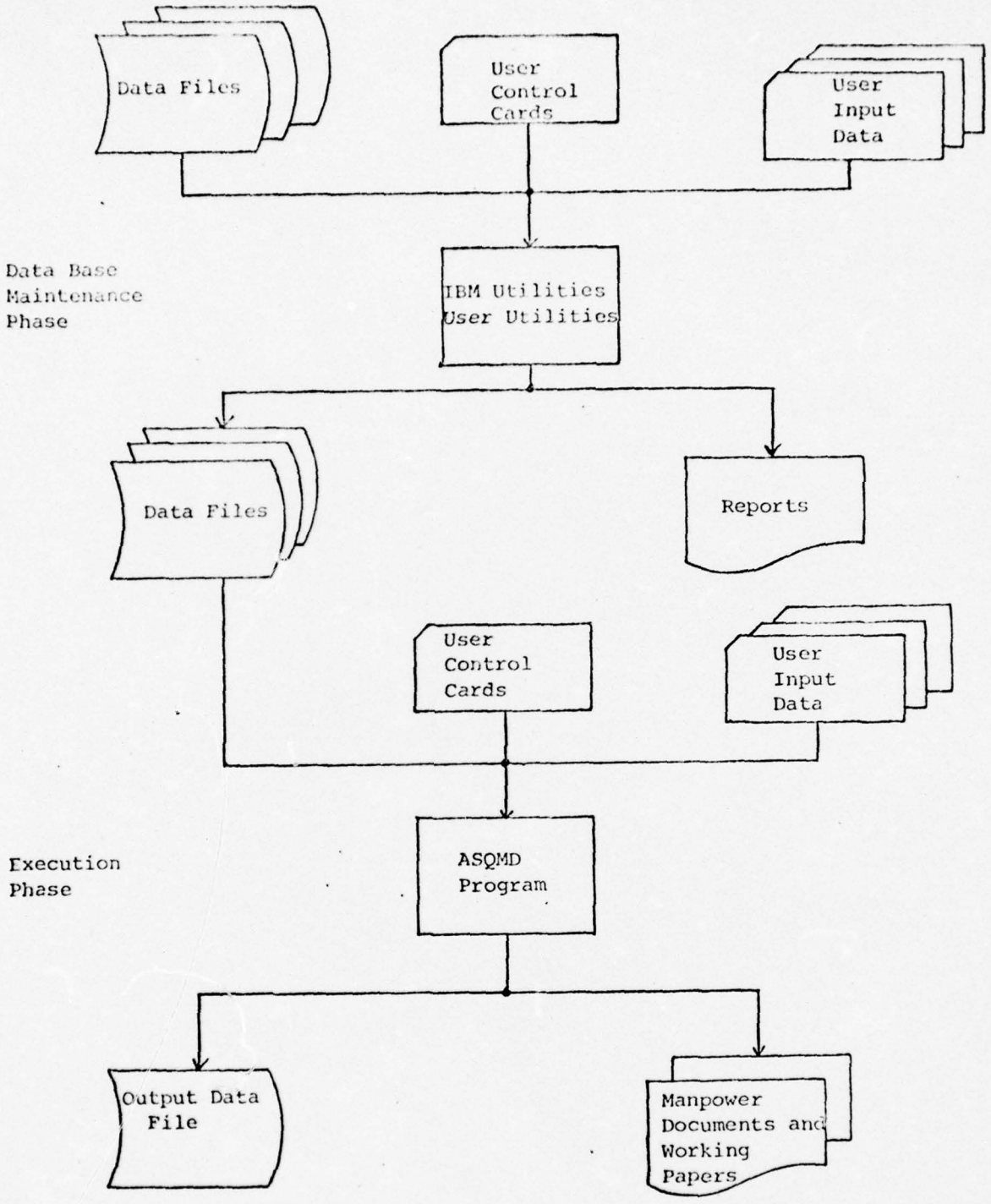


Figure 2-1: Overall System Structure

PROGRAM/UTILITY	PURPOSE
IEBGENER (U)	This utility allows the user to create a data set or add a member to an existing data set.
IEBPTPCH (U)	This utility allows the user to list or punch the contents of a specified data set.
IEBUPDTE (U)	This utility allows the user to change individual records within a data set.
IEHPROGM (U)	This utility allows the user to delete an existing data set.
SORT (U)	This utility causes a file to be sorted according to user specifications.
UPDATE (P)	This program causes the Billet Title File to be updated according to user supplied input cards.
SQMDBGO (P)	This program generates an ASQMD document using user supplied input parameters.
OP0001 (P)	This program causes a new ASQMD document to be added to an ASQMD masterfile.
OP0002 (P)	This program selects a specified ASQMD document to be submitted to the 1000/4A interface system.
OP0003 (P)	This program merges like billets into a single record for use in the 1000/4A interface system.
OP10004A (P)	This program generates a preliminary 1000/4A report.
OP10004B (P)	This program generates a final 1000/4A report using update cards to alter the preliminary report.
OP10004C (P)	This program produces cards for input to the 1000/2 system.

Table 2-2

2.5 PERFORMANCE

This section presents a brief description of the overall performance capabilities of the system. It covers the type and volume of input and output, and the flexibility, reliability, and utility of the system for its various applications.

2.5.1 Inputs

The inputs to the ASQMD program consists of fifteen data files, user control cards, and user data cards. User control cards consist of the minimum required to execute the catalogued procedure, plus three mandatory program control cards. User data cards consist of one mandatory card type (of which one card is required), one card type usually present (one card for each aircraft type in the squadron) and eleven optional card types (no predetermined number of cards, when present).

The data files are summarized in Table 2-3. The input data cards are summarized in Table 2-4.

FILE NAME	TYPE OF INFORMATION	FILE SIZE (Approx.)
AIRCREW	Billet titles by BSN	Varies by SQDN type
ASPCTS	Percents for distributing administrative support work	96 records
AVIATOR	Pilot/NFO staffing tables	Varies by SQDN type
BILTITLE	Billet titles by BSN	476 records
DIRECTED	Directed billets	Varies by SQDN type
EXCPNEC	NECs for multiples by rating	91 records
FMPCTS	Percents for distributing facilities maintenance work	50 "
GRNDOFF	Ground officer staffing tables	Varies by SQDN type
GRSPRDS	Paygrade distributions	351 records
MAFSAF	Corrective maintenance data	114 "
NECDATA	NECs by aircraft/rating	83 "
PMCMDATA	Maintenance Data	1236 "
SQNINFO	Various factors, flags, etc.	51 "
WC040QA	Quality assurance staffing tables	398 "
BILUPDTE	Billet title updates	Varies by SQDN

Table 2-3: Input Data File Summary

Card Type	Type of Information	Minimum	Maximum
01	Squadron Title	1	1
03	OPNAVINST Titles	1	1
04	Squadron POE	1	1
05	Aircraft POE	0	1/aircraft
06	Squadron POE optional data	0	1
07	Print overrides	0	1
08	Minimum billets by WC	0	1/prod.WC
09	Dept. deletes	0	1
10	Directed billet	0	1/dir.billet
15	Billet deletes	0	1/billet
17	Billet data overrides	0	1/billet
18	Dept./Div. title override	0	1/WC
20	Standard Allowance Override	0	1/WC
21	Imposed manhours	0	1/WC
22	Deleted manhours	0	1/WC
99	Endup control card	1	1

Table 2-4: Input Data Card Summary

2.5.2 Outputs

The outputs of the ASQMD program consist of the Squadron Manpower Document (sections II, III, V, and VI), and a set of working papers by which the manpower analyst may track the derivation process.

Section II of the SQMD is the summary of officer, enlisted, and civilian billets by department. Section III is the listing of all billets by work center. Section V is the functional workload summary. Section VI is the summary of officer billets by designator/paygrade, enlisted billets by rating/NEC/paygrade, and civilian billets by skill/paygrade.

The working papers sections are: listing of user input data cards; listings of file input aviators, ground officers, directed billets, and aircrewmen; listing of file input aircraft CM data (including computed total manhours); listing of file input PM data (including CM distribution percentages); listing of work center standards, computed hours, and computed billets; squadron totals; listing of work center total workload by function.

All sections of the document are optional for printing, as are the working papers.

Samples of program output are shown in Appendix B.

2.5.3 Performance Characteristics

- Flexibility

The ASQMD is designed to determine manpower requirements based on standards with a minimum of user intervention. It is also designed to allow the user extreme flexibility in the application of judgement and experience to modify the data or outputs to match particular situations. As reflected in Table 2-4, the user has the capability (by card input) to:

add billets
delete billets
add workload
delete workload
specify minimum numbers of billets
change skills on billets
change the organizational structure
vary the number and types of aircraft
vary the flight hours and sortie length
vary the workweek, number of flying days, length of flying day, length of maintenance day
specify excess officers and aircrew beyond the number called for by seat factors
vary standard allowances.

All these variations are made directly as input to an ASQMD run (without affecting the data base). Additionally, the user has the option to permanently change the data base, to reflect changes in standards, survey data, or directed requirements. The file organization of the data base lends itself to ease of manipulation by standard IBM OS utilities.

- Reliability

The ASQMD has proved to be extremely accurate and reliable in producing a documented set of manpower requirements reflecting the input standards and POE. Extensive manual validation has showed that the outputs of the program are completely accurate over an extreme range of input variation.

- Utility

The ASQMD lends itself very well to both its objectives (see 2.1.1). For documenting the quantitative/qualitative manpower requirements of actual squadrons, the ASQMD can be used to replace the manual work of the analyst at each step in the process - preparing the initial draft for Fleet review, preparing the revisions (based on overrides and data changes), and preparing the final document for promulgation. For the manpower planner, the ASQMD can be an invaluable aid to

examine a range of possibilities before selecting an alternative. It can be used as a computational tool to assess the impact of changing hardware and operations on the manpower requirement. In this mode of operation, it makes possible a spectrum of analysis hitherto unfeasible because of the obvious limitations on manual computation.

The utility of the ASQMD is highlighted by its execution characteristics: on the PRC-CCI computer (IBM 370/155) a typical squadron run takes about 15 seconds of CPU time, and costs a total (including printing charge) of approximately $7.00.

2.6 DATA BASE

The ASQMD data base consists of the fifteen files identified in Table 2-3. The files are described in more detail in this section. File layouts and current listings of the file contents are included as Appendices B and C of the User's Manual, respectively. (The files are listed here in alphabetical order, corresponding to Table 2-3.)

2.6.1 Aircrew Priority File (AIRCREW)

This file contains whole billet data for enlisted flight crews for aircraft. Each billet includes billet sequence number, skill (rating, rate, NEC), and function code (usually OM). The number of aircrewmen is computed in the program, and that number of billets is selected from the file, starting with the first and continuing sequentially through the file. (Note: This does not imply billet sequence number order.)

2.6.2 Administrative Support Percentages (ASPCTS)

This file contains the administrative support distribution percents for production work centers. After squadron total maintenance is computed, the administrative support total for the maintenance work centers is calculated from a standard formula. Then the administrative support distribution percents are multiplied by the AS total, giving the AS workload for each work center in the Maintenance Department. The ASPCT file is organized by squadron type (i.e., there is one record for each class of squadron).

2.6.3 Aviator Priority File (AVIATOR)

This file contains whole billet data for aviator officers (pilots and NFOs). Each record includes billet sequence number, skills (designator, paygrade, NOBC, AQD, and U-Code) and function code (usually OW). The number of aviators is computed in the program, and that number of billets is selected sequentially from the file (similar to the process for aircrew).

2.6.4 Billet Titles (BILTITLE)

This file contains billet titles in billet sequence number order. Each billet title record contains the beginning billet sequence number for the range of BSNs for which the title is applicable, the title, an officer/enlisted/civilian flag, and for enlisted billets a rating field and supervisor flag. The program selects the proper title based on work center and skill, and then assigns the appropriate BSN based on the range indicated on the title record.

2.6.5 Directed Billets (DIRECTED)

This file contains directed whole billets, including BSN, skill identifiers and function. There are several directed billet files (for different squadrons or classes of squadrons); the user selects the correct one by a run control card. All the billets in the selected set are included in the squadron, and manhours equal to the standard workweek for each billet are accounted under the function specified on each billet record.

2.6.6 Exception NEC's (EXCPNECS)

This file contains the multiple NEC's, for cases in which a single rating would get more than one NEC for a single aircraft type. Each record contains the various NEC's, with their relative percentages to be assigned, for either high paygrade billets (E6, E7, E8) or low paygrade billets (E3, E4, E5).

2.6.7 Facilities Maintenance Percentages (FMPCTS)

This file contains the computation percents for calculating FM workload. For each work center, the FM workload is equal to the AS workload times the appropriate FM percent. There is one record in the file for each possible work center.

2.6.8 Ground Officers Priority File (GRNDOFF)

This file contains whole billet information, including BSN, skills, and function code (usually OW), for ground officer billets. The user inputs the number of ground officer billets, and the program selects them in sequence order.

2.6.9 Grade Spreads (GRSPRDS)

This file contains the pay grade distribution matrices that are used to assign paygrades to computed billets based on work center identify and population. There are nine different grade spread tables in the files, which are listed in Table 2-5. For each population size in the work center, the grade spread shows the number of billets of each pay grade.

2.6.10 MAF/SAF (Corrective Maintenance) Coefficients (MAFSAF)

This file contains the coefficients used in the negative exponential computation of corrective maintenance manhours for the squadron. For each aircraft type in the fleet, the file contains a record showing the regression coefficients based on a negative exponential relation of maintenance manhours to flight hours. The CM data are divided into carrier and ashore, and into MAF hours and SAF hours, giving four sets of coefficients.

Work Center (or branch or division)	Maximum Population Covered
Admin	16
Personnel	16
First Lt	24
Operations	20
Maintenance Ctl	19
Material Ctl	21
Production WC's	75
Ordnance	40
Line Division	120

Table 2-5: Pay Grade Spreads

2.6.11 NEC Data (NECDATA)

This file contains the NEC data for assignment of NEC's by aircraft type/rating. For each aircraft type there is one record, which contains the system NEC for the aircraft, and the particular NEC for each rating. In the case that the rating NEC is the same as the system NEC, the rating NEC field is blank. In the case that a particular rating gets no NEC, the rating field contains "0000". In the case that there are multiple NEC's for a single rating, the rating field contains "XXXX", signaling the program to refer to the Exception NEC file for that rating.

2.6.12 PM/CM (maintenance) Data (PMCMDATA)

This file contains the PM manhour values for four categories of PM - manhours per flight hour, manhours per aircraft per week, manhours per daily inspection, and manhours per sortie. It is organized by work center/rating; there is one record for each appropriate rating for each appropriate work center for each aircraft type. Additionally, each record contains the percent of total MAF and SAF (corrective maintenance) manhours computed for that aircraft type to be assigned to the rating/work center.

2.6.13 Squadron Information (SQNINFO)

This file contains various formula pointers, computational factors, flags, and special ratings. There is one record for each squadron class. See Appendix B of the User's Manual for description of data elements.

2.6.14 Work Center 040 (Quality Assurance) (WCØ4ØQA)

This file contains the staffing tables for assigning whole billets to work center 040. The user specifies the correct set of billets by a run control card; the program processes the records in the set as directed whole billets.

2.7 INPUT/PROCESS DESCRIPTION

This section describes in detail the inputs summarized in Section 2.5.1 (and in Table 2-4). The data on each user input card is described in terms of purpose and content. Also, the processing steps applicable to each input are related to the input. The input layouts and tables of allowable values for many of the inputs are given in Appendices D and G, respectively, in the User's Manual.

2.7.1 General Information (all card types)

Each card contains a twelve column card-key, consisting of a ten-character OPNAVINST field and a two-character CARD-TYPE field. This key can be used to sort cards prior to a run, and to keep cards from different runs segregated in storage. Of the two fields, only the CARD-TYPE is used by the program, to determine the appropriate processing.

Card types 01, 03, and 99 are control cards; all others are data cards. In addition to the twelve column card-key, many of the data card types also contain an additional eight columns of common information, consisting of a separating space, followed by a seven-character squadron name field (entitled SQUADRON). This field is for information only; it is not used in the ASQMD processes; it appears on card types 04, 05, 06, 10, 20, 21, and 22.

2.7.2 C.T. 01 - Squadron Title

This card type contains the squadron title that appears (centered) in the pages of the squadron manpower document. The title should be left-justified in the field on the card so that the centering routine in the program will locate it properly on the document output pages. The maximum length of the squadron title is 60 characters. This card type is mandatory, and must be first in the input data deck.

2.7.3 C.T. 03 - OPNAVINST Title

This card type contains the OPNAVINST title that appears in the pages of the SQMD. The ten-character field occurs in Columns 47 through 56 on the data card. The card type is mandatory, and must be second in the input data deck.

2.7.4 C.T. 04 - Squadron POE

This card type contains the POE information common to the squadron as a whole. Squadron type is used in a variety of places in the

program to decide between alternative formulas, processes, etc, that reflect standards based on class (VF, VP, etc.). Deployment is either "CARRIER" or "ASHORE", again for selecting from alternative standards based on deployment. Note that this field does not preclude the entry of deployed flight hours for ashore squadrons, or vice versa. Maintenance day is for display purposes only; it is not utilized in the ASQMD processing. Flying day is used to compute workload for plane captains/handlers (Jamerson formula). Flying Days per Week is used in computation of planned maintenance manhours (related to manhours per daily inspection). Applicable workweek is the standard workweek value for the squadron. It is the assumed value for any work center which does not have an individual value entered. The workweek is used for a number of computations including, of course, the determination of the number of billets required to support the workload. Number of shifts for work center 020 is used to determine the number of billets required as supervisors for that work center (Maintenance/Material Control). QA-KEY is the key to retrieving the appropriate quality assurance billets from the staffing table stored in the WC040QA file. The number of BEQ's is used in the program to determine the number of BEQ watchstanders. Enclosure number is a display item used in printing the SQMD. Work center 230 factor is a numeric factor used to compute the number of ordnancemen required in certain squadron types. If the number of men computed from workload factors is less than the product of the factor times the number of aircraft, the difference is added to the number of billets, and the extra manhours are counted as OM. Exactly one card of this type is mandatory.

2.7.5 C.T. 05 - Aircraft POE

This card type contains the POE data particular to each aircraft type. Each card contains the data for one aircraft type. Number of planes is the number of that type, used in many places throughout the program in computation of manhour and direct support requirements. Hours per month deployed is the number of carrier-based flight hours for each aircraft of that type in the squadron. Average hours per sortie deployed is the average sortie length for carrier-based aircraft of that type in the squadron. Hours per month ashore and average hours per sortie ashore are as above, for shore-based aircraft. These flight hours and sortie lengths are used throughout the program in computations of manhours and direct support requirements. Pilot seat factor, NFO seat factor, and aircrew seat factor are the numbers of each category required to make up a flight crew for the aircraft. Crew ratio is the ratio of number of flight crews for each aircraft. These factors and ratio, together with the number of aircraft of the type, enable computation of the number of pilots, NFO's, and aircrewmen necessary to man the aircraft in the squadron. An individual aircraft will generally be either carrier-based or shore-based, therefore only one set of fields will be filled. The values placed in the unused fields must be '000' in the hours per month field and '999' in the average sortie length field.

2.7.6 C.T. 06 - Squadron POE Optional Data

This card type contains data which are not required by the ASQMD program, but which the user may choose to input. They are data relating to the numbers of various billets. Ground officer number is the number of ground officer billets to be input from the ground officer staffing table (file). Excess pilots, excess NFO's and excess aircrew are the numbers in each category above the numbers calculated from seat factors, crew ratios, and number of aircraft by type. The excess numbers are added to the computed numbers to determine the total numbers to be selected from the respective staffing tables. The number of students is a variable applicable to training squadrons, in which workload for the PN's is created by students on board, even though the students are not counted as billets in the squadron population.

2.7.7 C.T. 07 - Print Overrides

This card type contains flags to override print of working papers and various document sections. The flags are not positional; they are set by the occurrence of the appropriate character in any of the flag fields. The operation is shown in Table 2-6.

Presence of the Character	Causes Suppression of
"2"	SECTION II
"3"	SECTION III
"5"	SECTION V
"6"	SECTION VI
"W"	Working Papers
"D"	Directed Billets
in any flag field on C.T. 07	in the print routines.

Table 2-6. Print Override Flags

2.7.8 C.T. 08 - Minimum Billets by Work Center

This card contains minimum work center requirements. Card 8 work center contains the two-digit work center identification equal to the first two digits of the starting billet sequence number of the work center (for production maintenance work centers). Minimum billets per shift is exactly as implied - the number of shifts times the minimum per shift equals the minimum billets for the work center. If the minimum for the work center is greater than the number computed from standards, the difference is added to the number of billets to be spread, and the additional billets are accounted as OM workload equal to the standard workweek.

2.7.9 C.T. 09 - Department Deletes

This card type contains a list of departments to be deleted when processing directed billets for the particular run. There are ten two-digit fields available for entering the two digit identifiers (as in 2.7.8) of the unwanted departments.

2.7.10 C.T. 10 - Directed Billets

This card type contains directed whole billets, to be added to the output squadron without going through the billet derivation process. Each card present in the run contains all the information necessary to create one billet in the output set. Each billet contains a billet sequence number. The officer/enlisted/civilian indicator denotes the class of the billet. For officers, the skill information includes primary and secondary NOBC, AQD, U-code, designator, and paygrade. For enlisted, the skill data field contains the primary and secondary NEC, the rating, and the paygrade. For civilians the skill field contains the GS-series and GS-grade. Each directed billet card contains a function field. If a legal function code is entered, the standard workweek is accounted in manhours for the function for the appropriate work center (determined from the billet sequence number, as in 2.7.8). Each directed billet card contains a title override flag and a replacement title field. If the character "*" is entered in the title override flag, then the replacement title is used in place of the billet title (from the title file) that would normally be associated with the billet sequence number.

2.7.11 C. T. 15 - Billet Deletes

This card type contains data on billets to be deleted from the final list before output. The billets might be computed during the derivation process, or they could be directed billets (from the directed billet file) where the user chose to use this deletion capability rather than modify the directed billet file.

The type of delete is an "O", "E", or "C" code that signifies the class of billet to be deleted. The billet for deletion field contains the billet sequence number of the billet to be deleted. The function of deletion field contains a function code for reducing the functional workload of the work center by the number of manhours equal to the workweek.

2.7.12 C.T. 17 - Billet Data Override

This card type contains override data for changing a billet (a manual "billet file modification" procedure). The type of override is an "O", "E", or "C", indicating the class of billet to

be overridden. The billet sequence number indicates the particular billet to be changed. The override data allow changing any skill field or combination of fields. The overrides are applied to the final billet list (after completion of processing) before output.

2.7.13 C.T. 18 - Dept./Div. Title Overrides

This card type contains title overrides for organizational components. Each card contains a sequence number and a new title. The sequence number is used to locate the component in the squadron organization (by the same method as 2.7.8). The new title (up to 25 characters) replaces the standard title in the organization table.

2.7.14 C. T. 20 - Standard Allowance Overrides

This card type contains the replacement values to override the standard values for allowances for a work center. Each record represents one work center; if a record is absent for a work center, the values use standard defaults; thus, the card type is optional. The work center index is the two-digit field containing the first two digits of the billet sequence numbers appropriate (see again Section 2.7.8). The work center workweek replaces the default (applicable workweek) read from card type 04 (for this work center only, of course). The productivity allowance and production delay factors (if present) override the standard values, stored in a table in the program, and used in workload computations.

2.7.15 C.T. 21 - Imposed Manhours

This card type contains additional imposed manhours (above the workload computed from standards) by function code, for a work center. The work center index field locates the particular work center (as in 2.7.8). The imposed manhours are entered in positional fields corresponding, respectively, to OM, PM, CM, AS, FM, UT, and OW. Each imposed manhour value entered on a card of this type is added to the functional manhours of the appropriate function for the work center, and also to the total functional workload of the work center (which is used to compute the number of billets).

2.7.16 C.T. 22 - Deleted Manhours

This card type is exactly the same as card type 21, except that within the ASQMD, the hours are subtracted, instead of added.

2.7.17 C.T. 99 - Endup Control Card

This card type contains no data, but must appear last in the input data card set to signify the end of the control and data cards.

SECTION 3

Operating Procedures

3.1 PRE-RUN PROCEDURES

Prior to the execution of the ASQMD program, the user will need to make changes to the JCL and to the input transaction cards.

3.1.1 JCL Overrides

The user has the option to override many of the JCL parameters. Those commonly overridden will be AVIATOR , AIRCREW, DIRECT, GRNDOFF and BILLETS. To override these parameters the user need only input the file to be overridden and the squadron name of the override, for example:

```
//   AVIATOR=VX5,
//   AIRCREW=VX5,
```

If no override card is present, the program will assume that there is no input for that specific file. The user should verify that the squadron name of the override exists on the specific data set being overridden. A list of acceptable squadron names for each file can be found in Appendix H of the User's Manual. In addition, Appendix H gives the number of billets for the specific file by squadron.

The user may also override the MAFSAF and PMCM parameter in order to run a document using historical maintenance data.

3.1.2 POE Data

For each squadron, different POE information will be used. In addition, override/addition cards will be used for most runs when generating smooth documents. Appendix D gives the format for all cards used in the ASQMD system. In general, the sequence of the input cards is not important, however, two exceptions to this rule exist. First, card types '01' and '03' must be the first two input cards with card type '01' first. Second, card type '04' must precede a card type '06'. Card type '06 is optional. Any other cards may be in any sequence desired. Section 3.3 (Limitations) should be read to determine the actual effect and consequences for various override cards.

3.2 TSO

The ASQMD system can be executed entirely from TSO by using standard TSO commands. The JCL necessary to execute the program and all basic utility functions resides on the TSO data base. The files are described in detail in this section .

3.2.1 PROCLIB

This file is a partitioned data set consisting of four members. Member SQMDBGO is an execution of the ASQMD module only. Member UPDATE is an execution of the billet title file update only. Member SQMDBALL is a single execution of both the UPDATE and the SQMDBGO members. Member SQMDBPRC is an execution of the ASQMD module as it must be done during classified runs at PRC.

3.2.2 RUN

This file is a partitioned data set consisting of four members. Each member is the JCL necessary to execute the corresponding named members of PROCLIB. The '//*' cards are comments to enable the users to more easily run the system.

3.2.3 UTILITY

This file is a partitioned data set containing JCL for miscellaneous programs required to maintain the ASQMD system.

Member TAPEANAL is the JCL necessary to produce an analysis of the NAVMMACLANT data tape.

Member LOAD is the JCL necessary to generate the new PMCM-MAFSAF files.

Member COPYOUT is the JCL necessary to copy all the TSO data sets out to tape.

Member DELETE is the JCL necessary to delete all but the UTILITY file on the TSO data base.

Member COPYBACK is the JCL necessary to reload the data sets from the tape onto the TSO data base.

3.3 LIMITATIONS

Within the ASQMD system, various limitations exist. This does not imply that certain required functions are not performed. It means that when given an option to do a task one of two ways, by chosing one method certain features inherent to the other method will no longer be available. Careful examination of these limitations is necessary in order to fully utilize and understand how change cards to the ASQMD system operate.

- Billets added to maintenance work centers will not be considered when grade spreads are applied. Thus, erroneous grade spreads might occur. An alternative would be to add the proper number of hours to the manhour totals.

- Billets deleted are done so after gradespreads are applied. Thus erroneous grade spreads will occur. An alternative would be to delete the proper number of hours from the manhour totals.

- If new departments are added (44000, 45000, 46000) the only allowable combinations are:

  a) 44000 & 45000 & 46000
  b) 44000 & 45000
  c) 44000 & 46000
  d) 44000

- If a billet is to be deleted, generally the hours will not come from only one function. However, a CT15 deletes from only one function. To use a CT22 prior to computing grade spreads rather than a CT15 might cause the wrong billet to be deleted.

- When overriding division CPOS (21050, 29050, 37050) all fields must be included even if only one is to be changed.

- When deleting billets, remember that those billets existed when personnel and administrative hours were generated. Thus, those departments (Pers, Admin, 1st Lt) will have extra hours.

  a) ADMIN = .314 hours/billet
  b) PERS = .435 hours/billet

- If a billet is added without a function code, the computed number of billets subject to a grade spread will decrease.

- Career Counselors are only added to squadrons which consisted of 200 men prior to the assignment of the Career Counselor.

- No more than 10 aircraft types may exist in any one squadron.

- NECs of 'XXXX' will occur when an NEC was designated as having exception percentages but none existed on the file.

- NECs of '0000' will occur whenever an aircraft was described on POE data but did not exist in the files.

- If all hours from a maintenance work center are being deleted by a CT22, remember that FM and AS are calculated as a percentage of all PM/CM. Therefore, two iterations will probably be necessary since the sum of PM/CM will decrease on the first run, therefore changing each work center's individual apportioned amount of AS and FM
- A change in billets throughout the squadron could have the side effect of changing the billets in ADMIN Dept, PERSONNEL Dept, 1st LTs Dept and even the Career Counselor.

- The hours used to calculate the Administrative and Personnel departments are only close approximations, but should be accurate to within 10 total hours.

- Grade Spread Limitations

Grade Spread Size	Department Group
16	Administrative
16	Personnel
10	Ops Dept.
25	1st LT Dept.
19	Maintenance Control
15	Material Control
75	Production Work Centers
120	Line Division
40	Ordnance Dept.

- Array Size Limitations

Max Billets Assignable	
150	Officers
700	Enlisted
1	Civilian

- When using card type '05', if the aircraft is carrier-based, the value for average sortie length ashore must be '999' and if the aircraft is shore-based, the value for average sortie length deployed must be '999'.

- If card type '06' is used, all unused fields must be zero filled.

- If an invalid aircraft type is used, NECs of '0000' will occur for billets with work attached to that plane. PMCM data and MAFSAF values will all be zero.

- If an invalid squadron name is used, the program will terminate with a message stating same.

- When updates of standards of imposed hours are performed against WC210 they are done against the ASW branch (WC #30.) Only at the billet computation process is the switch made to the electrical branch (WC #31.) Therefore, all WC210 changes must be made against work center index 30.

- When hours are added to a work center which is comprised of more than one rating, the extra hours are apportioned on the same ration as other hours in that work center. Hours cannot be added to a specific rating.

3.4 PROGRAM ERRORS

Although much care has been exercised to insure that the ASQMD program does not contain any program 'bugs', errors will occasionally occur. This section lists those errors most likely to occur and the probable cause of each. Appendix L shows representative pages of a dump pointing out those fields most likely to be useful in solving the problem.

ERRORS

OC7 Data Exception, attempt to do an arithmetic operation with a non-numeric field.

Probable Causes

1. Fields on an input card misaligned.
2. Computed billets for a work center exceeded the number of billets in the grade spread.
3. Invalid Rate for directed billet.

322 Time exceeded. Program may have entered an infinite loop.

Probable Causes

1. Hours erroneously added to the WC 04000 series which has no enlisted.
2. The squadron was so large that time ran out normally. This would occur around the 550 enlisted mark.

SQMD not run due to prior condition codes: This will occur if during the UPDATE program any abnormal termination occurred. Two possibilities exist:

1. An IEBUPDTE sequence error occurred during the BILTITLE step. User should correct the error and resubmit the entire job.
2. The SCRATCH step generated an error. This can only occur if there was a system crash and then the job was automatically rerun. The user should resubmit the entire job.

013 File error

Probable cause

1. On one of the JCL override statements an illegal squadron name was used. The User System Log, found on listing immediately before the JCL, will show the file in error.

3.5 BILLET TITLE FILE UPDATES

DATALIB contains two billet title files. One, NEWBIL, contains the permanent billet title file list. A second file, TEMPBIL, contains a temporary billet title list which consists of the NEWBIL list after squadron specific updates were made. This file, although permanent on DATALIB should be treated as a temporary file. TEMPBIL for one squadron cannot generally be used by another squadron.

3.5.1 K3SQMD1.BILUPDTE.DATA

This is a partitioned data set which consists of all the Billet Title updates. The file is used in the procedures UPDATE, SQMDBPRC and SQMDBALL. A default to an empty data set is used so that using those prcedures will not cause an error if no update is required.

3.6 PROCESSING NAVMMACLANT TAPES

When a tape of PMCM and MAFSAF data is received from NAVMMACLANT, the data found on that tape should be extracted and added to K3SQMD1. DATALIB. DATA. The member name assigned should somehow reflect the data that was received. It is suggested that a code such as 'PMCM0576' or 'MAF0676' be used. Currently, a sequential numbering system is used. A step-by-step procedure for loading the information on 'DATALIB' is as follows:

1) Transport tape from NIH to PRC

2) Execute TAPEANAL to determine which file of the tape the desired data can be found. A JCL list is found in K3SQMD1.UTILITY.DATA (TAPEANAL) CNTL.

3) Execute K3SQMD1.UTILITY.DATA (LOAD) CNTL. This program reads the tape and generates new PMCM and MAFSAF files. See notes in TSO JCL of 'LOAD' for necessary overrides.

4) Execute K3SQMD1.UTIILITY.DATA (PRINT) CNTL. This program prints the MAF/SAF file as is. See notes in TSO JCL of 'PRINT' for necessary overrides.

5) Using TSO make necessary edits of MAF/SAF eliminating verbage, replacing it with zeroes.

6) Return tape from PRC to NIH.

3.7 MISCELLANEOUS COMPUTATIONAL PROCEDURES

This section states various computational steps used in the ASQMD program which are either unique to this program or are not clearly defined by other documents.

3.7.1 Estimation of Admin and Personnel Hours

The Admin and Personnel department base their AS hours on a formula which requires knowledge of the total number of billets in the squadron. However, the billets for these departments are computed when only the total maintenance hours for the other departments is known. Due to rounding rules, it was discovered during development that the division of total hours by the work week yielded an estimated number of billets below that amount actually generated. Therefore a factor was added to the estimated number of billets to more accurately predict what the final total would be. After examining ten squadrons of various sizes the following formula was established for use in the program:

$$Y = \frac{\text{TOTAL HOURS FOR ENLISTED}}{\text{Workweek}}$$

$$\text{Est Enl} = 1.1\ (Y) + \frac{8}{Y}$$

3.7.2 Assignment of NECs

NECs are found in two places in DATALIB. First, they are found in the NECDATA file. Second, they are found in the PMCM file. The ASQMD program uses those found in the NECDATA file and ignores those in the PMCM file.

3.7.3 Rounding Rule

The rounding rule, which is discussed in Appendix A, is used for all work centers. The appropriate value is added to the fractional number of computed billets and then the new value is truncated leaving only a whole number of billets.

3.7.4 1st Lt. Standards

Within the 1st Lts department, some billets are imposed. However, BEQ supervisors and FAC maintenance men are generated based on the number of other billets in the squadron. This department uses the same estimating procedure as does the Admin department (see 3.7.1) to estimate the number of enlisted billets. Then

using the table in the User's Manual, it determines the number of 1st Lt. billets. For example, if the estimated squadron population was 500, the program would step down the table until it encountered a number greater than 500. When it reached 530, the search would cease. Since 530 was the eighth entry in the table, eight billets worth of work would be assigned.

Additionally when imposed hours are added to the 1st Lts department, these hours are added to the before mentioned hours. When grade spreads are computed for these hours, two processes occur depending on whether the squadron was shore- or carrier-based. For carrier-based squadrons, the first assigned billet is a PPO/DAMAGE CTL PO with AS work. Subsequent billets will be OPEN with AS work if they are not AN rated and FAC MAINTMAN if AN rated. For shore-based squadrons, the first assigned billet is a HANGER MAINT SUPVR with AS work. The second billet is a BEQ MAA SUPVR with AS work if not AN rated and a FAC MAINTMAN if AN rated. Subsequent billets are BEQ MAA if not AN rated and FAC MAINTMAN if AN rated.

3.7.5 WC230

For certain carrier-based squadrons, the number of computed billets is augmented by a factor which is input on card type '04'. This factor is multiplied by the number of computed billets yielding a new number. Excess hours required for this augmenting are added to the OM hours of that work center. Baseline runs against specified squadron were run to determine the factor. If the field is blank on the input card, a factor of 1.0 is assumed.

3.7.6 UT Computations

Utility Task hours are 'hard-wired' into the program based on squadron type.

DEPT	VAA7FLT VAA6FLT VFF4FLT VF14FLT HSFLT	VSFLT VFPFLT VAWFLT VAQFLT RVAHFLT	ALL OTHER CARRIER
ADMIN	10.4 hrs.	10.4 hrs.	10.4 hrs.
PERS	10.4	10.4	10.4
WC020	10.4	10.4	10.4
WC050	10.4	10.4	10.4
WC110	41.5	20.7	0.0
WC120	41.5	20.7	0.0
WC130	10.4	10.4	10.4
WC131	10.4	10.4	10.4
WC210	62.2	20.7	0.0
WC211	62.2	20.7	0.0
WC220	41.5	20.7	0.0
WC230	41.5	0.0	0.0
WC310	103.7	62.2	0.0

3.7.7 STEP BY STEP COMPUTATIONAL PROCEDURES

The following steps are used by the program to calculate work center hours:

(1) Figure total MAF manhours and total SAF manhours
(2) Spread MAF and SAF manhours to the work centers via percentages
(3) Add MAF and SAF by work centers
(4) Figure CM PD by work centers
(5) Add MAF and SAF CM Productive delay to get total CM per work center
(6) Figure total raw PM by work center
(7) Add 30% MRPA to the raw PM by work center
(8) Figure PA + PD by work center
(9) Compute the raw PM and MRPA multiplied by PA times PD
(10) Compute the total PM by work center
(11) Compute squadron maintenance equal to total PM plus total CM
(12) Compute total AS using the appropriate AS formula
(13) Multiply total AS times AS percent and then spread to work centers
(14) Figure FM by work center equal to FM% by WC AS
(15) Spread troubleshooter hours
(16) Compute requisition factors and enter as AS for WCØ5Ø
(17) Compute WCOSO FM as a percent of WCØ2Ø AS
(18) Compute hours for WCOSO using number of shifts and AS's from formulae
(19) Compute hours in OPS office
(20) Compute YN and PN as AS hours from formula of estimated billets

3.8 SPECIAL FEATURES

After the initial design work for the ASQMD system, various features were added to allow the user more flexibility with the system. This section describes the most prominent of these features and how they function.

3.8.1 PM Only

Some squadrons possess planes which do not fly but which to require PM to be performed. For these squadrons, the PM only feature was added. By using hours/month of zero on card type '05' all hours associated with CM will be zero, thus causing a PM only status.

3.8.2 QA Key

Many aircraft require Quality Assurance billets. It is possible that a specific squadron would possess two such aircraft. By giving the aircraft type on a card type '04' the program will select the set of QA billets desired by the user.

3.8.3 New Departments

On occasion, a squadron may wish to have a department which is not in the standard set of departments. Examining the table will indicate that some departments have been titled 'OPEN'. These titles may be overridden by a user supplied title and then directed billets may be added to these departments. A card type '15' overrides the title while a card type '10' adds the billets. When the title override occurs, the Section II table is also altered so that these new departments are shown correctly in the Section II Summary Report.

3.8.4 Directed Billet Bypass

Some departments, FRAMP for example, are generated through directed billets. Occasionally, the user may wish not to process some directed billets but still not wish to eliminate all directed billets. By use of a card type '09', the user may eliminate all program use of any directed billets for any department desired. When this card is used, the billets are not processed when the directed billet file is read, thus no billets and no hours are generated.

3.8.5 Working Papers

Before the printing of the ASQMD document, a set of working papers are printed. These papers are a formatted listing of arrays used in the program to generate billets. They contain by work center all hours, computed and imposed, along with all other factors which went into the computation of billets, such as PD percent, workweek, etc. Also PMCM and MAFSAF values are listed along with the latest update date. For PMCM, two dates are listed in the form MMY. The first date is the latest deployed based data updates while the second one is the latest shore-based data updates.

3.8.6 PD Increment

A feature of the working papers is the PD increment column. This number is the extra PM that a one percent rise in the PD factor would cause. This can be helpful if a squadron PD factor is believed wrong but the effect of a change in that factor is unknown.

3.9 RECOMPILING THE PROGRAM

As new requirements become known, the ASQMD program will have to be altered and a new LOAD MODULE created. Each statement of the program has a unique line number. Normal TSO commands can be used to update the ASQMD program. After updating is completed, the program must be recompiled. The 'COMPILE' member of UTILITY.DATA contains the JCL necessary to compile only. The new program is read from the data set specified on the //COB.SYSIN card. It is loaded into the data set specified on the //LKED.SYSLMOD card and into the member found immediately after the //LKED.SYSIN card. The '(R)' means replacement but can also be used for a newly created data set.

SECTION 4

1000/4A Interface System

4.1 OVERVIEW

Manpower requirements for aircraft squadrons are delineated in the Squadron Manpower Documents (SQMD). The funded billets for each activity are then displayed on the Manpower Authorization (OPNAV Form 1000/2). Changes to the OPNAV 1000/2 are requested via the Manpower Authorization Request (OPNAV FORM 1000/4A). Data is placed on the 1000/4A manually, and keypunched from that form.

Significant manpower actions (a reorganization for example) required a vast amount of hand-coding of 1000/4A's. Inasmuch as changes of this nature apply to the manpower documents as well as the authorizations, it would demonstrably reduce the manual effort required if these changes could be entered with a single effort. The 1000/4A Interface System was written to satisfy these requirements. The system functions are shown in the overview schematic, figure 4-1.

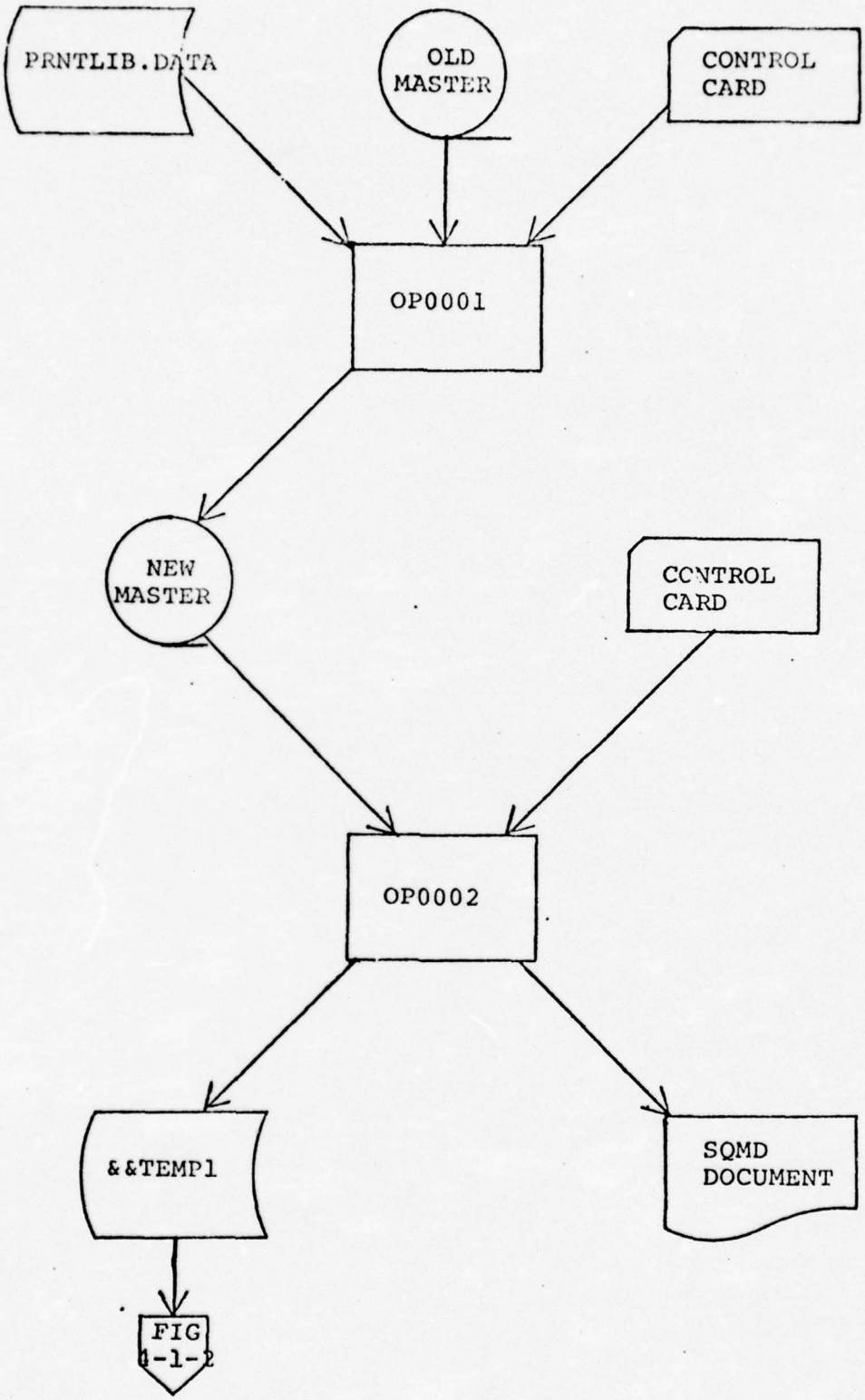

PRNTLIB.DATA
OLD MASTER
CONTROL CARD
OP0001
NEW MASTER
CONTROL CARD
OP0002
&&TEMP1
SQMD DOCUMENT
FIG 4-1-2

Figure 4-1

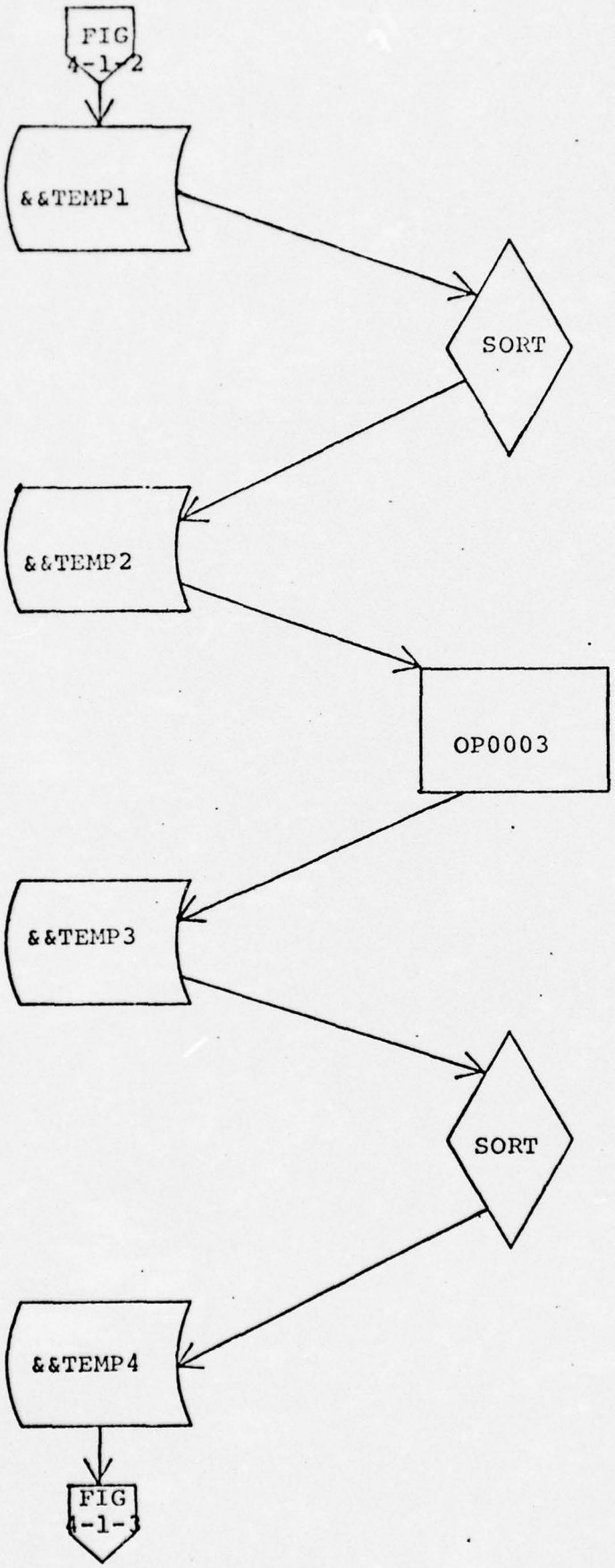


Figure 4-1 (cont)

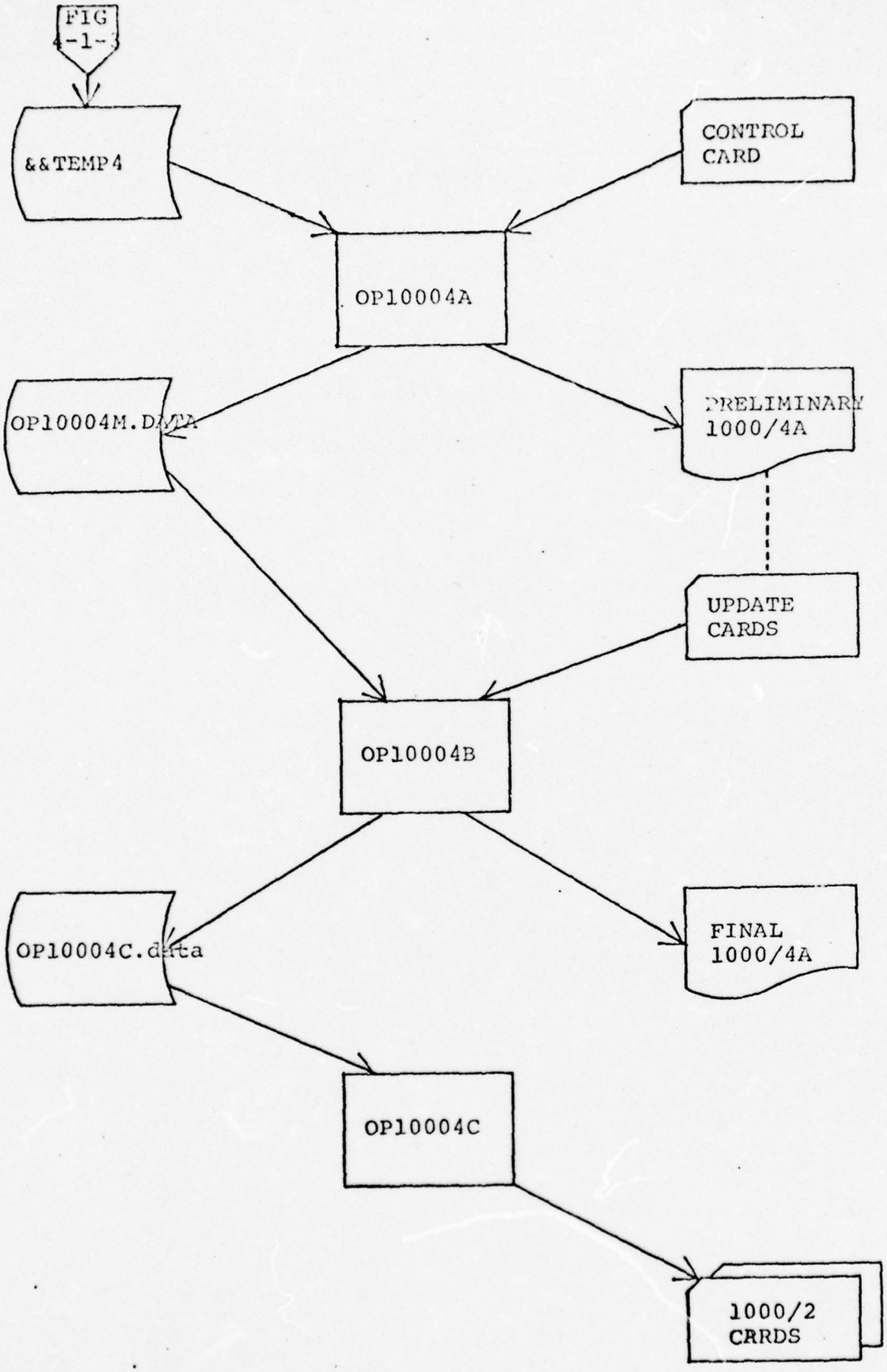


Figure 4-1 (cont)

4.2 PROGRAM DESCRIPTIONS

The 1000/4A interface system consists of six COBOL programs and two utility sorts. Figure 4-1 shows the system flow of the interface system. Four files are permanently attached to the system and during the execution of the system four temporary files are created. These temporary files are not saved at the end of each execution.

The 1000/4A system takes as input the actual ASQMD document, to include working papers, and stores this on a tape file of all ASQMDs after appending a user-supplied identifying number to the document. The ASQMDs residing on tape may be printed, initiated into the 1000/4A system or both. Upon entering the system, like records are merged and sorted with the final results a 1000/4A report. This report can be corrected using update cards and a new report produced. When the final report is created, cards are produced which the 1000/2 system reads to produce the 1000/2 report. Sections 4.2.1 through 4.2.6 give a more detailed description of each program in the system.

4.2.1 OP0001

After the ASQMD is executed and finalized, the user, instead of printing the final document can place it on a data set named K3SQMD1.PRNTLIB.DATA. This data set is a line-by-line image of the ASQMD document. OP0001 reads PRNTLIB and adds it to a tape file of all ASQMDs. A control card is read, and the ten-character code is attached to the document as it is added to the master file. This enables each document to be individually accessed. The necessity for at least two tapes is envisioned. For each run the previous output tape will now be the input tape and vice-versa. The current master tape will be a line-by-line image of all ASQMDs.

4.2.2 OP0002

Using the current master tape, this program gives the user three options. First, he can select and print any existing ASQMD by merely referencing its name and the proper code. Second, he can select and start on the 1000/4A process of any existing ASQMD. Third, he can do both of the above operations. Appendix M gives a description of the control cards required. If only the first option is desired this program is run separately and no output files are created. If either of the other options is desired, then the system automatically runs until a preliminary 1000/4A report is produced.

4.2.3 OP0003

The file output from OP0002 is sorted and sent to this program. OP0003 inputs no control card and creates no permanent file. This program merges together like billets so that a condensed list can be passed to latter programs in the system. JCL for this step is included in that for OP0002.

4.2.4 OP10004A

This program reads the sorted condensed file and produces a preliminary 1000/4A report along with a permanent output file used to generate the report. A control card is input, giving information on how certain fields are to be used. This card specifically defines whether the billets-authorized field is to be extended to fiscal year fields. JCL for this step is included in that for OP0002.

4.2.5 OP10004B

This program refines the previously generated 1000/4A report by the use of update/correction cards. The first input card is the control card defined in Section 4.2.4. This program inputs the tape produced by OP10004A and produces a 'final' 1000/4A file. If this 'final' file is still in need of further corrections, it is input to this program replacing the file produced by OP10004A. If, instead, the file is good, it is input into OP10004C.

4.2.6 OP10004C

This program takes as input the 'final' 1000/4A file and produces a tape of card images compatible to the 1000/2 system as used by PERS-3. A single input card of header information is read.

4.3 CATALOGUED JCL PROCEDURES

Residing on PROCLIB are five catalogued procedures. These allow the user to execute the 1000/4A system from TSO using a minimum of JCL. This section explains the different JCL procedures.

Member TOMASTER is the JCL necessary to add an ASQMD document to the master tape. The run JCL has two necessary overrides defining the input and output tape. If either is missing the job will terminate with an S013 completion card.

Member PRNTSQMD is the JCL necessary to print a specified ASQMD. No execution of the 1000/4A system is allowed by this procedure.

Member RUN10004 is the JCL necessary to take an ASQMD and produce a preliminary 1000/4A report. In addition, the user may also print the ASQMD.

Member UPD10004 is the JCL necessary to update the preliminary 1000/4A report. Due to the possibility of excessive input cards, this procedure should probably not be run from TSO but instead from a remote terminal.

Member PCH10004 is the JCL necessary to create 1000/4A card images for input to the 1000/2 system.

4.4 RUN STEPS

When a smooth ASQMD document has finally been generated, the user may wish to produce a 1000/4A report and create cards for input into the 1000/2 system. This section will give an overview of the entire run procedure and then a step-by-step description of how to run the 1000/4A system.

4.4.1 General Overview

Figure 4-1 shows the basic 1000/4A flow. An ASQMD document, residing on the TSO data set PRNTLIB is merged with an existing tape of all ASQMD documents, from which a new ASQMD tape is created. This tape is read as input into a program (OP0002) which extracts information from the tape for the specified squadron, as found in the OP0002 control card, and creates a file of only that information needed to produce a 1000/4A report. This file is then sorted, like billets are combined and then resorted so as to be input to the program which produces a preliminary 1000/4A report. This report is then examined and update cards are created for input into the program which will produce a final 1000/4A report. A file is also created of information necessary to punch 1000/2 cards. If no further corrections are required, the 1000/2 cards are punched for submission to the 1000/2 system.

4.4.2 PRNTLIB

K3SQMD1.PRNTLIB.DATA is a partitioned data set with each member containing an entire ASQMD document. No condensing of the document is made. The individual member is created by the use of a JCL override on the final smooth run. This run will not be printed, therefore this could well be a rerun of the final smooth run. The JCL card to override is

```
//SQMDB.SQMD DD DSN=K3SQMD1.PRNTLIB.DATA(member)
```

This card should go immediately before the //CTRLCARD DD * card. After a member has been successfully added to the master tape, that member should be deleted in order to reduce TSO storage costs.

4.4.3 TAPE Files

The 1000/4A system requires the use of three tape files. One tape is necessary in order to input cards into the 1000/2 system since that system actually expects a tape file of card images. The other two tapes will contain all previously published ASQMDs. Since this could easily number into the hundreds, the cost of

storing these files on-line through TSO could become exorbitant. By using tapes, at a combined rental of only $10 per month, a great cost savings could be realized. Two tapes are a minimum requirement and it is recommended that a three-tape rotation system be implemented. Using this system, at any given execution, at least one tape would not be being used by the system. Thus, if a catastrophic system crash occurred destroying the contents of both tapes, a one generation old backup tape would still be available. Tapes require /*SETUP cards as are shown in the User's Manual.

4.4.4 1000/4A Step-by-step Run Procedures

1. Run the ASQMD system with the //SQMDB.SQMD override card as explained in 4.4.2.

2. Execute procedure TOMASTER. The squadron code on the control card should be some unique identifier. It is suggested that the first seven positions be the squadron name, the next two be the year, and the final be a letter suffix to distinguish it from any other identical squadrons run that year. A list of all squadron codes on the new master file is generated as a byproduct of this program.

3. Execute procedure RUN10004. The OP0002 control card should have an '*' in CC14. If a print of the ASQMD document is also desired, place an '*' in CC12. Up to two ASQMDs can be joined on one 1000/4A report. If multiple ASQMDs are used, place a '1' in CC16 of the first control card and a '2' in CC16 of the second control card.

4. Examine the 1000/4A report making appropriate correction cards.

5. Execute procedure UPD10004, inputting all correction cards.

6. Examine the 1000/4A report. If any further corrections are needed, make them and to to Step 5. If no further changes are necessary, go to Step 7.

7. Execute PCH10004.

8. Input data tape of card images into 1000/2 system.

APPENDIX A

ASQMD STANDARDS

APPENDIX A

DEVELOPMENT OF SQUADRON MANPOWER STANDARDS

During the course of the Squadron Manpower study, certain manpower standards were developed to cover areas that were previously undefined or subject to analyst judgment.

This appendix presents brief summary information regarding the standards used in the ASQMD program. The standards mentioned are:

	Paragraph
Projected Operating Environment	A-1
Planned Maintenance Computation	A-2
Corrective Maintenance Computation	A-3
Admin Support and FM Manhours	A-4
Allowances	A-5
Officer Workload	A-6
Aviation Maintenance NECs	A-7
Production Work Center Supervisors	A-8
Quality Assurance (Work Center 040)	A-9
Planned Maintenance Branch (WC 140)	A-10
Troubleshooters (Work Center 320)	A-11
Plane Captains/Handlers	A-12
Fractional Manning (Rounding)	A-13
Paygrade Disbribution Tables	A-14
Officer and Aircrew Manning	A-15
Directed Billets	A-16
Career Counselor Point Standard	A-17
Billet Title File	A-18

A-1. PROJECTED OPERATING ENVIRONMENT (POE)

MSS conducted a review of existing squadron POEs, and developed a POE format for the ASQMD program that contained the information needed to drive the program computations. The format development was dynamic, and was approved with the understanding that what was approved was a program input format, not a standard for Navy development of POEs.

A-2. PLANNED MAINTENANCE COMPUTATIONS

PM manhours are computed by work center, based on number and type of aircraft (POE), flight hours and sortie rate (POE), flying days (POE), and the coefficients in the Squadron Standards PM/CM Data Base System. The categories of PM computed are manhours per sortie, per week, per flight hour, per daily inspection. These computed manhours are aggregated by work center and by rating/aircraft type.

Allowances are added for PA, PD, and MRPA (see discussion in Paragraph A-5 below.

The maintenance computations are described in the NAVMMACLANT Final Report - Work Center Staffing Standards and the PM/CM User's Manual.

A-3. CORRECTIVE MAINTENANCE COMPUTATIONS

CM hours are computed by aircraft type for MAF and SAF hours, based on the coefficients for the negative exponential regression determined by NAVMMACLANT from analysis of 3-M data. The MAF and SAF hours are spread to the production work centers by the percentage factors stored in the Squadron Standards PM/CM Data Base System. An allowance is added for PD (see Paragraph A-5 on allowances).

The maintenance computations are described in the NAVMMACLANT Final Report - Work Center Staffing Standards.

A-4. ADMINISTRATIVE SUPPORT AND FACILITIES MAINTENANCE MANHOURS

For production work centers, AS is computed from a general formula, and spread by a percentage table, by squadron type. The formulas and tables are contained in NAVMMACLANT Final Report - Work Center Staffing Standards. The squadron type designations were provided by OP-124F in accordance with the comprehensive list of squadron types.

Departmental administrative support is computed by the appropriate method described in the Work Center Staffing Standards report.

FM is computed as a percentage of AS. The table for FM computation is also in the Work Center Staffing Standards report. (In exceptional cases, FM computation may be described separately in the text of the report for an individual work center.)

A-5. ALLOWANCES

Production Delay (PD) - Prior to the commencement of this project, an interim PD standard had been developed which expressed PD as a percent of active maintenance manhours for PM and CM. The table was keyed on deployment and work center.

Knowing that a more comprehensive PD standard was to be devleoped, MSS coded into the ASQMD a PD formula based on a constant value, a factor for active maintenanc workload, and a factor for number of aircraft. The constant and number-of-aircraft coefficients are zero (until data are developed) and there is a default table for percent of maintenance manhours (which is the table in the interim standard).

Make-ready/Put-away (MRPA) - Also previously established was a 30% MRPA allowance to be applied to PM.

Productivity Allowance (PA) - A 20% PA for PM and AS in administrative and operations is specified in the Work Center Staffing Standards Report. The ASQMD has a variable PA (by work center) with 20% as the default value.

A-6. OFFICER WORKLOAD

Previously promulgated SQMDs had shown officers workloads as OM manhours. The ASQMD program displays a separate category for OW (Officer Workload), and each billet is accounted as OW for the squadron workweek.

A-7. AVIATION MAINTENANCE NECs

Maintenance NECs are assigned by rating/aircraft type. In general, for a given aircraft type, all the billets within a rating will have the same NEC. Exceptions to this are made on a percentage basis, and also a paygrade (high = E6, 7, 8 - low = E3, 4, 5) distinction.

Where aircraft types are mixed in a squadron, the approved approach requires the assignment of NECs in proportion to the work center/rating maintenance workload. Where maintenance workload is not identified for the work center (billets driven solely by AS, FM, and/or OM), the squadron-wide maintenance workload proportion is used.

A-8. PRODUCTION WORK CENTER SUPERVISOR

Ratings (and sometimes paygrades) for maintenance work center supervisors are taken from a table developed by NAVMMACLANT Code 7. The table is organized by squadron type.

Some of the billets are treated as directed billets, and are added to those computed from functional manhours. Others are rating/rate standards applicable to the senior billets computed from workload.

A-9. QUALITY ASSURANCE WORK CENTER (040)

Billets are assigned as directed billets from the Quality Assurance file, based on squadron type.

Manhours are credited as OM for the standard workweek for the squadron.

The Q.A. billets were produced by NAVMMACLANT (Code 7). On the billet tables for various squadrons, the billet sequence numbers are assigned and the squadron types are designated.

A-10. PLANNED MAINTENANCE BRANCH (WORK CENTER 140)

The number of billets is computed from normal workload calculations and consists of AS and its associated FM workload only. Paygrades are normally E6, except where the squadron has over 20 aircraft, in which case the first billet is E7. Ratings are rotated (AMS, ADJ, AMH, etc.). NECs are system NECs, rotated by aircraft type in order of quantity of aircraft.

A-11. TROUBLESHOOTERS - WORK CENTER 320

Troubleshooters are assigned as directed billets for some squadrons, or distributed as OM workload to various maintenance work centers for other squadrons, based on deployment and squadron type.

In the cases where there is a troubleshooters branch (WC 320), the billets are read from a table and processed as directed, with their manhours being counted as OM. In the other cases, the OM hours for the various work centers are computed using pre-launch standby time, flight hours, number of sorties, sorties per launch, number of aircraft, and sortie length.

A-12. PLANE CAPTAINS/PLANE HANDLERS

For carrier-based squadrons, plane captains/or plane handlers are computed from a standard developed at NAVMMACLANT (Code 7). The

number of billets is computed from the workload based on PM/CM/AS/FM, and is also computed based on the formula. In the standard, the greater of the two numbers is used. Paygrades are taken from the paygrade distribution table for the work center. Ratings are determined by methods described in the standard. Billets are plane captains in squadrons without aircrew and plane handlers in squadrons with aircrew.

A-13. FRACTIONAL MANNING (ROUNDING RULE)

Fractional billets are rounded on a work center (vice rating) basis, using a table relating the fractional rounding to the workweek and the total number of billets. The rounding table is as follows:

#Billets	Greater than 56 hr/wk	56 or less hour week
1	1.050	1.078
2	2.100	2.156
3	3.150	3.234
4	4.200	4.312
5	5.250	5.391
6	6.300	6.469
7	7.350	7.500
8	8.400	round-up
9	9.450	over X.500
10	10.500	
	round-up over X.500	

A-14. PAYGRADE DISTRIBUTION TABLES

Paygrade distributions for various work centers given the distribution of rates for the various work centers based on the number of computed enlisted billets. Directed billets are considered separately, and do not contribute to the number used to select the appropriate column from the table for distribution of paygrades to computed billets.

For some work centers, the table also gives guidance regarding ratings and billet titles.

A-15. OFFICER AND AIRCREW MANNING

Reference to existing POEs and data on allowances by aircraft revealed that two sets of factors were needed for each aircraft type - a number of pilots, NFOs, and aircrewmen for each crea, and a number of crews (crew ratio) for each aircraft. Accordingly,

these numbers were incorporated into the POE record. The number of pilots, NFOs, and aircrewmen for the squadron is computed by the following formula: number per crew x crew ratio x number of aircraft, summed across aircraft types. After the number, N, is computed for a category, the billets are selected by taking the first N of the category from a priority table for the squadron type.

A-16. DIRECTED BILLETS

For a large number of squadrons/squadron types, NAVMMACLANT has developed a directed billet file. These may include entire work centers (e.g., AIMD) where no staffing standard currently exists, on special billets in designated work centers.

A-17. CAREER COUNSELOR POINT STANDARD

The requirement for Career Counselors is based on the total number of enlisted billets, including AIMD and integrated services.

A-18. BILLET TITLE FILE

Billet titles are associated with 5-digit billet sequence codes. In the file, the occurrence of a title signifies that any subsequent billet sequence code which is less than the next one in the title file will be associated with the preceding title, e.g.:

05200	Photo Intell Tech Supv
05210	Photo Intell Tech
05300	Comm Clerk Supv

Billet 05200 (if it occurs) is titled Photo Intell Tech Supv,
Billets 05210 thru 05290 (any or all that occur) are Photo Intell Tech.; 05300 is Comm Clerk Supv, etc.

For automation purposes, the billet title file also contains OFF/ENL/CIV, Rating, and Supervisor indicators.

APPENDIX B

SAMPLE ASQMD PROGRAM OUTPUT

SECTION II

OPNAVINST
DATE

MANPOWER SUMMARY

FOR

VP-31 SHORE BASED RTS

MAJOR ORGANIZATIONAL COMPONENT	REQUIRED TO SUPPORT ROC/POE		
	OFF	ENL	CIV
EXEC DEPT	6	20	0
ADMIN DEPT	11	27	0
OPS DEPT	38	6	0
OPEN	0	84	0
FRAMP DEPT	2	0	0
SFTY DEPT	4	0	0
MAINT DEPT	15	178	0
INTEGRATED SERVICES	0	22	0
AIMD	0	36	0
TOTAL	76	373	0

II - 1

ENCLOSURE 1

B-1

Figure B-1: ASQMD Section II

SECTION III

OPNAVINST
DATE

MANPOWER REQUIREMENTS

FOR

VP-31 SHORE BASED RTS

SEQ CODE	BILLET TITLE	SSPEC CODE	AQD/U	PRI NOBC	SEC NEC CODE	DS RT	G R	REQUIRED TO SUPPORT ROC/POE
22160	P/P MAINTMAN			6319/		ADJ3		1
22170	P/P MAINTMAN			6319/		ADJAN		1
22180	P/P MAINTMAN			6319/		ADJAN		1
22190	P/P MAINTMAN			6319/		ADJAN		1
22200	P/P MAINTMAN			6319/		ADJAN		1
22210	P/P MAINTMAN			6319/		ADJAN		1
22220	P/P MAINTMAN			6319/		ADJAN		1
22230	P/P MAINTMAN			6319/		ADJAN		1
23000	A/F ER W/C 120							
23010	A/C CMNT A/C		DJ3/M	8197/		1321J		1
23050	A/F MAINTMAN	SUPVR		6319/		AMSC		1
23060	A/F MAINTMAN			6319/		AMH2		1
23070	A/F MAINTMAN			6319/		AMH3		1
23080	A/F MAINTMAN			6319/		AMHAN		1
23090	A/F MAINTMAN			6319/		AMHAN		1
23100	A/F MAINTMAN			6319/		AMS1		1
23110	A/F MAINTMAN			6319/		AMS1		1
23120	A/F MAINTMAN			6319/		AMS2		1
23130	A/F MAINTMAN			6319/		AMS2		1
23140	A/F MAINTMAN			6319/		AMS2		1
23150	A/F MAINTMAN			6319/		AMS3		1
23160	A/F MAINTMAN			6319/		AMS3		1
23170	A/F MAINTMAN			6319/		AMS3		1
23180	A/F MAINTMAN			6319/		AMS3		1
23190	A/F MAINTMAN			6319/		AMS3		1
23200	A/F MAINTMAN			6319/		AMSAN		1
23210	A/F MAINTMAN			6319/		AMSAN		1
23220	A/F MAINTMAN			6319/		AMSAN		1

Figure B-2: ASQMD Section III

SECTION V

OPNAVINST
DATE

FUNCTIONAL WORKLOAD

FOR

VP-31 SHORE BASED RTS

FUNCTIONAL TITLE	FUNCTIONAL HOURS	TOTAL HOURS	FUNCTION DESCRIPTION
		31.9	
A/C DIV W/C 100			
OM	31.9		OPERATIONAL MANNING
OW	31.9		OFFICER WORKLOAD
		63.8	
P/P BR W/C 110			
OM	22.8		OPERATIONAL MANNING
PM	141.5		PREVENTIVE MAINTENANCE
CM	361.6		CORRECTIVE MAINTENANCE
AS	70.9		ADMINISTRATIVE/SUPPORT
FM	6.7		FACILITIES MAINTENANCE
OW	31.9		OFFICER WORKLOAD
		635.6	
A/F BR W/C 120			
OM	45.6		OPERATIONAL MANNING
PM	197.0		PREVENTIVE MAINTENANCE
CM	395.9		CORRECTIVE MAINTENANCE
AS	82.3		ADMINISTRATIVE/SUPPORT
FM	8.2		FACILITIES MAINTENANCE
OW	31.9		OFFICER WORKLOAD
		760.9	
CORROS CTL BR W/C 121			

Figure B-3: ASQMD Section V

SECTION VI OPNAVINST
DATE

SUMMARY OF OFFICER MANPOWER REQUIREMENTS (PART 1)

FOR

VP-31 SHORE BASED RTS

DESIG	G O-6 (CAPT)	H O-5 (CDR)	I O-4 (LCDR)	J O-3 (LT)	K O-2 (LTJG)	L O-1 (ENS)	M W-4 (CWO4)	N W-3 (CWO3)	O W-2 (CWO2)	P W-1 (WO1)	TOTAL
1301		2									2
1311		1	3	32							36
1321			4	27							31
1520			1		1						2
2102				1							1
3100						1					1
6330					1						1
6360				1							1
7330								1			1
TOTAL		3	8	61	2	1		1			76

VI - 1 ENCLOSURE 1

Figure B-4: ASQMD Section VI (Officers)

SECTION VI

OPNAVINST
DATE

SUMMARY OF ENLISTED MANPOWER REQUIREMENTS (PART 2)

FOR

VP-31 SHORE BASED RTS

RATING	PR1 NEC	SEC NEC	E-9 (MCPO)	E-8 (SCPO)	E-7 (CPO)	E-6 (PO1)	E-5 (PO2)	E-4 (PO3)	DESIG STKR	E-3	E-2	TOTAL
ABH	8319				1	1		2				4
RATING TOTAL					1	1		2				4
AD		8251		2								2
AD	8319			1								1
RATING TOTAL				3								3
ADJ	6418						1	2	1			4
ADJ	8319	9567				2						2
ADJ		8251			1	4	7					12
ADJ	8319				1	3	4	5	7			20
RATING TOTAL					2	9	12	7	8			38
AE	7117					1						1
AE	7136							1				1
AE									3			3
AE	7101	9567				1						1
AE		8251			1	2	8					11
AE	7102			1	1		2	2	2			8
AE	7101					1	1	2	2			6
RATING TOTAL				1	2	5	11	5	7			31

Figure B-5: ASQMD Section VI (Enlisted)

SECTION VI

OPNAVINST
DATE

SUMMARY OF CIVILIAN MANPOWER REQUIREMENTS (PART 3)

FOR

VP-31 SHORE BASED RTS

CIVILIAN SKILL	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	TOTAL

VI - 9

ENCLOSURE 1

Figure B-6: ASQMD Section VI (Civilian)

```
1                01VP-31 SHORE BASED RTS
2    5320.VP     03
3    5320.VP     04 VP-31    VPRTS    ASHORE    12 24 50 319 2 .
4    5320.VP     05          P-3B     08 000 999 055 045 0000 0000 0000 0000
5    5320.VP     05          P-3B     02 000 999 000 999 0000 0000 0000 0000
6    5320.VP     05          P-3C     08 000 999 055 045 0000 0000 0000 0000
7    5320.VP     05          P-3C     02 000 999 000 999 0000 0000 0000 0000
8    5320.VP     06          VP31     07 069 000 116 000
9                99    END OF DATA
```


Figure B-7: Working Papers - Listing of User Input Data Cards

DIPECTED BILLETS

10	47010E	AK ANOM	VP-31
10	47060E	DK 1 OM	VP-31
10	47070E	DK SNOM	VP-31
10	47080E	DK SNOM	VP-31
10	47110E8406	HNOM	VP-31
10	47120E8406	HNOM	VP-31
10	47130E	HNOM	VP-31
10	47160E3501	MS SNOM	VP-31
10	47170E3501	MS SNOM	VP-31
10	47180E3501	MS SNOM	VP-31
10	47190E3502	MS SNOM	VP-31
10	47200E3502	MS SNOM	VP-31
10	47210E3502	MS SNOM	VP-31
10	47220E3502	MS SNOM	VP-31
10	47260E8195	PH 2 OM	VP-31
10	47310E	PN SNOM	VP-31
10	47410E	ANOM	VP-31
10	47650E	PO 2 OM*BEQ MGR	VP-31
10	47660E	ANOM	VP-31
10	47670E	ANOM	VP-31
10	47680E	ANOM	VP-31
10	47690E	ANOM	VP-31
10	48010E6418	ADJ2 OM	VP-31
10	48020E6418	ADJ3 OM	VP-31
10	48030E6418	ADJ3 OM	VP-31
10	48040E6418	ADJANOM	VP-31
10	48200E7117	AE 1 OM	VP-31
10	48210E7136	AE 3 OM	VP-31
10	48220E	AE ANOM	VP-31
10	48230E	AE ANOM	VP-31
10	48240E	AE ANOM	VP-31
10	48400E	AMH2 OM	VP-31
10	48410E	AMH3 OM	VP-31
10	48500E	AMS3 OM	VP-31
10	48700E6803	AO 2 OM	VP-31
10	49000E	ASHANOM	VP-31
10	49010E	ASHANOM	VP-31
10	49020E	ASHANOM	VP-31
10	49100E	AT 1 OM	VP-31
10	49110E6568	AT 2 OM	VP-31
10	49120E6661	AT 2 OM	VP-31
10	49130E6661	AT 2 OM	VP-31
10	49140E6568	AT 3 OM	VP-31
10	49150E6612	AT 3 OM	VP-31
10	49160E6612	AT 3 OM	VP-31
10	49170E	AT 3 OM	VP-31
10	49180E	AT 3 OM	VP-31
10	49190E	AT ANOM	VP-31
10	49200E		
10	49210E		
10			
10			

Figure B-8: Working Papers - Listing of File Input Directed Billets

10	49610E	AX 2 OM	VP-31
10	49620E6564	AX 3 OM	VP-31
10	49630E6561	AX ANOM	VP-31
10	49640E	AX ANOM	VP-31
10	49800E	PG 1 OM	VP-31

```
AIPCREW
42050E     8251ADJC OM                                                  VP-RTS
42060E     8251ADJ2 OM                                                  VP-RTS
42070E     8251ADJ2 OM                                                  VP-RTS
42080E     8251ADJ2 OM                                                  VP-RTS
42090E     8251ADJ2 OM                                                  VP-RTS
42100E     8251AE 1 OM                                                  VP-RTS
42110E     8251AE 2 OM                                                  VP-RTS
42120E     8251AE 2 OM                                                  VP-RTS
42130E     8251AE 2 OM                                                  VP-RTS
42140E     8251AMH2 OM                                                  VP-RTS
42150E     8251AMH2 OM                                                  VP-RTS
42160E     8251AMH2 OM                                                  VP-RTS
42170E     8251AMH2 OM                                                  VP-RTS
42180E     8251AMS2 OM                                                  VP-RTS
42190E     8251AMS2 OM                                                  VP-RTS
42200E     8251AMS2 OM                                                  VP-RTS
42210E8319828EA0 1 OM                                                   VP-RTS
42220E8319828EA0 2 OM                                                   VP-RTS
42230E8319828EA0 2 OM                                                   VP-RTS
42240E8319828EA0 2 OM                                                   VP-RTS
42250E8319828EA0 2 OM                                                   VP-RTS
42260E8319828EA0 2 OM                                                   VP-RTS
42270E     8256AT 2 OM                                                  VP-RTS
42280E     8256AT 2 OM                                                  VP-RTS
42290E     8265AT 2 OM                                                  VP-RTS
42300E     8265AT 2 OM                                                  VP-RTS
42310E     8265AT 2 OM                                                  VP-RTS
42320E     8261AT 3 OM                                                  VP-RTS
42330E     8252AX 2 OM                                                  VP-RTS
42340E     8252AX 2 OM                                                  VP-RTS
42350E     8261AX 3 OM                                                  VP-RTS
42360E     8261AX 3 OM                                                  VP-RTS
09010E7821     AW CMOM*FRAC SUPVR                                       VP-RTS
09020E78217861AW C OM*SCHED/COUNS                                       VP-RTS
09030E     8251AD CSOM*SCHED/COUNS                                      VP-RTS
09040E     8251AD CSOM*AIRCREW INSTR SUPVR                              VP-RTS
09050E     8251ADJ1 OM*AIRCREW INSTR SUPVR                              VP-RTS
09060E     8251ADJ1 OM*AIRCREW INSTR SUPVR                              VP-RTS
09070E     8251ADJ1 OM*AIRCREW INSTR                                    VP-RTS
09080E     8251ADJ1 OM*AIRCREW INSTR                                    VP-RTS
09090E     8251ADJ2 OM*AIRCREW INSTR                                    VP-RTS
09100E     8251ADJ2 OM*AIRCREW INSTR                                    VP-RTS
09110E     8251ADJ2 OM*AIRCREW INSTR                                    VP-RTS
09120E     8251AE C OM*AIRCREW INSTR                                    VP-RTS
09130E     8251AE 1 OM*AIRCREW INSTR                                    VP-RTS
09140E     8251AE 2 OM*AIRCREW INSTR                                    VP-RTS
09150E     8251AE 2 OM*AIRCREW INSTR                                    VP-RTS
09160E     8251AE 2 OM*AIRCREW INSTR                                    VP-RTS
09170E     8251AE 2 OM*AIRCREW INSTR                                    VP-RTS
09180E     8251AE 2 OM*AIRCRE                                           VP-RTS
09190E     8251AMH1 OM*AIRCRE
09200E     8251
09210E     8251AM
09220E     8251AMH2 OM*AIRCREW INSTR                                    VP-RTS
09230E     8251AMH2 OM*AIRCREW INSTR                                    VP-RTS
09240E     8251AMH2 OM*AIRCREW INSTR                                    VP-RTS
09250E     8251AMS1 OM*AIRCREW INSTR                                    VP-RTS
09260E     8251AMS1 OM*AIRCREW INSTR                                    VP-RTS
```

Figure B-9:
Working Papers - Listing of File Input Aircrew Billets

AVIATOR OFFICERS

0002008670	DJ4/M1301HOW	VP-RTS
0003008672	DJ3/M1301HOW	VP-RTS
0007008696	DJ3/M1311IOW	VP-RTS
0006008696	DJ3/M1321IOW	VP-RTS
0009008696	DJ4/M1321IOW	VP-RTS
0101002615	DJ3/M1321IOW	VP-RTS
0102002615	DJ3/M1311JOW	VP-RTS
0105003415	DJ3/M1321JOW	VP-RTS
0108002412	DJ3/M1311JOW	VP-RTS
0109002770	DJ4/M1311JOW	VP-RTS
0201003965	DJ3/M1311JOW	VP-RTS
0205003230	DJ4/M1321JOW	VP-RTS
0208003320	DJ3/M1321JOW	VP-RTS
0210003525	DJ4/M1311JOW	VP-RTS
0301009442	DJ4/M1311JOW	VP-RTS
0302009442	DJ4/M1311JOW	VP-RTS
0401008680	DJ4/M1311IOW	VP-RTS
0402008680	DJ3/M1311JOW	VP-RTS
0407008674	DJ4/M1311JOW	VP-RTS
0412008664	DJ3/M1311JOW	VP-RTS
0416008662	DJ4/M1311JOW	VP-RTS
0417008662	DJ3/M1321JOW	VP-RTS
0420008678	DJ3/M1321JOW	VP-RTS
0423008666	DJ4/M1311JOW	VP-RTS
0424008666	DJ4/M1311JOW	VP-RTS
0425008686	DJ4/M1321JOW	VP-RTS
0601003290	DJ4/M1311HOW	VP-RTS
0602003217	DJ3/M1311JOW	VP-RTS
0603003217	DJ4/M1321JOW	VP-RTS
0607003290	DJ3/M1321JOW	VP-RTS
0633008593	DJ3/M1311JOW	VP-RTS
0634008593	DJ3/M1311JOW	VP-RTS
0635008593	DJ3/M1311JOW	VP-RTS
0636008593	DJ3/M1311JOW	VP-RTS
0637008593	DJ4/M1311JOW	VP-RTS
0639008593	DJ4/M1311JOW	VP-RTS
0639008593	DJ4/M1311JOW	VP-RTS
0640008593	DJ4/M1311JOW	VP-RTS
0641008593	DJ3/M1321JOW	VP-RTS
0642008593	DJ3/M1321JOW	VP-RTS
0643008593	DJ3/M1321JOW	VP-RTS
0670003236	DJ3/M1321JOW	VP-RTS
0671003236	DJ4/M1321JOW	VP-RTS
0672003236	DJ4/M1321JOW	VP-RTS
0673003236	DJ4/M1321JOW	VP-RTS
0686003219	DJ3/M1311JOW	VP-RTS
0687003219	DJ4/M1311JOW	VP-RTS
0688003219	DJ4/M1321JOW	VP-RTS
0689003219	DJ4/M132	P-RTS
0690003219		
0691003219		
0692003219		
0693003965	DJ4/M1321JOW	VP-RTS
0694003965	DJ3/M1311JOW	VP-RTS
1101003219	DJ4/M1321IOW	VP-RTS
1103003219	DJ4/M1321JOW	VP-RTS
1401008656	DJ4/M1311IOW	VP-RTS
1410008696	DJ3/M1311JOW	VP-RTS

Figure B-10:
Working Papers - Listing of File Input Aviator Billets

```
GROUND OFFICERS
0016000045          2102JOW                                    VP-RTS
1501006190          1520IOW                                    VP-RTS
1601006176          1520KOW                                    VP-RTS
1602006176          6330KOW                                    VP-RTS
1603006176          7330NOW                                    VP-RTS
1901068925          3100LOW                                    VP-RTS
2901006199          6380COW                                    VP-RTS
END GROUND OFFICERS
```


Figure 11:
Working Papers - Listing of File Input Ground Officer Billets

AIRCRAFT SYS NEC		MAF LOG A	MAF B	SAF LOG A	SAF B	MAX FLHRS	FLT HRS	AVE SORTIE	--- HOURS --- AC MAF	AC SAF	--- TOTAL --- AC	SRT/WK	MAF SAF DATE
P-3B	CARRIER	0.00000	.00000	0.00000	.00000	00	00	99.90	698	279	08	22.8	07JAN7
8319	ASHORE	2.67487	.00169	1.62669	.00139	1207	55	4.50					
P-3B	CARRIER	0.00000	.00000	0.00000	.00000	00	00	99.90	000	000	02	00.0	07JAN7
8319	ASHORE	2.67487	.00169	1.62669	.00139	1207	00	99.90					
P-3C	CARRIER	0.00000	.00000	0.00000	.00000	00	00	99.90	507	247	08	22.8	12DEC7
8319	ASHORE	1.99929	.00088	1.23659	.00078	1537	55	4.50					
P-3C	CARRIER	0.00000	.00000	0.00000	.00000	00	00	99.90	000	000	02	00.0	12DEC7
8319	ASHORE	1.99929	.00088	1.23659	.00078	1537	00	99.90					

Figure B-12:

Working Papers - Listing of File Input CM Data, With Computed Manhours

AIRCRAFT	MC	RATING	NEC	PM MH PER SORTIE	PM MH PER WEEK	PM MH PER FL HR	PM MH PER DAY	CM MAF PERCENT	CM SAF PERCENT	PMLM DATE
P-3B	110	ADJ	8319	0.000	0.741	0.133	0.420	25.20	9.50	07MAY75
P-3B	120	AMH	8319	0.000	0.043	0.011	0.060	4.10	3.10	07MAY75
P-3B	120	AMS	8319	0.000	2.585	0.037	0.420	19.50	11.20	07MAY75
P-3B	121	AMS	8319	0.000	0.000	0.000	0.000	0.00	21.80	12AUG75
P-3B	130	PR		0.000	0.250	0.001	0.000	0.30	0.90	07MAY75
P-3B	131	AME	8319	0.000	0.184	0.010	0.000	3.30	7.90	07MAY75
P-3B	210	AT		0.000	1.435	0.011	0.000	16.90	1.70	07MAY75
P-3B	210	AX		0.000	0.000	0.000	0.000	10.50	1.00	31JAN75
P-3B	220	AE		0.000	0.500	0.030	0.000	18.60	4.10	07MAY75
P-3B	230	AO	8319	0.000	0.125	0.007	0.000	1.30	10.60	07MAY75
P-3B	240	PH		0.000	0.000	0.000	0.000	0.30	0.00	31JAN75
P-3B	310	PC		3.000	3.827	0.013	0.000	0.00	28.20	07MAY75
P-3B	110	ADJ	8319	0.000	0.741	0.133	0.420	25.20	9.50	07MAY75
P-3B	120	AMH	8319	0.000	0.043	0.011	0.060	4.10	3.10	07MAY75
P-3B	120	AMS	8319	0.000	2.585	0.037	0.420	19.50	11.20	07MAY75
P-3B	121	AMS	8319	0.000	0.000	0.000	0.000	0.00	21.80	12AUG75
P-3B	130	PR		0.000	0.250	0.001	0.000	0.30	0.90	07MAY75
P-3B	131	AME	8319	0.000	0.184	0.010	0.000	3.30	7.90	07MAY75
P-3B	210	AT		0.000	1.435	0.011	0.000	16.90	1.70	07MAY75
P-3B	210	AX		0.000	0.000	0.000	0.000	10.50	1.00	31JAN75
P-3B	220	AE		0.000	0.500	0.030	0.000	18.60	4.10	07MAY75
P-3B	230	AO	8319	0.000	0.125	0.007	0.000	1.30	10.60	07MAY75
P-3B	240	PH		0.000	0.000	0.000	0.000	0.30	0.00	31JAN75
P-3B	310	PC		3.000	3.827	0.013	0.000	0.00	28.20	07MAY75
P-3C	110	ADJ	8319	0.000	0.741	0.133	0.420	21.60	6.90	07MAY75
P-3C	120	AMH	8319	0.000	0.043	0.011	0.060	4.60	2.30	07MAY75
P-3C	120	AMS	8319	0.000	2.585	0.037	0.420	17.20	9.50	07MAY75
P-3C	121	AMS	8319	0.000	0.000	0.000	0.000	0.00	21.00	12AUG75
P-3C	130	PR		0.000	0.250	0.001	0.000	0.30	1.10	07MAY75
P-3C	131	AME	8319	0.000	0.184	0.010	0.000	4.00	4.50	07MAY75
P-3C	210	AT		0.000	1.435	0.011	0.000	14.50	3.20	07MAY75
P-3C	210	AX		0.000	0.000	0.000	0.000	16.60	3.60	31JAN75
P-3C	220	AE		0.000	0.500	0.030	0.000	19.50	6.20	07MAY75
P-3C	230	AO	8319	0.000	0.125	0.007	0.000	1.20	15.90	07MAY75
P-3C	240	PH		0.000	0.000	0.000	0.000	0.40	0.50	31JAN75
P-3C	310	PC		3.000	3.827	0.013	0.000	0.00	25.30	07MAY75
P-3C	110	ADJ	8319	0.000	0.741	0.133	0.420	21.60	6.90	07MAY75
P-3C	120	AMH						.0	2.30	07MAY75
P-3C	120	AMS						20	9.50	07MAY75
P-3C	210	AT		0.000	1.435	0.011	0.000	14.50	3.20	07MAY75
P-3C	210	AX		0.000	0.000	0.000	0.000	16.60	3.60	31JAN75
P-3C	220	AE		0.000	0.500	0.030	0.000	19.50	6.20	07MAY75
P-3C	230	AO	8319	0.000	0.125	0.007	0.000	1.20	15.90	07MAY75
P-3C	240	PH		0.000	0.000	0.000	0.000	0.40	0.50	31JAN75
P-3C	310	PC		3.000	3.827	0.013	0.000	0.00	25.30	07MAY75

Figure B-13: Working Papers - Listing of File Input PM Data, With CM Distribution %'s

DPT	WRK WK	% PA	CON PD	& PD	A/C PD	IMPOSED MANHOURS OM	PM	CM	AS	FM	UT	OK	MAF HRS	SAF HRS	CM TOTAL	PLANNED MAINTENANCE A/C	SORTIE	HRLY	DAILY	TOTAL	AS PCT	FM PCT	BILLE OFF	ENL
	XXO	XX	XXX	XX	XXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXXO	XXXO	XXOO	XX	XXX
00	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1953	00	019
01	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	007
02	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	007
03	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1953	00	013
04	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	000
05	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	006
06	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	000
08	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	000
09	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	004
10	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	000
11	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	000
12	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	000
13	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	000
14	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1925	00	000
15	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1901	00	001
16	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1830	00	010
17	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	002
18	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	005
19	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0852	00	008
20	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	001
21	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	000
22	319	60	000	10	000	00000	00000	00000	00000	00000	00000	00000	02854	00435	03518	00148	00000	00269	00420	01415	0145	0000	00	019
23	319	60	000	15	000	00000	00000	00000	00000	00000	00000	00000	02752	00690	03959	00525	00000	00097	00508	01970	0145	0998	00	023
24	319	60	000	10	000	00000	00000	00000	00000	00000	00000	00000	00000	01126	01239	00000	00000	00000	00000	00000	0068	0621	00	006
25	319	60	000	05	000	00000	00000	00000	00000	00000	00000	00000	00036	00052	00092	00050	00000	00002	00000	00084	0086	0598	00	002
26	319	60	000	10	000	00000	00000	00000	00000	00000	00000	00000	00433	00331	00841	00035	00000	00020	00000	00056	0004	0698	00	005
27	319	60	000	00	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0007	0925	00	002
28	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	000	00	000
29	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1901	00	000
30	319	60	000	30	000	00000	00000	00000	00000	00000	00000	00000	03494	00243	04858	00287	00000	00022	00000	00003	0113	0765	00	020
31	319	60	000	30	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0769	00	000
32	319	60	000	30	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	1060	00	000
33	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	000
34	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	02287	00267	03065	00130	00000	00080	00000	00292	0095	0578	00	013
35	319	60	000	10	000	00000	00000	00000	00000	00000	00000	00000	00151	00680	00923	00025	00000	00014	00000	00066	0094	0891	00	005
36	319	60	000	30	000	00000	00000	00000	00000	00000	00000	00000	00041	00012	00069	00000	00000	00000	00000	00000	0000	0408	00	001
37	319	60	000	20	000	00000	00000									00000	00000	00000	00000	00000	0000	0000	00	000
38	319	60	000	10	000	00000	00000									00765	01368	00026	00000	03650	0095	3182	00	016
40	319	60	000	00	000	00000	00000									00000	00000	00000	00000	00000	0000	0000	00	000
41	319	60	000	00	000	00000	00									00000	00000	00000	00000	00000	0000	0000	00	000
42	319	60	000	20	000	00000	00									00000	00000	00000	00000	00000	0000	0000	00	032
44	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	000
45	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	001
46	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	000
47	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	000
48	319	60	000	20	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	022
	000	60	000	00	000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000	0000	00	000

Figure B-14:
Working Papers - Work Center Values

AIRCREW OM	SQDRN MAINT	SQDRN AS	TOTAL PILOTS	TOTAL NFOS	TOTAL AVIATORS	TOTAL OFF	TOTAL AIRCREW	TOTAL ENLISTED	TOTAL POPULATION	NBR A/C	TOTAL FLT HRS	TOTAL SORTIES
00.0	2204.7	567.6	69	0	69	76	116	373	449	20	202.4	45.6

DEPARTMENT	OM HOURS	PM HOURS	CM HOURS	AS HOURS	FM HOURS	UT HOURS	OW HOURS	TOTAL HOURS	PD PCT	PD INCR
EXEC DEPT	663.8	0.0	0.0	0.0	0.0	0.0	191.4	855.2		
ADMIN DEPT	0.0	0.0	0.0	214.2	0.0	0.0	159.5	373.7		
PERS OFC	0.0	0.0	0.0	209.4	0.0	0.0	127.6	337.0		
FIRST LT OFC	184.0	0.0	0.0	63.8	164.9	0.0	63.8	476.5		
OPS DEPT	0.0	0.0	0.0	0.0	0.0	0.0	319.0	319.0		
OPS OFC	0.0	0.0	0.0	167.7	32.2	0.0	0.0	199.9		
TRNG DIV	0.0	0.0	0.0	0.0	0.0	0.0	893.2	893.2		
AIRCREW OFC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
OPEN	2679.6	0.0	0.0	0.0	0.0	0.0	0.0	2679.6		
OPEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
FRAMP DEPT	0.0	0.0	0.0	0.0	0.0	0.0	63.8	63.8		
FRAMP TRNG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
OPEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
SFTY DEPT	0.0	0.0	0.0	0.0	0.0	0.0	127.6	127.6		
MAINT DEPT	0.0	0.0	0.0	0.0	0.0	0.0	63.8	63.8		
MAINT/MAT CTL W/C 020	95.7	0.0	0.0	198.6	12.5	0.0	95.7	402.5		
MAINT ADMIN W/C 030	63.8	0.0	0.0	0.0	0.0	0.0	0.0	63.8		
QA W/C 040	255.2	0.0	0.0	0.0	0.0	0.0	31.9	287.1		
MAT CTL W/C 050	0.					0.0	31.9	280.5		
DATA ANAL W/C 060								31.9		
A/C DIV W/C 100	31.9	0.0	0.0	0.0	0.0	0.0	31.9	63.8		
P/P BR W/C 110	22.8	141.5	361.8	70.9	6.7	0.0	31.9	635.6	10.000	4.37
A/F BR W/C 120	45.6	197.0	395.9	82.3	8.2	0.0	31.9	760.9	15.000	4.99
CORROS CTL GR W/C 121	0.0	0.0	123.9	49.9	3.0	0.0	0.0	176.8	10.000	1.12

Figure B-15:
Working Papers - Squadron Totals, Functional Workload

APPENDIX C

ASQMD PROGRAM COMPUTER SELECTION

I. BACKGROUND

A. PROJECT HISTORY

The Chief of Naval Operations (NOP-12) contracted with Management Science Systems (MSS) in June 1975 to develop a computer system for automated production of squadron manning documents, utilizing current methods, algorithms, and data, and subsequently to test the feasibility of new methods for squadron manning determination, to be integrated into the development of the Navy Manpower Planning System. The automated SQMD system is to be considered as an interim measure for facilitating the production of manning documents until such time as the Navy Manpower Requirements System (NMRS) is fully operational. In developing the automated SQMD program, MSS is to coordinate with NMRS development to ensure that latest NMRS data and procedures are used wherever possible, thus allowing for the maximum efficiency in adapting portions of the SQMD program into NMRS, and also guaranteeing best (latest) data in the interim document production.

Because of the desire to coordinate closely with NMRS developments and data, it was decided to allocate MSS computer time on the same computer that NAVMMACLANT was using for NMRS development - i.e. the IBM 370/168 at NIH. This would allow MSS to access the NMRS data files, and would ensure that MSS program code would be machine-compatible with NMRS programs. Computer time on the NIH computer was to be furnished by the Navy, up to the dollar limitation set in the contract.

B. SECURITY PROBLEM

Shortly after the beginning of the SQMD project it became clear that development of the SQMD and NMRS systems would have to be shifted to a secure computer facility, because of the necessity of processing SECRET information. NOP-12 initiated a search for a satisfactory site, focusing first on the NAVCOSSACT and JHU Applied Physics Laboratory computers, both of which routinely process SECRET Navy data. By 8 July, it had been determined that the JHU facility would not be available, and that a shift to NAVCOSSACT would require a significant time delay. At this time, the MSS project team, under considerable time pressure because of the SQMD contract deadline, began a search for a computer facility at which to perform SQMD program development.

II. SELECTION CRITERIA

The MSS team approached the problems of computer selection with a dual objective. The primary goal, of course, was to find a computer that would satisfy the SQMD project requirements as quickly as possible. A secondary goal was to provide information to NOP-12 that would assist in the selection of the site for the NMRS project. If, in fact, both projects could be run on the same computer, then the same advantages mentioned in IA could be maintained.

Criteria for selection fell into two classes, the firm requirements and the desirable characteristics.

A. FIRM REQUIREMENTS

There were three requirements for the SQMD project that could not be compromised: the ability to process SECRET information, the immediate availability of access, and the capability for remote job entry (RJE). Exceptions to these requirements were considered and rejected, as follows:

- The possibility that the system be developed on a non-secure facility, with the intention of eventual transfer to whatever secure facility was selected for NMRS--this was rejected because transfer to a new computer at a later date might require conversion of both programs and data, a time-consuming process which would cause unacceptable delay in the ability of the Navy to utilize the system to produce manning documents.

- Delay of selection of the SQMD site until the NMRS facility could be chosen--this possibility was rejected because the advantage which might be gained was not deemed to be worth the additional delay in completion of the SQMD project.

- Sacrifice of RJE capability--this was rejected for basically the same reason; the time wasted in going on-site for all computer runs during program development would result in considerable delay in completion and delivery of the SQMD system.

B. DESIRABLE CHARACTERISTICS

In addition to the above requirements, other characteristics were identified that would influence selection. They are listed below in order of their importance.

1. Low cost - Unless there were compelling reasons for another choice, a facility that showed significant cost advantage over its competitors should probably be a clear choice.

2. Interactive processing - For purpose of debugging programs and entering and modifying data, interactive processing on a low speed terminal is an invaluable aid to efficiency.

3. Rapid turnaround - Considering the extreme time pressure of the SQMD project deadline, the ability to achieve many rapid debug/test runs is crucial to timely completion.

4. Compatibility with NMRS data - Also because of time consideration, it would be very advantageous to be able to use the

NMRS data files without having to convert them for a non-IBM-compatible computer.

5. Good customer support - It is certainly advantageous to operate at a facility that demonstrates the capability and willingness to provide good support in both software and operations.

6. Previous MSS experience - A computer whose software (operating system, utilities, etc.) is familiar to project personnel would allow immediate beginning of programming/debugging, with minimum "learning time" loss.

7. On-site work space - For those times when it may be desirable for project personnel to go on-site, the availability of dedicated work space would increase efficiency.

III. PROCEDURE

A. PRE-SELECTION

A preliminary selection process was conducted to narrow the field of consideration. Many facilities were surveyed, and information was tabulated regarding both the fixed requirements and the desired characteristics. From among all the facilities considered, the ones which met the fixed criteria and appeared to have the most advantages were selected for detailed investigation.

B. SELECTION PROCESS

Representatives who had previously been contacted for preliminary information were met again for more detailed information, and to arrange site visits and benchmark runs. At each site, operations and customer support were surveyed, and the benchmarks were run to test running time and costs of computing and IO (input/output), and turnaround response. The benchmarks were two jobs that were typical of SQMD project requirements - a COBOL compilation of a program that was known to contain errors, and a COBOL compile-and-execute of a program that computed and printed an array of values and then wrote an output file of 10,000 records to a tape.

After the benchmark runs were completed, results of the survey and tests were tabulated for display and comparison of features and costs. Advantages and disadvantages of each contender were evaluated along with the quantitative data, and a selection recommendation was prepared.

IV. RESULTS

A. PRE-SELECTION

During the pre-selection, MSS contacted over a dozen computer facilities known either to project personnel or to co-workers. Of the eleven which were of sufficient interest to investigate, six were immediately eliminated because of inability to process SECRET data. Of the remaining five, one - Applied Physics Lab - had already indicated to NOP-12 and NAVMMACLANT that they might be unable to support a large new workload for any extended period, due to potential increase in their internal utilization. Another - NAVCOSSACT - was ruled out for reasons discussed below. This left three sites - two commercial and one Navy - under consideration.

Decision Regarding NAVCOSSACT

Preliminary discussions between NOP-12, NAVMMACLANT, and MSS had focussed on NAVCOSSACT as a probable site. Reasons were:

- Ability to handle SECRET data routinely
- Navy ownership
- Location of other programs and files there (e.g., Aircraft Program Data File, contains ROC and POE information.)

A meeting was held with NAVCOSSACT personnel, and MSS project personnel visited the site. At these meetings, the following relevant facts were brought out:

- NAVCOSSACT supports no RJE except through their own "hard-wired" terminals.
- NAVCOSSACT has no room for users to come on-site for debugging and testing
- NAVCOSSACT policy is that all systems running on their computer be designed, reviewed, and documented by their process, under the assumption that they will take over complete responsibility for operation and maintenance when the system becomes operational. It is not their policy to make their computer available to users outside their technical control.

These facts made it clear that NAVCOSSACT would not be satisfactory for the SQMD project development, and unlikely for the NMRS project move.

The data gathered in the pre-selection survey are shown in Table 1. The three remaining facilities for final consideration were Naval Ship Research and Development Center, Planning Research Corporation, and Utility Network of America.

TABLE 1 - PRESELECTION SURVEY

Installation	Computer	SECRET	RJE	Remarks
1. Applied Physics Lab (Johns Hopkins)	IBM 360/91	yes	yes	1. Cannot accept NMRS 2. Good previous exper.
2. Boeing	IBM 370/168	NO	yes	
3. COMNET	IBM 370/155	NO	yes	
4. CYBERNET	CDC	NO	yes	
5. Grumman Data Systems (Calldata, Inc.)	IBM 370/156 370/168	NO	yes	
6. Health, Education, & Welfare (HEW)	IBM 370/155 370/168	NO	yes	1. Good previous exper.
7. INFONET	UNIVAC 1108	NO	yes	
8. NAVCOSSACT	UNIVAC 1108 1110	yes	NO	1. Design and document requirements 2. Slow turnaround.
9. NSRDC	CDC 6400 6600 6700	yes	yes	1. previous experience.
0. Planning Research Corp. (PRC)	IBM 370/155	yes	yes	1. Good previous exper. 2. Compares well w/NIH.
1. Utility Network of America (UNA)	CDC CYBER-73 (mod 6400)	yes	yes	1. Compares well w/NSRDC

B. SELECTION INFORMATION

Representatives of each of the three candidate facilities were contacted for more detailed information, and to arrange site visits and benchmark runs. Pricing algorithms were obtained, and the technical data shown in Table 2 were gathered.

MSS Project personnel went on-site to each facility to observe operations and software support and to run the benchmark programs. Results of the benchmark runs are shown in Table 3. Observations regarding advantages and disadvantages are shown in Table 4.

C. COMPARISON OF CANDIDATES

1. COST, INTERACTIVE PROCESSING, TURNAROUND

These three factors, the most important considerations, are summarized in Table 5. PRC showed its clear advantage in cost, both for batch processing (benchmark runs) and in the charge rate for interactive processing. Turnaround time was best at UNA, undoubtedly due to their low utilization rate.

It is interesting to note also that a previous, more exhaustive, benchmark was conducted by the Bureau of Labor Statistics, comparing the PRC facility to the NIH computer (the current site of the NMRS project.) That test showed 25% cost advantage to PRC, not even considering the volume discount offered by PRC to large-scale users (such as NMRS.)

2. OTHER COGENT CONSIDERATIONS

- Compatibility with NMRS data - PRC, which utilizes

IBM equipment, could accept NMRS data tapes directly. UNA and NSRDC both have facilities for conversion, which might require some programmer effort.

- Good customer support - UNA seemed the most anxious to provide assistance; all three provided personnel on-duty to help users with software problems.
- Previous MSS experience - the IBM equipment of PRC was most familiar to MSS personnel; also, MSS already uses the PRC computer for some of its commercial software development. The CDC systems of UNA and NSRDC were somewhat familiar, but would undoubtedly require more learning.
- On-site work space - UNA provides best work space for users (private office); NSRDC and PRC have user work areas. NSRDC has more space available, PRC has a card reader where users may enter their own jobs.

TABLE 2 - FACILITIES AND SERVICES

	UNA	NAVCOSSACT	NSRDC	PRC
Computer	CYBER-73	UNIVAC-1100	CDC-6700	IBM-370
CPU	CDC-6400	U-1108 U-1110	CDC-6400 6600 6700	370/155
RJE	yes	limited (see text)	yes	yes
Timesharing dial-up	high cost	no	yes	yes-TSO
Operating system	SCOPE 3.4	EXEC-8	SCOPE 3.4	OS/MVT/HASP
Core	$320,000_8$ words = 1000K char	31K words = 150K char	131K words = 1310K ch.	1500K char
On-site work area	good	none	adequate	adequate
Tape drives	7-track	7-track 9-track	7-track 9-track	7-track 9-track
Disk drives	844's		1-6638 841's 844's	3330's
Turnaround	15 min.	4 hours	1 hour	1 hour
Notes	twice/day courier		mass storage 1 trillion on order	

TABLE 3 - BENCHMARK RESULTS

	PRC		UNA		NSRDC	
	Tape job	SQMD compile	Tape job	SQMD compile	Tape job	SQMD compile
Memory requirement [1]	115K byte	100K byte	2.8K word	10.4K wd	3.9K word	10.1K wd
Mass storage			3.6K word	10.8K wd	7.2K word	10.8K wd
CPU time	6.94 sec	8.80 sec	9.94 sec	7.62 sec	15.74 sec	11.78 sec
Input-output	322 excps	112 excps	32 sec	1.9 sec	28 sec	1.5 sec
Average weighted core [2]	214K LCS	94K LCS	411 KWS	205 KWS	11 KWS	27 KWS
Total Charge	$2.72	$2.56	$5.47	$3.15[3]	$7.30	$8.17[3]
Monthly charge for mass storage (10 cylinders on 3330 or equivalent)	$143		$460		$193	

Notes:

(1) Word on CDC computer = 10 bytes. High core allocation on IBM is system default amount, not necessarily used in run.

(2) Unexplained discrepancy probably due to difference in accounting units at NSRDC.

(3) Extra cost on similar system due to high NSRDC charges for card reads and print lines.

TABLE 4 -
ADVANTAGES AND DISADVANTAGES OF SYSTEMS

NSRDC - (1) Navy installation (may simplify selection and funding.)
(2) High cost for card reader and line printer.
(3) CDC system a. requires some learning
b. requires conversion of NMRS data
c. provides better utilities.

UNA - (1) Best customer support.
(2) Best on-site work space.
(3) High cost for interactive use.
(4) Fastest turnaround.
(5) CDC system (same comment- as NSRDC.)

PRC - (1) Least expensive for all types of charges.
(2) Supports TSO for terminals.
(3) MSO project gives good exposure, may simplify selection and funding.
(4) Favorable previous MSS experience.
(5) IBM system a. is familiar
b. is compatible with NMRS data.

TABLE 5 - SUMMARY COMPARISON CHART

	PRC	UNA	NSRDC
disk storage	$143 = 100%	$460 = 322%	$193 = 135%
SQMD compile	$2.56 = 100%	$3.15 = 123%	$8.17 = 319%
compile and exec. (write tape file)	$2.72 = 100%	$5.47 = 201%	$7.30 = 268%
turnaround time	30-90 min.	15-30 min.	30-90 min.
interactive processing cost	18¢/CP sec	50¢/CP sec	16¢/CP sec

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V. RECOMMENDATION

MSS recommends utilization of the PRC facility for the following reasons:

- low cost - PRC costs were lowest in every category; in fact, were considerably lower even than NIH
- NMRS compatibility - NMRS data could be used directly (no conversion required)
- familiarity - IBM equipment and software are well known, requiring minimum learning
- interactive processing - PRC supports TSO interactive language
- Navy acceptance - good exposure through MSO project should ease acceptance of non-government facility.

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