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PHASE II FINAL REPORT ON USE OF AIR FORCE ADP
EXPERIENCE TO ASSIST AIR FORCE ADP MANAGEMENT

VOLUME III

PHASE III CONCEPT AND PLAN

Alan J. Gradwohl
Wolford O. Wootan, Jr.

December 1966

TACTICAL PLANNING DIVISION
DIRECTORATE OF PLANNING AND TECHNOLOGY
ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
L. G. Hanscom Field, Bedford, Massachusetts

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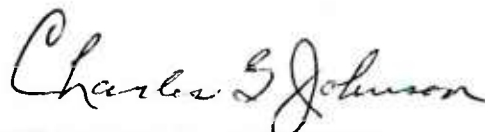
FOREWORD

This is Volume III of a three-volume final report prepared by the Information Systems Division of Planning Research Corporation, Los Angeles, California, under contract number AF 19(628)-5988, project number 7990. The Air Force Project Officer was Major George H. Montague, Electronic Systems Division, ESLT. Work on the project was performed under the direction of Alan J. Gradwohl, PRC Project Manager, from 16 February 1966 to 15 December 1966, with Stanton H. Wong in charge of producing the final report. Also providing significant assistance in the preparation of this final report was Fred I. Magidson.

This technical report has been reviewed and is approved.



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ABSTRACT

This is Volume III of a three-volume final report that covers Phase II of a three-phase project on the Use of Air Force ADP Experience to Assist Air Force ADP Management. In Phase I, a feasible concept and preliminary approach to using experience was synthesized; in Phase II, the approach was refined, the concept was validated, and the potential use of experience was broadened; and in Phase III, the improved and expanded approach will be implemented Air Force-wide.

Volume I of the final report covers the following: the history of the project; conclusions of Phase II and recommendations for Phase III, and summaries of Phase II activities, Phase III concept and plan, and the pilot version of the ADP Experience Handbook and Primer. Volume II reviews the four major activities of Phase II: data collection, data analysis, ADP Experience Handbook development, and Phase III planning. Volume III presents the detailed Phase III operational concept and development plan followed by a summary of costs and benefits.

This volume presents the concept and plan for Phase III. The operational concept for Phase III includes revised procedures for ADPS proposal submission, experience reporting, and asset reporting to an information storage and retrieval system. This system is the nucleus of a management information system that could be operational by June 1968. The major benefits will accrue from improved cost effectiveness and quality of ADP development and operations in the Air Force, and from cost and time savings in large system programs that involve ADP.

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I. INTRODUCTION

This is Volume III of a three-volume final report that marks the completion by Planning Research Corporation of a research study on the Use of Air Force ADP Experience to Assist Air Force ADP Management. The study is the second phase of a three-phase project; Phase II is to validate and refine concepts developed in Phase I and to develop an operational concept and plan for implementation in Phase III.

The purpose of the final report is to present the objectives, activities, findings, and conclusions of Phase II and to submit an operational concept and development plan for Phase III. These are reported in Volume II and Volume III, respectively. In addition, the pilot version of the ADP Experience Handbook and a Primer that serves as an elementary text for training potential users of the handbook are produced as two separate volumes distinct from this final report (refer to PRC documents R-930 and R-931). Volume I provides a concise summary of Volumes II and III and a brief description of the ADP Experience Handbook and Primer.

The purpose of Volume III is to present an operational concept and a development plan for Phase III. This volume is directed to those audiences at Headquarters, USAF, that have a particular interest in the operational concepts, detailed design, plan of implementation, and an analysis of costs and benefits for Phase III. Refer to Volume I, Section III, for a summary of conclusions and recommendations of Phase II.

This volume is organized into three major sections. The objectives and the preliminary design of procedures and processes for a Phase III Management Information System are discussed, a plan for the development of the proposed system is presented, and the costs and benefits to be derived from the implementation of the proposed system are summarized. Five appendixes contain supporting procedures and information.

II. OPERATIONAL CONCEPT

This section outlines the operational concept of a system that will perform the functions of collecting, editing, storing, and retrieving ADP experience and ADP asset data within the Air Force. The data can be reduced and presented in a variety of forms for use by Air Force managers. The system is called the Air Force ADP Management Information System (MIS).

The following paragraphs will establish the basic philosophy on which the MIS concept is founded. First presented are the overall objectives that the system should accomplish if it is to be an effective management tool. Then, an overview of the MIS is given, followed by a detailed explanation of each of the various aspects of the concept: ADPS proposal procedures, ADP experience and asset reporting procedures, the data editing process, the data storage and retrieval system, and report generation and use.

A. Objectives of the MIS

There are two principal objectives that the Air Force ADP Management Information System must achieve. The first objective is the improvement of the cost effectiveness and quality of ADPS development and operations in the Air Force. The second objective is to effect a cost and time saving in large Air Force system programs (AFR 375 series developments) that involve ADP.

1. Improve Cost Effectiveness and Quality of ADP Development and Operations

This objective will be achieved by improving the accuracy, completeness, and timeliness of ADP management information at Headquarters, USAF. The improved information will be used to more effectively prosecute a number of phases of the ADP management. These phases of ADP management at the Headquarters, USAF, level include review, evaluation, and approval/disapproval of ADPS proposals; efficient utilization of ADP assets; prosecution of an effective ADP standards program; application of controls to on-going ADP developments and operational systems; accurate forecasting of ADP expenditures in the Air Force budget; and performance of special studies on various aspects of Air Force ADP.

a. Review and Approval of ADPS Proposals

The Management Information System should result in the submission of higher quality ADPS proposals for consideration by Headquarters, USAF, and in better founded decisions on whether to approve or disapprove the proposals. The higher quality proposals should result

from more stringent regulations governing the content and preparation of proposals, and the better founded decisions will result from two factors:

- o Better quality proposals to evaluate
- o Systematic use of Air Force ADP experience to assist in the evaluation

b. Utilization of ADP Assets

The Management Information System should result in more efficient utilization of Air Force ADP assets. These assets are the software, application programs, data files, personnel experience, and ADP hardware currently resident in the Air Force. A central, accessible repository of the characteristics of these assets will promote sharing of assets and prevent duplication of effort.

c. Prosecution of ADP Standards Program

The Management Information System should result in more effective prosecution of the on-going ADP standards program. Information in the experience and assets data bases should make possible better predictions of the impact of proposed standards prior to implementation. Furthermore, the more timely and complete reporting from the field required by the Management Information System will result in more effective enforcement of standardization.

d. Application of Controls

The Management Information System, through more timely and complete reporting from the field, should allow Headquarters, USAF, to monitor on-going ADP developments and operational systems more closely. Out-of-control situations will be detected sooner, and Headquarters assistance could be applied to minimize duration and severity of problems.

e. Forecasting of ADP Expenditures

The Management Information System should allow Air Force budget planners to establish more meaningful forecasts for long-range ADP expenditures. The central bank of ADP cost data and the use of statistical cost estimating techniques will aid the budget planners in this function.

f. Performance of Special Studies

The Management Information System will have an experience and assets data base that should materially assist in the performance of special studies of all phases of Air Force ADP. Studies are sometimes requested by higher headquarters, but often the requests

are generated within Headquarters, USAF, usually for the purpose of investigating the effect of a policy change. Such studies are done at present, but they often require considerable time and expense. Not only should the Management Information System reduce this time and expense, but it should increase the accuracy and credibility of results because of the timely data available on which the studies could be based. Furthermore, many studies, not now conducted because of the sheer unavailability of data, could be made because of the broad scope of inexpensive data available.

2. Effect Cost and Time Savings in Large System Programs

The first objective dealt with the improvement of efforts related solely to ADP systems. This objective deals with very large systems where ADP may only be a small part; for example, programs under system management (AFR 375 series) procedures.

The development of a command and control system or weapon system usually involves a concomitant ADPS development, and, in a PERT sense, the ADPS development usually lies on the critical path. It is well known that any slippage in an event on the critical path affects all tasks "downstream" from that event. All errors, therefore, in predicting events on the ADPS critical path create total system costs and schedule slippages far out of proportion with the costs and slippages in the ADP system itself. The uncertainty involved in estimating the completion of an ADPS development, then, becomes extremely important.

It is unfortunate that ADP systems imbedded in larger programs require so much attention because, as pointed out, ADPS funding is usually small in relation to total program costs. Until better completion date estimates can be made and met, however, attention will remain focused on ADPS development.

Possibly more important than increased costs is the delay in achieving operational capability of a critical system. The Management Information System should provide the capability to forecast completion dates more accurately and to monitor the development closely enough for Headquarters, USAF, to influence adherence to the schedule. Therefore, the operational dates and costs of large programs will be less jeopardized by their ADP elements than they currently are.

B. Overview of the MIS

When viewing the Air Force ADP Management Information System in the broad sense, four major areas need discussion. These four areas are discussed below and can be classified broadly as scope; information flow; personnel requirements, both at Headquarters, USAF, and in the field; and computer requirements for operation of the system.

1. Scope

The ADP Management Information System is designed to cover all entities in the Air Force upon which the system will have some effect. These entities are ADP systems that will report their experience on a monthly basis, Data Processing Installations (as now defined in the USAF Data Systems Automation Program) that will report their assets on a monthly basis, and ADPS proposals submitted as they are generated.

Figure 1 gives estimates of the quantities of these entities that will be affected over time.¹ The estimates are based on knowledge of the current quantities of these entities, the rate at which they are predicted to grow, and the rate at which the ADP Management Information System can successfully handle them. On each curve, the time during which the MIS is building capability to handle the entity is the portion from the zero point to where the curve flattens. The flat portions of the curves indicate that the system is processing all active entities, and the workload is growing along with the entities. The projections presented later concerning workload and personnel requirements for the ADP Management Information System are based on these curves.

The relationship between ADP systems and Data Processing Installations warrants comment. An ADP system has a functional orientation, while a Data Processing Installation has a geographic orientation. An ADP system performs a single function at one or more data processing installations. For example, the ADP portion of the SPACE-TRACK system (an ADP system) performs a single function at one data processing installation (it catalogs space objects at Ent AFB), and the Accrued Military Pay System (also an ADP system) performs a single function (it pays Air Force personnel) at over 125 data processing installations. A data processing installation exhibits mirror-image characteristics: it may support one or more ADP systems. For example, the data processing installation that supports SPACETRACK supports only that ADP system, while the data processing installation that supports ADOBE also supports several other ADP systems.

2. Information Flow

Figure 2 shows the overall information flow of the proposed ADP Management Information System. The great bulk of data enters the system in the form of periodic reports from ADP users in the field. The frequency of reports should be monthly for most items, but could be stretched to quarterly (and even semiannually or annually) for some of the less volatile items. The content of the experience reports will

¹The dates shown for events in this and other charts throughout this volume are predicated on Phase III efforts commencing on or before 16 January 1967.

be the day-to-day experience gained in the field during the development and operation of the ADP systems, recorded as it happens. The content of the asset reports will be end-of-the-period snapshots of the posture of ADP assets in terms of hardware, software, application programs, data files, personnel, and surplus supplies.

A staff of editors should peruse the experience and asset reports for compliance and reasonableness and should add comments, explanations, and evaluations where applicable. The editorial staff should spend considerable time determining why the experience developed as it did, recording the reasons as commentary. The editorial staff should then input the experience data plus commentary and asset data into the storage and retrieval system. The editors should also be responsible for inputting data into the system on pending and approved proposals. The editors will receive a File Maintenance Report subsequent to the file maintenance run, allowing them to audit the outcome of the file maintenance activity.

The storage and retrieval system for the data base should itself be an ADP system. This is because of the size of the data base and the frequency and extent with which it must be both updated and manipulated to create reports. Figure 3 illustrates an estimate of this workload. The estimate shows, for example, that 2 years after the system is operational, the workload will be about 1,000,000 characters per month of input volume for data base update and about 7,000,000 characters per month of output volume for reports, with a data base of about 11,000,000 characters. So usage of an ADP system to perform storage and retrieval functions is indicated from the standpoint of volume alone. The response times required for the reports should be lenient enough to allow the data base to be stored inexpensively on magnetic tape (as opposed to direct access storage) if desired.

Four processing functions will be performed by the computer programs: input edit, file maintenance, data analysis, and report generation. Input edit programs will load the input data into the machine, check the data for reasonable magnitudes and logical inconsistencies, and do any formatting required. File maintenance programs will use the edited input data to add, delete, or correct information in the data base. Data analysis programs will perform simple manipulations on numeric data in the data base; for example, sequencing a set of numbers by magnitude or computing the statistical attributes of such a set. Report generation programs will retrieve data from the data base and format the data into reports.

The statistician will receive a Statistical Abstract of the data base each time it is updated. He will analyze this data and update the ADPS cost and development time prediction equations. The equations must be viewed as a continually changing and evolving set of relationships, not only during the first couple of years while the data base is building up, but continually thereafter, as use of the system and learning change the characteristics of the data. For example, the better controls provided by the MIS should, over time, decrease costs and time for

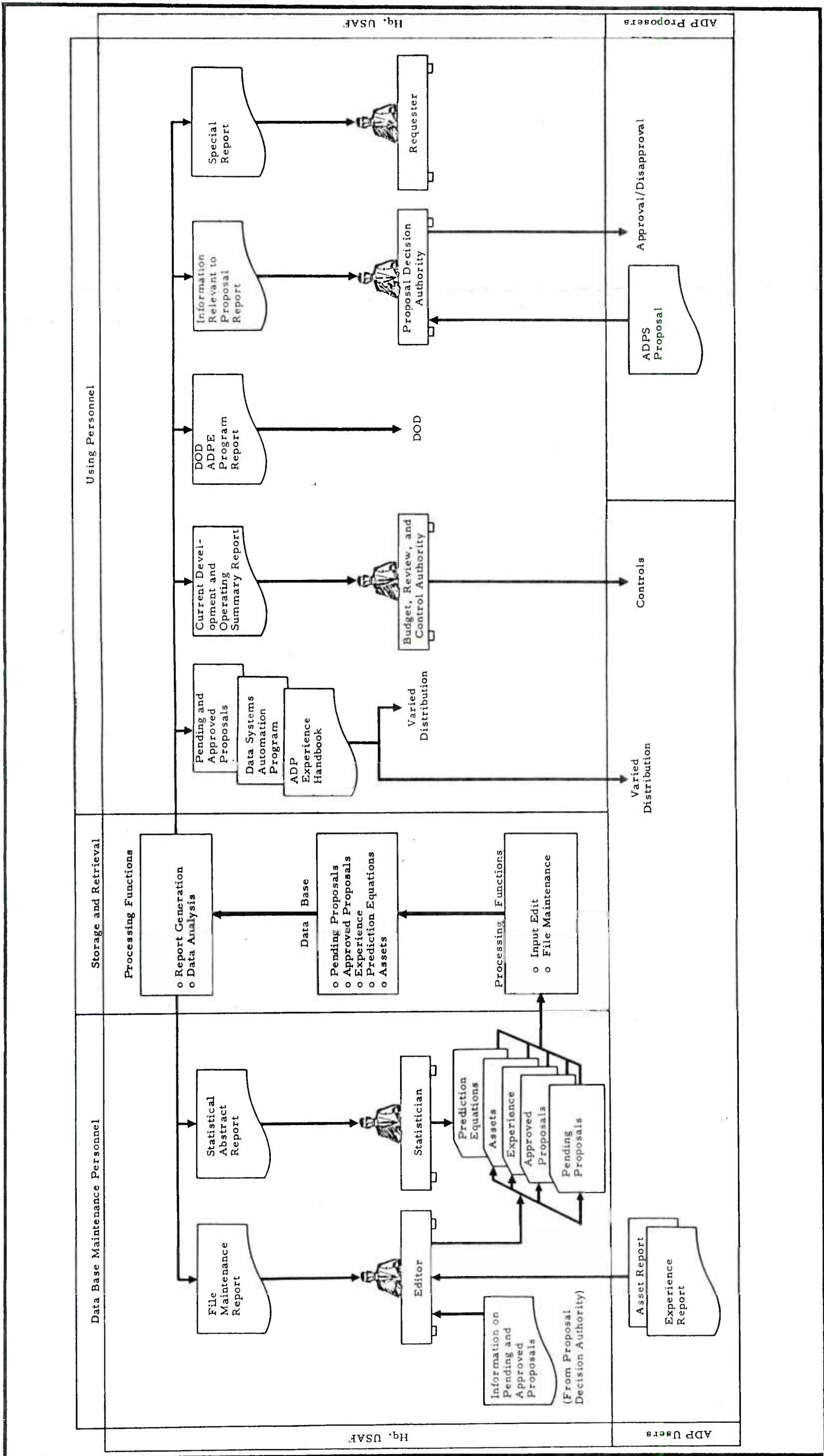


FIGURE 2 - INFORMATION FLOW OF AIR FORCE ADP MANAGEMENT INFORMATION SYSTEM

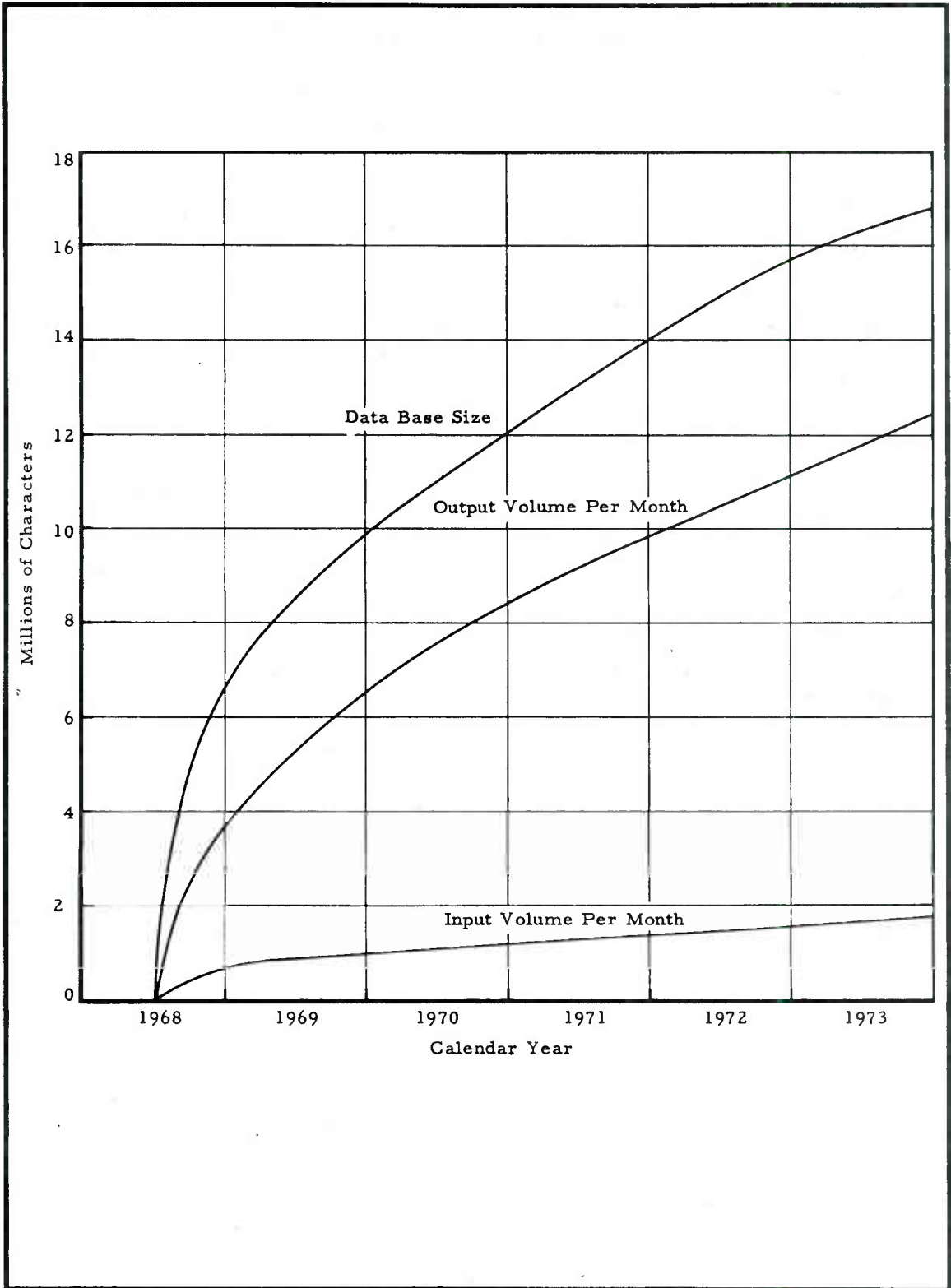


FIGURE 3 - PLANNED WORKLOAD FOR AIR FORCE ADP MANAGEMENT INFORMATION SYSTEM

development of the various categories of ADP systems. As this experience is entered into the data base, the prediction equations will change to show the more favorable costs that are attainable.

The proposal decision authority shown in Figure 2 is not a single person by whom all ADPS proposals must be approved. Rather, such authority is vested in a score of people scattered throughout the Air Staff. These people will call for and receive an Information Relevant to Proposal Report when they receive an ADPS proposal. This report will represent, with respect to the ADPS being proposed, the most relevant Air Force ADP experience. The report will also represent assets and cost and time predictions, plus pending and approved proposals. The decision authority will use this information to assess the proposal for possible duplication of current Air Force effort, potential for equipment or program sharing, and the credibility of proposed benefits, feasibility, and cost and development time.

In addition to the information automatically retrieved, the decision authority will have manual access to periodically published "snapshots" of various portions of the data base. There will be the Air Force ADP Experience Handbook, which will be a snapshot of the experience and prediction portions of the data base. An expanded version of the currently published Data Systems Automation Program could include the assets portion of the data base. The pending and approved proposals portions of the data base should also be published periodically. These periodic publications will enable the proposal decision authorities to "browse" the data base, and will also enable a wide distribution of selected portions within the Air Force ADP community.

The budget, review, and control authority shown in Figure 2, like the proposal decision authority, is scattered throughout the Air Staff. These authorities could receive a monthly report on the current status of ADP systems being developed and operated within their functional purview. The Current Development and Operating Summary Report, based on the experience reports submitted monthly from the field, would be brief and by exception only. The report would be designed to flag incipient situations that may degrade the performance or raise the cost of ADP systems if corrective action is not taken.

The storage and retrieval system would also have the capability to produce special reports from the data base. For example, the Air Force might wish to know the average time for unscheduled maintenance of a certain manufacturer's computer, or the average effort required for application program maintenance by functional area, or the distribution of computer instructions by programming language for a functional area, etc.

3. Personnel Requirements

The estimated personnel requirements for operating the Air Force Management Information System are shown in Table 1.

TABLE 1 - ESTIMATED PERSONNEL REQUIREMENTS FOR AIR FORCE ADP MANAGEMENT SYSTEM

Entity	Type of Effort	Job Description	Time Devoted ^{1,2}	Man-Years Per Year Per Entity	Calendar Year												
					1968		1969		1970		1971		1972		1973		
					Average No. of Entities Active ³	Man-Years	Average No. of Entities Active ³	Man-Years	Average No. of Entities Active ³	Man-Years	Average No. of Entities Active ³	Man-Years	Average No. of Entities Active ³	Man-Years	Average No. of Entities Active ³	Man-Years	
Hq. USAF	Data Base Maintenance	Chief Editor	Full	1.0													
		Associate Editor	Full	1.0													
		Associate Editor	Full	1.0													
		Statistician	Full	1.0													
		Maintenance Programmer	Full	1.0													
		Maintenance Programmer	Half	0.5													
ADP System	Experience Reporting (monthly)	Machine Operator	Half	0.5													
		Keypunch Operator	Full	1.0													
		Clerk-Typist	Full	8.0	1	8.0	1	8.0	1	8.0	1	8.0	1	8.0	1	8.0	
Data Processing Installation	Asset Reporting (monthly)	Experience Report Preparer	1 day/mo.	0.046													
		Clerk-Typist	0.25 day/mo.	0.012	25	1.5	140	8.1	175	10.3	200	11.6	225	13.0	250	14.5	
		Asset Report Preparer	0.5 day/mo.	0.023	80	2.4	300	9.0	325	9.8	350	10.5	375	11.3	400	12.0	
Total man-years per year attributable to ADP Management Information					11.9	25.1	28.1	30.1	32.3	34.5							

Notes: 1. Based on 260 paid working days per year.
 2. Times are marginal times over and above those currently devoted to these efforts. These marginal times are solely caused by the implementation of the ADP Management Information System. The man-year totals, therefore, represent the marginal personnel costs attributable to the ADP Management Information System.
 3. Derived from Figure 1.

The data base maintenance effort shown is seen to be constant over time, which may seem strange in the face of a growing workload. The reason for the constancy of effort is that the editorial effort per unit of data base maintenance is decreasing over time as learning takes place. This learning will be passed on as personnel are replaced, but the first group must pick up editing technique by trial and error.

The figures for personnel increases shown in Table 1 are attributable solely to implementation of the Air Force ADP Management Information System. There are also personnel increases that will occur if the system is not implemented. These increases will occur at Headquarters, USAF, along with the growing workload of reviewing and approving ADPS proposals; budgeting, reviewing, and controlling current developments and operational systems; and preparing special reports. It is conservatively estimated that about 100 man-years per year will be spent in this activity at Headquarters, USAF, by mid-1968, growing to 200 man-years per year by mid-1973. Implementation of the Air Force ADP Management Information System could reduce this projected growth anywhere from 50 to 100 percent. This is based on time savings possible by having accurate information readily accessible when it is needed.

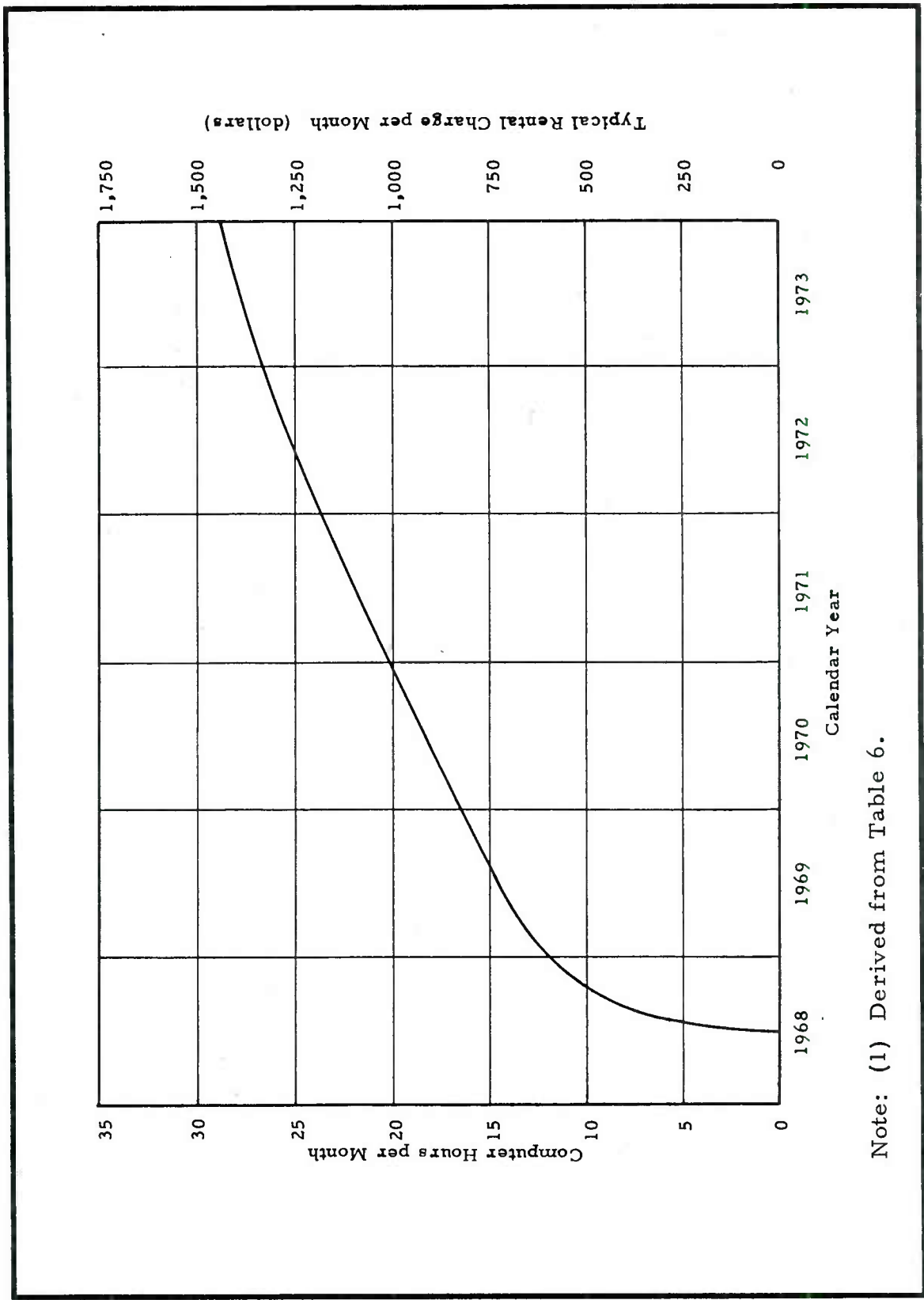
Thus, while implementation of the system might add some 32 man-years per year to overall Air Force ADP efforts by 1973, it could at the same time result in a manpower reduction of some 75 man-years per year by that time at Headquarters, USAF, for a net saving of 43 man-years per year.

4. Computer Requirements

A small-scale magnetic tape-oriented computer (with the power of, for example, an IBM 1401) should be able to handle information storage and retrieval functions for the Air Force ADP Management Information System. The actual selection of the computing equipment should be made, of course, at the time of submission of a DAP during Phase III. To give some estimates of the computer time requirements, however, it is necessary to make some basic assumptions. The estimates shown in Figure 4 assume a computer in the IBM 1401 class and a lease price of around \$50 per hour. It should be pointed out that the computer time estimates are based on an input/output limited system and, hence, a more powerful computer would not reduce these figures significantly. (A time-shared system could change the cost picture drastically, however, depending upon the workload mix.)

C. ADPS Proposal Procedures

As pointed out previously, ADPS proposal submission and evaluation procedures are a key part of the MIS. It is appropriate, therefore, to review the current procedures and describe suggested changes to these.



Note: (1) Derived from Table 6.

FIGURE 4 - ESTIMATE OF COMPUTER TIME REQUIRED FOR OPERATION OF AIR FORCE ADP MANAGEMENT INFORMATION SYSTEM(1)

1. Current Procedures

The majority of all proposals concerning data automation are submitted under guidance of the AFR 300 and AFR 375 series of regulations. A summary of these procedures and of some others that occasionally involve computers is presented in Appendix B of this volume. Table 2 contains a brief listing of the major types of documents that could be considered as ADPS proposals or that could contain information similar to that required by a proposal.

a. AFR 300 Series

The AFR 300 series regulations provide for the most consistent and straightforward handling of proposed ADP systems, perhaps because systems covered by these regulations have a computer as a major element, whereas a computer in other systems may only be a small part of a much larger system.

The 300 series regulations govern the submission of ADPS proposals for management supporting data systems, operations supporting data systems, R&D supporting systems, and, in certain cases, communications systems. For the first two types of systems, a Data Automation Proposal (DAP) must be submitted to the Directorate of Data Automation (AFADA) for approval. Instructions for DAP preparation are a part of AFR 300-3 (see Figure B-1, Appendix B of this volume). When a DAP is received by Headquarters, USAF, it is AFADA's responsibility to see that all interested parts of the Air Staff get a chance to review it and submit their comments. AFADA's goal is to process a DAP in no more than 45 days. When evaluating a DAP, there are two major questions that must be answered:

1. Does the Air Force need it?
2. If the Air Force does need it, is the proposed solution technically the best and the most economical one available?

There is very little formal information available to assist the evaluator in answering these questions. The skill and ingenuity of the officer assigned to coordinate the DAP evaluation is relied upon heavily. Formal tools are limited to the Data System Automation Program (DSAP) and a numerical listing of all past and present DAP's. There are no tools except the experience of the officers performing the evaluation for assessing cost estimates. Also, total system cost estimates are often obscured because regulations require only that additional resources needed (over and above those now on hand) be included in the DAP. (Current AFADA practice, however, requires that all resources be submitted before a DAP can be approved.)

If a DAP is disapproved, AFADA sends it back to the proposer with reasons for disapproval.

TABLE 2 - SUMMARY OF ADPS PROPOSAL TYPES

<u>Document</u>	<u>HQ USAF OPR</u>	<u>Regulations</u>	<u>Remarks</u>
Data Automation Proposal (DAP)	AFADA	AFR 300-2, 300-3 HOI 300-3	Management Supporting Data Systems.
	AFADA	AFR 300-2, 300-3 HOI 300-3	Operations Supporting Data Systems.
	AFADA	AFR 300-2, 300-6	AFR 300-6 being considered for publication to cover Operations Supporting Data Systems, which are now covered by either AFR 300-3 or AFR 375-1.
Letter of Transmittal	AFADA	AFR 300-2, 300-7	R&D Supporting Systems.
Required Operational Capability (ROC)	AFRDQ, AFSPD	AFR 57-1, 375-1, 375-2, 375-3, 375-4, HOI 375-1	Projects requiring systems management (e.g., RDT&E in excess of \$25,000,000 or production in excess of \$100,000,000).
Requirements Action Directive (RAD)	AFRDQ, AFORQ	AFR 57-1, 100-2	Qualitative Ground Communications-Electronics Meteorological Systems Requirements.
	See ROC		Directs AF in procedures for attaining capability described in ROC.
Advance Communications-Electronic Requirements Plan (ACERP)	AFSME	AFR 100-2 HOI 100-3	Quantitative Ground CEM requirement. If data automation included, AFADA involved per AFR 300-2A.

TABLE 2 (Continued)

Document	HQ USAF OPR	Regulations	Remarks
Communications-Electronics Implementation Plan (CEIP)	AFSME	AFR 100-2 HOI 100-3	See ACERP.
Development Plan	AFRRPB	AFR 80-2	For R&D projects using RDT&E funds not covered by AFR 375-1.
Program Change Proposal (PCP)	AFSPD	AFR 375-1, 375-4 HOI 375-1	Introduces new program to F&FP.
Proposed System Package Plan (PSP)	AFSPD	AFR 375-1, 375-4 HOI 375-1	Product of the definition phase of a system program.
System Package Plan (SPP)	AFSPD	AFR 375-1, 375-4 HOI 375-1	Tasks, schedules, required resources of a system program. Issued by SPD.
Preliminary Technical Development Plan (PTDP)	AFSPD	AFR 375-1, 375-4 HOI 375-1	Submitted by AFSC in response to an approved operational requirement. Supports the PCP to get approval for definition phase.

If a DAP is approved, AFADA may direct that implementation begin, or if more detailed planning is required, may establish a System Development Project by issuing a Data Project Directive (DPD). In the latter case, detailed system analysis is performed, and Data System Specifications are written and submitted for approval prior to implementation.

If new equipment is required for implementation of the proposed system, Equipment Specifications must be prepared (according to procedures outlined in AFM 171-9) so that equipment vendors may be solicited (ESD assists AFADA in this function) and the appropriate equipment acquired. Before soliciting for new equipment, however, AFADA determines whether existing AF equipment can do the proposed job.

For R&D Supporting Systems (AFR 300-7), only a letter of transmittal is required, but information required is similar to that required in a DAP, and AFADA functions are similar.

AFR 100-2 governs the submission of proposals for communications systems; however, if computing equipment is involved, the Advance Communication-Electronic Requirements Plan (ACERP) or Communications-Electronics Implementation Plan (CEIP) must go to AFADA as well as to AFSME. AFADA normally accepts the ACERP and/or CEIP in lieu of a DAP, but information requirements are the same as for DAP's.

b. AFR 375 Series

Systems subject to management under AFR 375 series regulations are normally much larger and more complex than those just discussed. The system management approach of AFR 375-1 must be applied if the proposed system is estimated to require total cumulative RDT&E funds in excess of \$25 million or production costs in excess of \$100 million.

The first step is to establish that a need exists for the new operational capability. The recently published AFR 57-1 (17 June 1966) establishes the Required Operational Capability (ROC) as the medium for accomplishing this. This document replaces the Qualitative Operational Requirement (QOR) and the Class V Modification Proposal.

Once the ROC is approved, Headquarters, USAF, issues a Requirement Action Directive (RAD), which supplies the necessary guidance for preparing program documents so that specific system and equipment characteristics may be decided upon. The RAD is a guidance document, not a funding instrument, and replaces the Specific Operational Requirement (SOR), the Operational Support Requirement (OSR), and the Advanced Development Objective (ADO).

A system program can have four phases during its life cycle. These are, briefly, as follows:

1. Conceptual Phase

Period extending from determination of a broad objective until OSD approval of the Program Change Proposal (PCP) covering the Definition Phase.

2. Definition Phase

Period between Conceptual and Acquisition Phases starting with the issuance of the System Definition Directive (SDD) and ending with the issuance of the System Program Directive.

3. Acquisition Phase

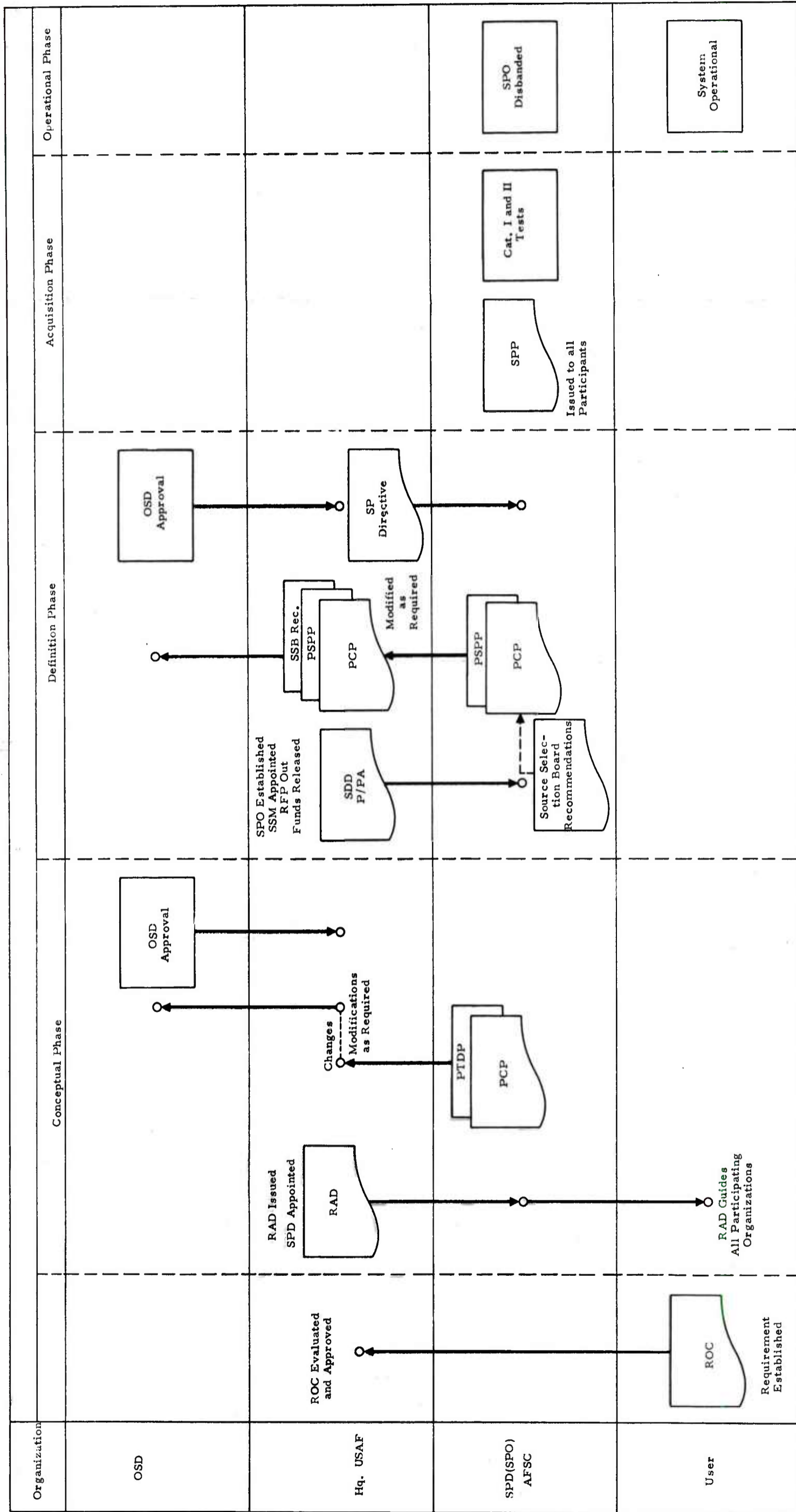
Period starting with SP Directive until the acceptance by the user of the last operating unit, or until the completion of Category II testing and until all changes required are placed on procurement, whichever occurs later.

4. Operational Phase

Period from acceptance by user of the first operating unit until disposition of the system. The Operational Phase overlaps the Acquisition Phase.

A much simplified version of the typical life cycle of a system program is shown in Figure 5. As can be seen from the chart, the key technical documents that must support cost estimates are the PTDP (Preliminary Technical Development Plan) and the PSPP (Proposed System Package Plan). These documents support PCP's (Program Change Proposals), which normally are submitted to OSD for approval of the program and funds at the decision to conduct the Definition Phase; at the completion of the Definition Phase; during the engineering development, prior to production; and when violation of DOD thresholds are imminent.

General instructions for preparing PSPP's, PTDP's, and SPP's are included as Attachment 1 of AFR 375-4. The only requirements in these instructions for presenting data automation information are that all EDP equipment used in support of the system be identified, including a list of data system functions, computations performed, and an intrasystem data flow diagram. It is not clear to what detail cost estimates will be identified with data automation elements.



OSD, Secretary of Defense
 Program Change Proposal
 Proposed System Package Plan
 Preliminary Technical Development Plan
 System Support Manager
 Program/Procurement Authorization
 Required Operational Capability
 System Definition Directive
 System Program Director
 System Program Office
 System Package Program
 Source Selection Board

FIGURE 5 - 375 SERIES SYSTEM MANAGEMENT PROCEDURES

2. Proposed Procedures

PRC proposes that Air Force proposal procedures be enhanced in two major ways:

- o Standardize and increase the amount of information required in an ADPS proposal
- o Make available better tools to the proposal evaluators to assist them in proposal assessment

These two are not, of course, completely independent. The Management Information System proposed by PRC in this report has as its basic philosophy that more information (and more precisely defined information) be reported to Headquarters, USAF, in proposals and operating reports so that this information, when properly assembled, can aid in the assessment of information reported. In a "closed loop" system such as this, information reported helps build the data base which is used ultimately to evaluate the reported information itself.

To start with, then, PRC proposes that all ADPS proposals contain more data about the ADP system under consideration, and that this data be reported in a standard way across all systems. Appendix A is an example of the type of information PRC feels is necessary at Headquarters, USAF. It is proposed that this type of information be required for all proposals concerning ADP, whether they be submitted via AFR 375-1 or 100-2, etc. The most important additional information required by these instructions over past instructions is the detailed specification of workload descriptors, total resources by category, and a more detailed development plan. These instructions also call for a more comprehensive statement of the result of benefits analysis and alternative solutions.

PRC feels that there are several significant advantages to the Air Force in requiring this depth of information in a proposal.

- o This information is necessary to build the data base which is the basis for better proposal evaluation tools, better control of ADPS developments, etc.
- o A proposer must know more about the system he is proposing in order to give such information; hence, his cost estimates will be more likely to be accurate, the probability is higher that he will meet his schedules, and his proposed system will be easier to evaluate.
- o Standardization will cause all proposers and evaluators to talk about the same information in the same way. For example, workload now becomes a meaningful, quantitative thing, not something left open to interpretation.

- o Headquarters, USAF, will have facts against which to measure performance during development and operation of an ADP system. Variances between promises and actual performance also provide guidance in the evaluation of future proposals.

D. ADP Experience and Asset Reporting Procedures

This section explains the current and proposed procedures for the field reporting of ADP experience and assets to Headquarters, USAF. The first part covers the current reporting procedures and the second part, proposed procedures. The second part also shows how the currently reported experience and asset information compares with the information requirements of the proposed system.

1. Current Procedures

Appendix C summarizes, very briefly, the most important periodic reports made to (and through) Headquarters, USAF, covering ADP experience and assets in the Air Force. The first two reports are generated at Headquarters, USAF, from field inputs, and are shown here only to represent these field inputs.

2. Proposed Procedures

Table 3 shows the reporting requirements of the ADP Management Information System in contrast with the content of current reports. (These requirements are shown in greater detail in Appendix D, in the form of data items in the information storage and retrieval system data base.) It is seen that there is little matching among the reporting requirements and the content of current reports. The DOD ADPE Program Reporting System, while appearing on the surface to match some of the experience reporting requirements of the proposed system, has two serious deficiencies for this purpose. First, the report is made annually, and second, the reporting entity has a geographic orientation (installation) rather than a functional orientation (ADP system).

It appears that little direct use can be made of the current reporting system in bringing the ADP Management Information System to fruition. The current system (excepting the DOD ADPE Program Supporting System, over which the Air Force has no control) must undergo an extensive overhaul to mold it to the ADP information needs of Air Force management. Starting with the current reporting system as a base, and the detailed data base design as the reporting requirements, one of the key Phase III tasks will be to design the report forms and to specify procedures for their completion and submission to Headquarters, USAF.

E. Editing Process

The editing process will be essentially the man-machine interface between the information storage and retrieval system and the

TABLE 3 - REPORTS REQUIRED BY ADP MANAGEMENT INFORMATION SYSTEM IN CONTRAST WITH CURRENT REPORTS

Report Name	Reports Required by ADP Management Information System			Current Reports								
	Reporting Entity	Report Content		Content Reporting Frequency	1 AF-E6 Vol. I	1 AF-E6 Vol. II	4 AF-E6	6 AF-E6	8 AF-E6	CEI Detail Spec. (Comp. Program)	DD-I and L (SA) 678	
Experience Report	ADP System	Location		A		S	S					
		Organization		A		S						
		Schedule	Planned		M							
			Actual		M							
		Description			A							
			Input		M							
		Workload	Output	Planned	M							
			Data Base		M							
				Processing Functions		M						
			Input		M							
			Output	Actual	M							
			Data Base		M							
		Hardware	Processing Functions		M							
					A							
		Software			A							
		Application program development			A							
		File conversion			A							
		Documentation			A							
		Personnel			M							
		Operations			M				I	I	S	
Application program maintenance			A									
Benefits			A									
Cost factors	Planned	Development	M									
		Operations	M									
	Actual	Development	M									
		Operations	M									
Future plans	Hardware		A									
			Q		I	I	I	I	I			
	Software		Q									
		Application programs	Q		I				I	I		
Data files		Q		I					I			
	As Above	Q										
Personnel		Q										
	Surplus Supplies	Q										

Key: A = As required, but no more than monthly. Q = Quarterly. I = Available in current report, but in insufficient detail. S = Available in current report, and in sufficient detail.

organizational entities generating input to the system. This process, always present in ADP systems, is painstaking, fraught with minutia, complicated by its logistics, and very frustrating to the personnel trying to accomplish it; and, unfortunately, the process will be with us until men can act like machines (or vice versa).

There are two aspects of the editing process worthy of mention here. One is the sheer logistics of the job, and the other is the insertion of evaluations as comments into the experience data base.

1. Logistics

This section illustrates the logistical features of the editorial process. In 1970, for example, the editorial staff will receive each month an average of 175 Experience Reports, 325 Asset Reports, 50 ADP Proposals, and some updated prediction equations. Each of these items must be read, edited, transcribed to a machine-readable medium, and submitted for a file maintenance run. Hopefully, much of the input will arrive from the field in a machine-readable form; at least this is one of the objectives of the Phase III forms design task.

Even editing itself will take on logistical aspects when verification of the inevitable missing, misinterpreted, and incomprehensible data items is necessary. These incongruities, and there could be hundreds of them during a given month, will have to be resolved by telephone, message, or written correspondence if the data base is to retain its integrity.

2. Evaluation

In addition to keeping the data base current with field inputs, the editorial staff must prepare evaluations of some of the experience data and insert these evaluations into the data base as comments. Three types of evaluations are necessary before experience data can be included in the data base:

- o Evaluation of data quality (reliability, completeness, currency, etc.)
- o Evaluation of system "normality" (unusual environmental or innovation factors)
- o Evaluation of system quality (against some standard of excellence)

Comments on these three types of evaluations are included below.

a. Data Quality

For quality coding data items, a simple scheme such as the following could be applied:

- 1 = Data obtained from a document or direct observation; involved no judgment
- 2 = Data obtained from a document or direct observation; involved some degree of judgment
- 3 = Data obtained solely by judgment without aid of a document or direct observation

This coding would best be applied in the field as the Experience Report is being formulated, so the editorial staff should have little of this type of evaluation to accomplish. Since unreliable data is also undesirable, the coding of data quality will permit the editorial staff to bar the entry of large blocks of unreliable data to the data base and to direct the upgrading of data quality. In practice, however, if the coding is done in the field, extra effort will most likely be applied to collecting only high-quality data. No one will continually want to submit low-quality data.

b. System "Normality"

Since the two main purposes of the experience data base are to allow monitoring of ADPS development progress and cross-system comparisons, the ADP systems in the data base must all be equalized to a comparable basis. This means that ADP systems exhibiting unusual cost/time experience relative to their workload descriptors, should either not be compared with other systems or should be normalized before the comparison is made. Unusual cost/time experience means that either the cost factors or the development time (or both) are much larger or much smaller than the workload descriptors seem to warrant.

At least two dimensions of normality will be important. These are environmental normality (e.g., an Arctic location, unusually high personnel turnover, unusual fluidity in system requirements, etc.) and proximity of the implementation to the state of the art then current. Detecting both types of abnormality and then adjusting the data to reflect normality will be at best a subjective process. Nonetheless, it is a function that must be performed by the editorial staff if maximum utility is to be obtained from reported experience.

There are, of course, many other factors that will have a tendency to affect cost equations--factors such as inflation, learning (the same type of job should become cheaper the more times the job is done), and changes in costs of certain items (such as computer time).

The editor must attempt to comment on such items and enter appropriate commentary with the experience data. Under no circumstances, however, should he change the original data itself.

c. System Quality

Also needed when comparing one ADP system with another is knowledge about the quality of the systems themselves; that is, whether they are "good" or "below average" systems. The meaning of quality, in this case, is in the sense of system performance (against some standard of excellence) rather than system effectiveness, which is a function of the value of the products of the system to the Air Force. The evaluation of system effectiveness is clearly not a function to be performed by the editorial staff.

System performance may be judged against several criteria. Current values of workload/cost/development time may be used to express the relative quality of the system in conjunction with the following criteria:

- o Previous values of workload/cost/development time for the same system. (Has automation resulted in improved performance?)
- o Value of workload/cost/development time for similar systems. (How does the performance of this system compare with that of similar systems?)
- o Values of workload/cost/development time attained by very good (or very poor) systems. (How does performance of this system compare with that of extreme landmark systems?)
- o A priori values of workload/cost/development time set by knowledgeable professionals. (How does performance of this system compare with preestablished performance standards?)
- o Values of workload/cost/development time promised in the ADPS proposal. (How does actual performance compare with planned performance?)

The editorial staff will use one or more of these measures in evaluating system performance and should then insert the evaluations in the comment sections of the experience data base.

F. Information Storage and Retrieval System

This subsection presents the basic concept of the information storage and retrieval system, which is part of the Air Force ADP Management Information System. The subsection is divided into six parts. The first

four parts explain a preliminary design of the main system components: data base, inputs, outputs, and programs. The fifth part presents estimates of the workload the system may be expected to carry, in terms of characters in the data base and characters per month for both input and output volume. The sixth part extends the workload estimates into a projection of computer hours per month.

1. Data Base

The data base could be organized into three files: (1) the Experience File in sequence by ADP System, (2) the Prediction Equations File in sequence by type of cost/time to be predicted, and (3) the Assets File in sequence by data processing installation. This organization is shown in Table 4; the organization is based on a detailed design of the data base down to the data item level shown in Appendix D.

Table 4 also shows the time orientation of the Experience File (time orientation is not important for either assets or prediction equations) and indicates personnel responsibilities for data maintenance. Time orientation is important in the experience area because a running history is being kept, and it is necessary to know not only what happened but also when it happened. The time orientation runs from the time that the ADPS proposal was pending, through the time it was approved, and through all the monthly reporting periods since ADPS proposal approval to the present time. The last element of the record is a current summary of all the important information generated in the past. The current summary is prepared by the editor and will be the record of the ADP system that is retrieved in the majority of instances.

Magnetic tape should be a satisfactory storage medium for the data base, since there should be no particular urgency with which information must be retrieved. A response time measured in seconds or even minutes is just not required for this application. In many cases, with simple queries, these low response times will be obtainable through manual lookup in the latest copies of the Experience Handbook or Data Systems Automation Program.

Some items in the experience portion of the data base could be portrayed better graphically than written out in English. Examples of such items are the system flow diagram and the development schedule. Such items could be stored in English on magnetic tape along with codes that will help an artist create the graphical image, or, in some cases, the line printer could be made to act like a graphical output device. Another solution would be to drive an off-line digital plotter. The precise methods and equipments will be decided upon during Phase III.

TABLE 4 - DATA BASE ORGANIZATION

Data Description			Time Orientation						Current Summary		
File Name	Sequence	Content	Proposal		Reporting Period						
			Pending	Approved	First	Second	...	Last			
Experience System		Location	F	F	F	F	...	F	E		
		Organization	F	F	F	F	...	F	E		
		History	F	N	N	N	...	N	E		
		Schedule	Planned	F	F	F	F	...	F	E	
			Actual	N	N	F	F	...	F	E	
		Description		F	F	F	F	...	F	E	
		Workload	Planned	Input	F	F	F	F	...	F	E
				Output	F	F	F	F	...	F	E
				Data Base	F	F	F	F	...	F	E
				Processing Functions	F	F	F	F	...	F	E
			Actual	Input	N	N	F	F	...	F	E
				Output	N	N	F	F	...	F	E
				Data Base	N	N	F	F	...	F	E
				Processing Functions	N	N	F	F	...	F	E
		Hardware		F	F	F	F	...	F	E	
		Software		F	F	F	F	...	F	E	
		Application Program Development		F	F	F	F	...	F	E	
		File Conversion		F	F	F	F	...	F	E	
		Documentation		F	F	F	F	...	F	E	
		Personnel		F	F	F	F	...	F	E	
		Operations		F	F	F	F	...	F	E	
		Application Program Maintenance		F	F	F	F	...	F	E	
		Benefits		F	F	F	F	...	F	E	
		Cost Factors	Planned	Development	F	F	F	F	...	F	E
				Operations	F	F	F	F	...	F	E
			Actual	Development	N	N	F	F	...	F	E
				Operations	N	N	F	F	...	F	E
		Future Plans		F	F	F	F	...	F	E	
		Remainder of Systems	As Above	As Above	As Above	As Above	As Above	As Above	As Above	As Above	
	Prediction Equations	Type of Cost/Time	Prediction Equations	N	N	N	N	...	N	S	
Assets	Installation	Computer	Hardware	N	N	N	N	...	N	F	
			Software	N	N	N	N	...	N	F	
			Application Programs	N	N	N	N	...	N	F	
			Data Files	N	N	N	N	...	N	F	
		Remainder of Computers		As Above	As Above	As Above	As Above	As Above	As Above	As Above	
		Personnel		N	N	N	N	...	N	F	
		Surplus Supplies		N	N	N	N	...	N	F	
	Remainder of Installations	As Above	As Above	As Above	As Above	As Above	As Above	As Above	As Above		

Key: E = Generated by editor.
 F = Edited by editor but generated in the field
 N = Nonapplicable combination of content and time slice.
 S = Generated by statistician.

2. Inputs

Four basic types of inputs will be involved:

- o Experience
- o Prediction Equations
- o Assets
- o Controls

The first three are file maintenance inputs, while the fourth issues operational instructions to the information storage and retrieval system each time it runs.

The experience inputs include information on pending proposals, approved proposals, monthly experience reports, and current summaries of ADP experience submitted by editors. Prediction equation inputs will be the functional form(s) of the predictors and confidence intervals and the values required for constants in the equations. Asset inputs will be information from the asset reports submitted monthly by all data processing installations. Control inputs will specify the sequence of events to be performed during any given run; for example, a set of control codes could specify "update the Experience File, print a Statistical Abstract Report, and print a new Experience Handbook."

3. Outputs

Outputs will be reports printed on the line printer. Included could be such reports as the following:

<u>Title</u>	<u>Suggested Frequency</u>
Information Relevant to ADPS Proposals Report	As required
Current Development and Operating Summary Report	Monthly
File Maintenance Report	Coincident with file maintenance activity
Statistical Abstract Report	Coincident with file maintenance activity
Pending and Approved Proposals Report	Monthly
Data Systems Automation Program Report	Quarterly
Experience Handbook Report	Quarterly
DOD ADPE Program Report	Annually
Special Report	As required

A brief description of each proposed report follows, including the action required to generate the report, its content, and who makes use of the report.

a. Information Relevant to ADPS Proposals Report

Upon receipt of a new ADPS proposal to evaluate, the proposal decision authority should extract from it the proposed values for workload descriptors. These descriptor values will be used to retrieve relevant development and operating experience from the current experience summaries on file, plus any information on relevant pending or approved proposals that may be in the data base. In addition, the prediction equations and confidence intervals will be solved using the proposed workload descriptors, and the answers will be printed out. Other descriptors will be used to retrieve existing assets that may influence the decision on the proposal.

Thus, the report submitted to the proposal decision authority might contain:

- o Relevant development experience
- o Relevant operating experience
- o Relevant pending proposals
- o Relevant approved proposals
- o Relevant assets
- o Predicted costs and confidence intervals
- o Predicted time and confidence interval

b. Current Development and Operating Summary Report

The various budget, review, and control authorities scattered throughout the Air Staff would receive these monthly reports for systems and installations that fall within their purview. All ADP systems and data processing installations covered by the storage and retrieval system would be eligible for appearance in these reports. The reports could be designed to flag potential trouble spots, and would be made on an exception basis only. Typical of the items that could be reported are an operational date about to be slipped, a machine utilization below some acceptable level, or a cumulative number of man-months for development that is about to exceed the original estimate.

c. File Maintenance Report

Each time the Experience, Prediction Equation, or Asset Files are updated, a File Maintenance Report should be printed for the cognizant editor. The report would be a listing of the items added, deleted, or changed during the file maintenance run. Since the editor is responsible for the integrity of the file, he should peruse this report to ensure that all the proper file maintenance actions were taken and that no catastrophic occurrences befell the file.

d. Statistical Abstract Report

Each time one or more of the numeric items in the Experience or Prediction Equation File receives an addition or an update, a Statistical Abstract Report would so notify the statistician. Periodically, the statistician might request a complete printout of all the numeric items in the files via this report.

e. Pending and Approved Proposals Report

The monthly Pending and Approved Proposals Report should be distributed to all Air Staff personnel who have a requirement for this information. The report would describe each pending and approved proposal and would contain indexing by such attributes as dates of receipt, submitting organization, functional area, etc.

f. Data Systems Automation Program Report

This quarterly report could be an extension of the current Section III of the USAF Data Systems Automation Program and would have the same distribution. It would contain all the information that Section III currently presents, plus information on the following:

- o Hardware (with more detail than at present)
- o Operating systems
- o Programmer aids
- o Utility routines
- o Library routines
- o Application programs (with more detail than at present)
- o Data files

Inspection of Appendix D will reveal that considerable detailed information about each of the above items exists in the Assets File. It is not intended that all this information be printed in the Data Systems Automation Program Report. Rather, only short descriptive information should be printed out, the detail being retrievable when needed via the Special Report (see subsection i below).

g. Experience Handbook Report

This report would essentially be a quarterly listing of the Experience File current summaries and the Prediction Equation File. Portions of this listing would be directly insertable into the reproducible copy of the Experience Handbook. Other portions could serve as source material for graphical summaries to be manually produced and inserted into the reproducible copy of the Handbook.

h. DOD ADPE Program Report

The information storage and retrieval system data base should contain enough information to produce almost completely

the annual DOD ADPE Program Report (DD-I&L (SA) 678) at Headquarters, USAF. This would relieve the field activities of all but a small portion of the responsibility for preparation of the report.

i. Special Report

The Special Report could be a variable content, variable format report used to extract one-time aggregations of information from the data base. This capability allows virtually any combination of data to be retrieved, summarized, and printed out. Examples of such requirements are the need to know the percentage of Air Force data stored by type of transmission code (e. g., BCD, EBCDIC, ASCII, etc.), the total dollars spent during each of the last five fiscal years on direct access storage equipment, a count of the system analysts and programmers by rank/grade and major air command, etc.

The requirements for such reports may come from the Headquarters, USAF, level, or from some higher or lower organizational level. The organizations responsible for prosecution of the Air Force ADP standards program and for budgeting should find this feature of the ADP Management Information System particularly valuable.

4. Programs

Programs written for the information storage and retrieval system will perform at least five functions: input edit, file maintenance, data analysis, report generation, and executive functions. Each of these functions is discussed in more detail below, and a discussion on the possibility of using existing generalized program systems to perform some of the functions is included. The choice of the best programming language to be used will be made during Phase III.

a. Use of Existing Generalized Program Systems

It is possible that one of the current generalized program systems could be used to perform some of the information storage and retrieval functions, notably file maintenance and report generation. Two candidate program systems are the Formatted File System (FFS) for the IBM 1410 and 7094, and the Information Processing System (IPS) for the CDC 1604 and AN/FSQ-20. The advantage of using such a program system is that development cost may be reduced because less code has to be written. The disadvantage is that operational cost may be increased because generalized systems are often inefficient for any one specific job. The use of generalized program systems will be investigated as part of the Phase III implementation effort.

b. Input Edit

The input edit programs should perform the following major functions:

- o Load input data
- o Check numeric fields for presence of nonnumeric characters
- o Check numeric fields for unreasonable magnitudes
- o Check all fields that must have entries for presence of these entries
- o Check all fields that express codes for code legality
- o Print error messages

c. File Maintenance

The file maintenance programs should perform at least the following functions:

- o Add or delete entire files or records
- o Add, delete, or change individual data items
- o Print File Maintenance Report

d. Data Analysis

The data analysis programs are really a subset of the report generation programs, since the data cannot be analyzed until the report generation programs retrieve it from the files. The data analysis programs should perform the following functions:

- o Sort and merge both alphabetic and numeric lists
- o Derive statistical attributes of numeric lists (e.g., mean and standard deviation)
- o Derive frequency counts (e.g., the number of Air Force bases that employ 1 to 10 data processing personnel, 11 to 20, 21 to 30, etc.)
- o Solve equations for cost/time prediction and confidence intervals

e. Report Generation

The report generation programs should perform the following functions:

- o Retrieve data from the files and present it either to the data analysis programs or to the print programs
- o Print fixed format reports (e.g., Statistical Abstract Report or Experience Handbook Report)
- o Print the variable format Special Report

f. Executive

The executive programs should perform the following functions:

- o Control all processing by establishing the sequence in which functional and utility programs are called in
- o Print a run record (e.g., date, requester, programs used, number of lines printed, etc.)

5. Detailed Workload Estimate

Table 5 shows a detailed estimate of data base size, input volume, and output volume for the information storage and retrieval system. The data in Table 5 may be summarized as follows:

	Calendar Year					
	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
Characters in Data Base	5.7×10^6	8.9×10^6	10.7×10^6	12.8×10^6	15.0×10^6	16.3×10^6
Characters per Month of Input Volume	0.6×10^6	0.9×10^6	1.1×10^6	1.3×10^6	1.5×10^6	1.6×10^6
Characters per Month of Output Volume	3.2×10^6	5.2×10^6	7.6×10^6	8.8×10^6	10.6×10^6	11.7×10^6

6. Computer Time Estimate

Table 6 takes the workload estimates of Figure 1 and Table 5 and develops them into an estimate of the monthly computer time required for operation of the information storage and retrieval system. The computer is assumed to have the power of a typical IBM 1401 configuration. It is realized, of course, that choice of software can affect these estimates. Table 6 may be summarized as follows:

	Calendar Year					
	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
Computer Time Required, Hours per Month	9.3	14.7	18.1	21.6	25.4	27.6

TABLE 5 - DETAILED WORKLOAD ESTIMATE FOR INFORMATION STORAGE AND RETRIEVAL SYSTEM

Description	Assumption	Calendar Year				
		1969	1970	1971	1972	1973
Data Base						
Experience						
Average No. of ADP Systems	From Figure 1	140	175	200	225	250
Average Size of Experience Record, Char.		10,000	15,000	20,000	25,000	25,000
Average Size of Data Base, Char.		1.4 x 10 ⁶	2.6 x 10 ⁶	4.0 x 10 ⁶	5.6 x 10 ⁶	6.3 x 10 ⁶
Prediction Equations		Negligible	Negligible	Negligible	Negligible	Negligible
Assets						
Average No. of Data Processing Installations	From Figure 2	300	325	350	375	400
Average Size of Assets Record, Char.		25,000	25,000	25,000	25,000	25,000
Average Size of Data Base, Char.		7.5 x 10 ⁶	8.1 x 10 ⁶	8.8 x 10 ⁶	9.4 x 10 ⁶	10.0 x 10 ⁶
Total Data Base, Average Size, Char.		8.9 x 10 ⁶	10.7 x 10 ⁶	12.8 x 10 ⁶	15.0 x 10 ⁶	16.3 x 10 ⁶
Input Volume						
Controls, Character Per Month		Negligible	Negligible	Negligible	Negligible	Negligible
Requests, Character Per Month		Negligible	Negligible	Negligible	Negligible	Negligible
Data Base Updates, Char. Per Month	10 percent of data base per month	0.9 x 10 ⁶	1.1 x 10 ⁶	1.3 x 10 ⁶	1.5 x 10 ⁶	1.6 x 10 ⁶
Total Input Volume, Char. Per Month		0.9 x 10 ⁶	1.1 x 10 ⁶	1.3 x 10 ⁶	1.5 x 10 ⁶	1.6 x 10 ⁶
Output Volume						
Information Relevant to ADPS Proposal Report						
Average No. of ADPS Proposals Per Month	From Figure 1	20	50	60	70	80
Characters Per Month		1.0 x 10 ⁶	2.5 x 10 ⁶	3.0 x 10 ⁶	3.5 x 10 ⁶	4.0 x 10 ⁶
Current Development and Operating Summary Report	From no. of ADP systems above, times avg. of 1,000 char. per report	0.1 x 10 ⁶	0.2 x 10 ⁶	0.2 x 10 ⁶	0.2 x 10 ⁶	0.3 x 10 ⁶
File Maintenance Report	Same rate as data base updates	0.9 x 10 ⁶	1.1 x 10 ⁶	1.3 x 10 ⁶	1.5 x 10 ⁶	1.6 x 10 ⁶
Statistical Abstract Report		0.05 x 10 ⁶	0.05 x 10 ⁶	0.05 x 10 ⁶	0.1 x 10 ⁶	0.1 x 10 ⁶
Pending and Approved Proposals Report		0.05 x 10 ⁶	0.05 x 10 ⁶	0.05 x 10 ⁶	0.1 x 10 ⁶	0.1 x 10 ⁶
Data Systems Automation Program Report	List of assets data base. Run quarterly, pro-rated monthly.	2.5 x 10 ⁶	2.7 x 10 ⁶	2.9 x 10 ⁶	3.1 x 10 ⁶	3.3 x 10 ⁶
Experience Handbook Report	List of experience and prediction equation data bases. Run quarterly, pro-rated monthly.	0.5 x 10 ⁶	0.9 x 10 ⁶	1.2 x 10 ⁶	1.9 x 10 ⁶	2.1 x 10 ⁶
DOD ADPE Program Report	Run annually, pro-rated monthly.	Negligible	Negligible	Negligible	Negligible	Negligible
Special Report		0.1 x 10 ⁶	0.1 x 10 ⁶	0.1 x 10 ⁶	0.2 x 10 ⁶	0.2 x 10 ⁶
Total Output Volume Characters Per Month		5.2 x 10 ⁶	7.6 x 10 ⁶	8.8 x 10 ⁶	10.6 x 10 ⁶	11.7 x 10 ⁶

TABLE 6 - ESTIMATE OF COMPUTER TIME REQUIRED FOR OPERATION OF INFORMATION STORAGE AND RETRIEVAL SYSTEM

Function	Medium	Performance ¹	Unit Requirement	Effective Rate (Char/min)	Calendar Year											
					1968		1969		1970		1971		1972		1973	
					Workload/Mo ²	Min/Mo	Workload/Mo ²	Min/Mo	Workload/Mo ²	Min/Mo	Workload/Mo ²	Min/Mo	Workload/Mo ²	Min/Mo	Workload/Mo ²	Min/Mo
Input Reading	Cards	800 cards/min	70 char/card	56,000	0.5 x 10 ⁶	9	0.9 x 10 ⁶	16	1.1 x 10 ⁶	20	1.3 x 10 ⁶	23	1.5 x 10 ⁶	27	1.6 x 10 ⁶	29
Output Printing	Line Printing	600 lines/min	90 char/line	54,000	2.8 x 10 ⁶	52	5.2 x 10 ⁶	96	7.6 x 10 ⁶	140	8.8 x 10 ⁶	163	10.6 x 10 ⁶	196	11.7 x 10 ⁶	216
Data Base Manipulation	Magnetic Tape	556 char/in 75 in/sec 0.75 in record gap	1,000 char/record	1,760,000	742 x 10 ⁶	423	1,155 x 10 ⁶	654	1,392 x 10 ⁶	786	1,662 x 10 ⁶	939	1,950 x 10 ⁶	1,104	2,115 x 10 ⁶	1,197
Total Production Time						484		766		946		1,125		1,327		1,442
Program Maintenance (15 percent of total production time)						73		115		142		169		199		216
Total Machine Time						557		881		1,088		1,294		1,526		1,658
Total Machine Time (hours/month)						9.3		14.7		18.1		21.6		25.4		27.6

- Notes: (1) For purposes of developing computer time requirements, performance is assumed to be that of a typical IBM 1401 configuration.
- (2) Derived from Table 5. Data base is assumed to be passed 6 times per workday for each of 21.67 workdays/month.
- (3) Derived from Figure 3.

III. DEVELOPMENT PLAN

This section presents a detailed plan for developing the Air Force ADP Management Information System (MIS) and the Information Storage and Retrieval System (IS&R) described previously. All key tasks to be performed are enumerated and explained below, and the time-phasing of these tasks is illustrated in Figure 6.

1. Plan and Prepare for Interviews

PRC will reduce all findings of Phase II; PRC will also plan for filling in all informational gaps related to ADPS proposal submittal and review and to all developmental and operational ADPS reporting procedures. The relationship of the MIS to the Resources Management System currently being developed will be thoroughly investigated.

2. Coordination Meeting

In a meeting with appropriate AF personnel, PRC will review findings to date in the area of organizational responsibilities and ADPS information flow. Gaps in this information will be identified and a list of interviewees established. Headquarters, USAF, should send the selected interviewees a letter notifying them of PRC's intention to visit them.

3. Conduct Interviews

PRC staff members will interview each of the selected interviewees with a goal of establishing in detail types of ADPS proposals evaluated, evaluation procedures and tools, reporting procedures, control, etc. It is suspected that interviews will be required with various personnel at Headquarters, USAF; as well as Headquarters, AFSC; Headquarters, AFLC; and selected SPO's.

4. Integrate Findings and Write Report

The results of the interviews will be analyzed and a report written. This report should identify all major organizations involved in the evaluation and approval of ADPS proposals within the Air Force, types of proposals, evaluation procedures and tools, reporting requirements, etc. This will allow the MIS to be designed so as to be most useful to all potential users. Also, all Standard Management Supporting Systems will be reviewed so that all appropriate information may be reflected in the DAP concerning the IS&R system to be implemented.

5. Define the Project Schedule

In conjunction with Air Force personnel, PRC will prepare a detailed schedule and PERT chart. This schedule must take into account

the various lead times required for DAP submission and approval, forms design and approval, AFR and HOI revision, etc.

6. Define Rules for Establishing Which Systems Must Report

In conjunction with Air Force personnel, a set of rules will be established that will govern which ADP systems will report information. Using these rules, a list of ADP systems to be included will be prepared. These rules will be modified and refined if necessary as the MIS is developed. For each system type included in the list, it must be established in detail what reporting procedures are in current use and what information is reported and in what format.

7. Design Reporting Procedures

The concept for experience reporting established in Phase II will be finalized and detailed reporting procedures established, including the design of reporting forms.

8. Write DAP for Information Storage and Retrieval System

A Data Automation Proposal will be written covering the implementation of the IS&R System. This DAP, together with proposed experience reporting forms, will be submitted to AFADAC for approval. The possibility of using a generalized program system (e. g. , Formatted File System) to perform some of the information storage and retrieval functions will have been investigated prior to this time.

9. Design Information Storage and Retrieval System in Detail

Once the DAP is approved, the IS&R System will be designed in detail, including flow charts, file layouts, input formats, and output formats. Preliminary operating procedures will be written.

10. Determine Personnel Requirements for New MIS

PRC and the Air Force will determine what additional personnel will be required for a successful operation of the MIS, and justifications will be written.

11. System and Schedule Review

Upon completion of the IS&R System detailed design, the entire system and preliminary operating procedures will be reviewed with Air Force personnel. Modifications will be made if desirable, and the original schedule and PERT charts reviewed and updated to reflect the more precise milestones available at this time. The precise computer and programming language for implementation will be finalized.

12. Personnel Job Description Preparation

After the requirements for new personnel have been approved by the Air Force, Job Descriptions and Task Lists will be written for new Headquarters, USAF, personnel. These documents will contain such information as training and experience required and a description of what tasks must be performed.

13. Programming of the Information Storage and Retrieval System

The system will be programmed and desk-checked.

14. Conversion of Already Collected Data

Data already collected by PRC will be converted to a form acceptable to the system so that an initial data base may be established. This data base will be the nucleus of the ultimate operational data base and will also serve as data for checkout of the system.

15. System Test Plan Preparation

A checkout and system test plan will be devised. Test data will consist of already collected data plus any specially contrived data deemed necessary to exercise and demonstrate the system completely.

16. Checkout of Information Storage and Retrieval System

The programs will be checked out using established data and procedures.

17. System Test of Information Storage and Retrieval System

The IS&R System will be subjected to the system test devised earlier. Results will be evaluated by PRC and presented for Air Force review during the system turnover phase.

18. Documentation

The IS&R System will be documented, including preparation of an operator's manual and programmer's maintenance manual. The latter will contain all flow charts, memory maps, file structures, input formats, and output formats.

19. Define Training Requirements

PRC will establish the scope and depth of training required by the Air Force to maintain and use the system and will present these findings to the Air Force for review and approval.

20. Training Plan Preparation

A training plan will be written and submitted for Air Force review. Training will be provided in the program maintenance of the system and in the overall concept and use of the MIS and IS&RS as a whole (orientation).

21. Rewrite Appropriate Air Force Regulations

All Air Force regulations affecting the submission of ADPS proposals and the reporting of ADPS information will be revised to reflect the new rules.

In addition, new and/or revised HOI's will be prepared covering all affected areas, including use of the MIS, production and use of outputs, and preparation of inputs. These will then be submitted through appropriate Air Force channels for approval and publication.

22. Prepare Training Materials

Materials will be prepared for use in the two types of training courses: program maintenance and orientation. Maximum use will be made of program documentation, new AFR's and HOI's, etc.

23. Accomplish Training

The training courses will be presented by PRC to Air Force personnel selected by the Air Force. The courses will include training in the operation and maintenance of the Information Storage and Retrieval System as well as MIS orientation. Also, editors and statisticians will be given an introductory course.

24. Advise Air Force During Familiarization

PRC will furnish advisory service during the 6 months after system turnover to ensure that all questions are answered.

It will be desirable, in order to make the initial data base as complete as possible, to enter data concerning all ADP systems currently in operation in the Air Force. The current DSAP would probably contain sufficient data for the inclusion of all data systems and their major assets, with some editing, of course. This would not include the type of detail included in the 18 ADP systems studied by PRC. If the Air Force desired, the same type of data collected on these 18 systems could be collected on all, or a part of, the remaining ADP systems. This effort could be added to the proposed implementation plan as an independent task.

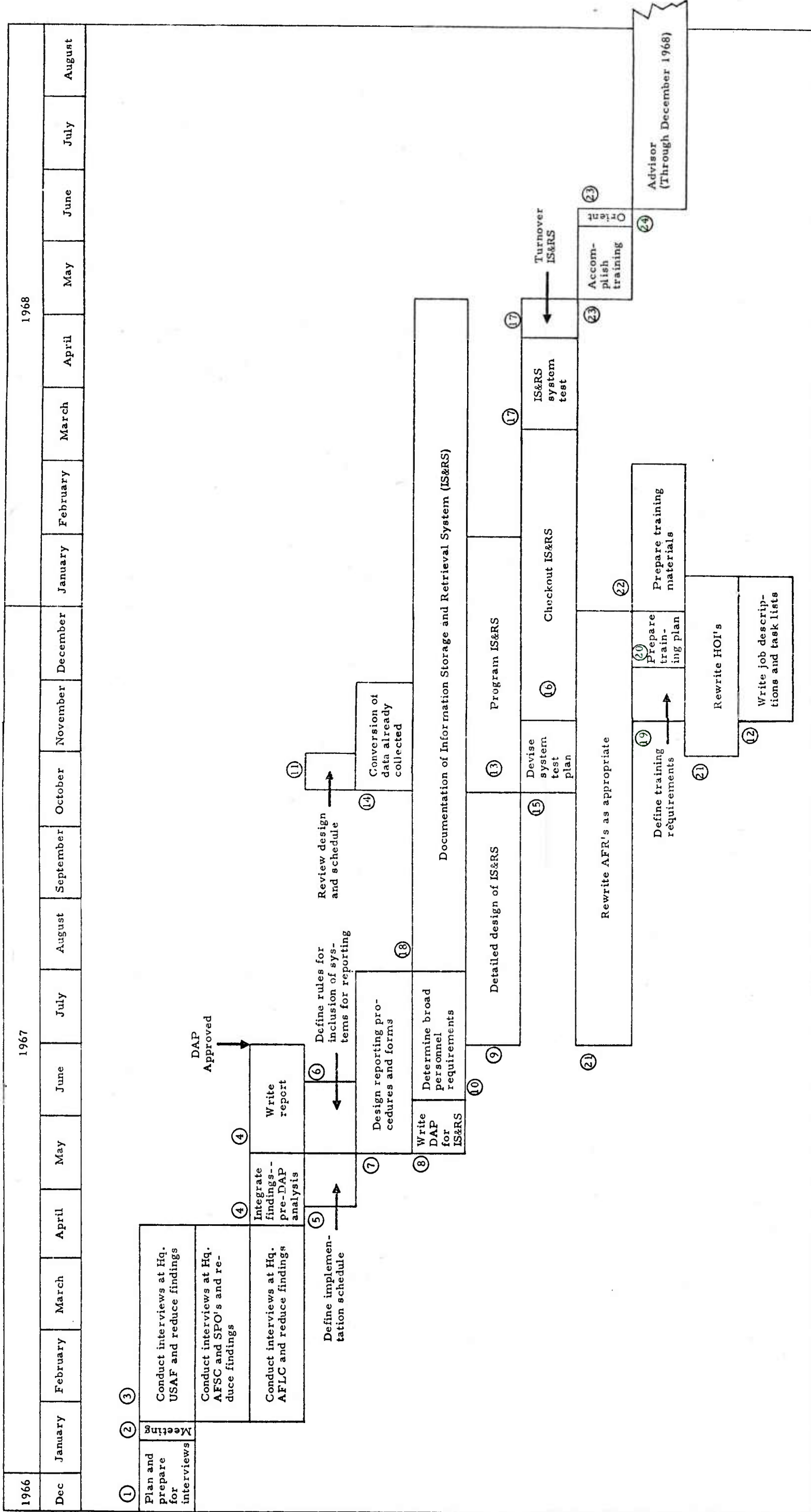


FIGURE 6 - PHASE III DEVELOPMENT PLAN

IV. SUMMARY OF BENEFITS AND COSTS

Previous sections have presented the basic concept and preliminary design of the Air Force ADP Management Information System and a plan for developing it. This section summarizes the benefits of the system and attempts to forecast costs associated with the system over the next 7 years.

A. Benefits

The ADP Management Information System should provide a tool not now available to Air Force managers and should improve all aspects of ADP management in the Air Force. Specifically, the system should effect a cost reduction at Headquarters, USAF, for the performance of ADP management functions, and at the same time improve the quality of ADPS proposals, developments, and operations. Some specific benefits are discussed below.

1. Improved Cost Effectiveness and Quality of ADP Development and Operations

The Air Force ADP Management Information System will result in more accurate, complete, and timely ADP management information being available to Air Force managers. This will allow the Air Force, as outlined below, to more effectively prosecute a number of phases of ADP management.

a. Improved ADPS Proposal Submission/Review/Approval Process

More stringent regulations on the content of ADPS proposals will result in the submission of higher quality proposals to Headquarters, USAF; and the systematic use of ADP experience in the proposal review and approval process will result in better founded Headquarters decisions. A side benefit from the higher quality proposals will be less expensive and better performing ADP systems; this is because the problem will be studied in greater depth before a solution is implemented.

b. More Efficient Utilization of ADP Assets

A central, accessible repository of the characteristics of Air Force ADP assets will promote sharing of assets and prevent duplication of effort. ADP assets are considered to be software, application programs, data files, personnel experience, and ADP hardware currently resident in the Air Force.

c. More Effective Prosecution of ADP Standards Program

Information in the experience and assets data bases will make possible better predictions of the effect of proposed standards prior to implementation, and more timely and complete reporting from the field will result in more effective enforcement of standardization.

d. Tighter Control of On-Going ADP Developments and Operations

More timely and complete reporting from the field will enable Headquarters, USAF, to detect out-of-control situations sooner, and will lend assistance to minimize duration and severity of problems.

e. Improved ADP Budget Forecasts

The central bank of ADP cost data, and particularly the cost prediction equations, will aid budget planners in the construction of long-range ADP budget forecasts.

f. Ready Availability of Data for Performing Special Studies

The availability of the experience and assets data bases will reduce the time and expense of performing special studies, and will increase their accuracy and credibility at the same time. Furthermore, many needed studies, not now made because of the sheer unavailability of data, will be possible because of the broad scope of data available.

2. Cost and Time Savings in Large System Programs That Involve ADP

The ADP element usually lies on the critical path (in a PERT sense), and its slippage causes other more costly elements of the total program to await its completion, not to mention the postponement of the military capability the total system is going to deliver. After the ADP Management Information System is operational, this should happen less frequently. The costs and operational dates of large system programs (AFR 375 series developments) will be less jeopardized by their ADP elements because of the capability afforded by the MIS to forecast ADP completion dates more accurately and to monitor ADP developments more closely.

3. Cost Reduction at Headquarters, USAF

If the Air Force ADP Management Information System is not developed, it is estimated that the increasing ADP management workload

will require an additional effort of 100 man-years per year (over and above that to be expended in 1968) at Headquarters, USAF, by 1973.

This effort will be required to handle the growing workload of reviewing and approving ADPS proposals; budgeting, reviewing, and controlling current developments and operational systems; and preparing special reports.

Figure 7 presents a summary of the benefits and costs of the proposed ADP Management Information System. It can be seen that development of the MIS could result in a reduction in personnel costs of some \$600,000 per year by 1973. This, of course, must be balanced against the cost of developing and operating the Management Information System, as discussed in the next subsection.

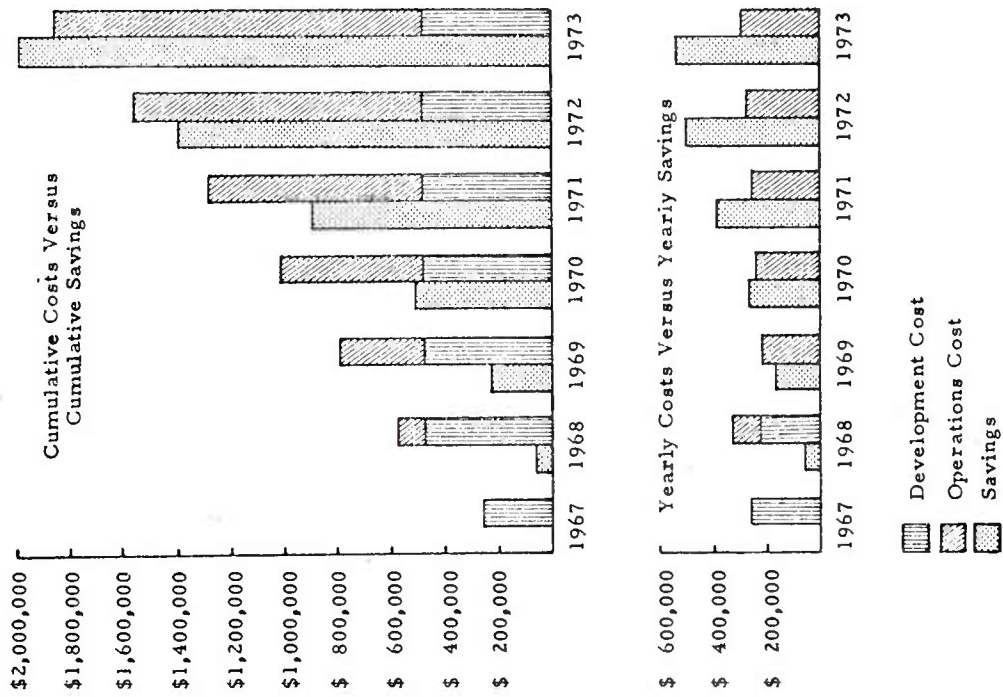
B. MIS Development and Operating Costs

The cost of developing the MIS, including initial training and orientation of appropriate Air Force personnel, would be approximately \$480,000 spread over calendar year 1967 and the first half of 1968. This includes \$465,000 for implementation and training efforts and \$15,000 for computer time for program checkout and system test. As shown in Figure 7, the cost of operating the system (operations beginning in mid-1968) will rise from about \$101,000 in 1968 to about \$293,000 in 1973. The operations cost includes data base maintenance at Headquarters, USAF; experience reporting efforts by ADP systems in the field; and asset reporting efforts by data processing installations in the field.

The total development and operating cost over the next 7 years is, then, approximately \$1,847,000. The estimated cumulative saving over the same period is about \$1,990,000. In other words, the system should pay for itself in less than 7 years, not even considering the more intangible benefits resulting from increased quality and better controls over ADP system development. The big payoff of the MIS, however, will come in the field, where the dollars saved by the Headquarters personnel reduction could be absolutely dwarfed by the dollar reduction achieved through better ADP management.

C. Cost Detail

Table 7 shows the cost detail used to arrive at the figures presented previously. Included are the costs of development and operation of the Air Force ADP Management Information System and benefits of a resulting personnel reduction at Headquarters, USAF. All costs, of course, must be considered only as budgetary estimates, and are subject to the assumptions made.



Benefits

1. Cost savings as shown.
2. Improved cost/effectiveness and quality of Air Force ADP development and operations through:
 - a. Improved ADPS proposal submission/review/ approval process
 - b. More efficient utilization of ADP assets
 - c. More effective prosecution of ADP standards program
 - d. Tighter control of on-going ADP developments and operations
 - e. Improved ADP budget forecasts
 - f. Ready availability of data for performing special studies
3. Cost and time savings in large system programs that involve ADP, because of capability to forecast completion dates more accurately and to monitor developments more closely.

FIGURE 7 - SUMMARY OF COSTS AND BENEFITS

TABLE 7 - COST DETAIL

Phase	Item	Calendar Year							Seven-Year Totals
		1967	1968	1969	1970	1971	1972	1973	
Development	Implement system ¹	\$255,000	\$210,000						\$465,000
	Computer time for checkout/test ²	<u>5,000</u>	<u>10,000</u>						<u>15,000</u>
	Subtotal	\$260,000	\$220,000						\$480,000
Operations	Air Force/Civil Service personnel ³		\$ 95,000	\$201,000	\$225,000	\$241,000	\$258,000	\$276,000	\$1,296,000
	Computer time for operations/maintenance ⁴		<u>6,000</u>	<u>9,000</u>	<u>11,000</u>	<u>13,000</u>	<u>15,000</u>	<u>17,000</u>	<u>71,000</u>
	Subtotal		\$101,000	\$210,000	\$236,000	\$254,000	\$273,000	\$293,000	\$1,367,000
	Total Cost	\$260,000	\$321,000	\$210,000	\$236,000	\$254,000	\$273,000	\$293,000	\$1,847,000
Operations	Personnel reduction at Hq., USAF ⁵		\$ 50,000	\$170,000	\$280,000	\$390,000	\$500,000	\$600,000	\$1,990,000

Notes: (1) Based on tasks in Figure 6.

(2) Based on an estimated 300 hours total at \$50 per hour.

(3) Based on the man-years per year in Table 1 at \$8,000 per year straight salary (no overhead included).

(4) Based on the hours per month in Table 6 at \$50 per hour.

(5) Based on a linear reduction over 5 years (mid-1968 to mid-1973) of 75 personnel at \$8,000 per year straight salary (no overhead included).

APPENDIX A
ADPS PROPOSAL SUBMISSION INSTRUCTION

Complete detail pertaining to each ADPS proposal item should be furnished if possible. If certain items are not available at time of submission, it should be so stated. Items not directly pertinent to the specific proposal should be marked "Not Applicable." The following format must be followed:

A. Identification

Indicate originating base and/or organization, parent command, and preparation date.

B. Title

State the name of the proposed system. Identify the data automation requirement/recommendation.

C. Purpose

State the purpose of the proposed automation and specify what is to be accomplished. Relate this to an established function or responsibility. Give any background information that will lead to better understanding of the requirement and the proposed solution. Indicate any associated organizational and procedural changes contemplated.

D. System Summary

Fill out the "ADPS Proposal Summary" form using entries consistent with indexing classifications found in the ADP Experience Handbook (Pilot Version).

E. System or Modification Description

1. Inputs

Describe the content, the purpose, and (where possible) the format of each major input to the system. Describe the source for inputs, communications required for the inputs, and type of input validation.

2. Data Base

Describe the content, the purpose, and (where possible) the format of each major file in the system. Stress update procedures and the use of the files in the operation of the system.

3. Outputs

Describe the content, the purpose, and (where possible) the format of each major output from the system. Describe the user of outputs and communications required to get outputs to the user.

4. Data Flow

By flow charts and/or narrative means, describe the major functions of the system. Show the data flow and indicate the system's relationship with the users and with other systems.

5. Workload Descriptors

Explain the derivation of the following workload descriptors:

- a. Number of Input Transaction Types
- b. Number of Input Data Fields
- c. Number of Output Formats
- d. Number of Data Base Record Types
- e. Characters Per Month Input Volume
- f. Characters Per Month Output Volume
- g. Characters in Data Base

6. Functional Area

Indicate which of the following functional areas are involved:

<u>Code</u>	<u>Functional Use</u>
A	Operations Supporting Systems
B	Research and Development Systems
C	Equipment Management Systems
D	Material Management Systems
E	Personnel/Manpower Systems
F	Civil Engineering Management Systems
G	Maintenance Management Systems
H	Financial and Accounting Operations Systems
I	Medical Operations Systems
J	Procurement and Production Man- agement Systems
K	Plans and Programs
L	Weather Systems
M	Communications Management Systems
N	Intelligence Systems
O	Transportation Management Systems
P	Miscellaneous

7. Decentralized Operations

Explain where the system is to be operational, the number of sites, their relationships, and provisions for software maintenance and control.

8. Multiple Applications

State if the system shares hardware with other applications.

9. Programming Languages

Explain the programming languages and system support programs to be utilized.

10. Type of Processing

Explain the mode of operation, especially if on-line, time-sharing, etc.

11. File Conversions

Explain any file conversion requirements. If possible, explain the size and nature of the files and the methods to be used to accomplish the conversions.

12. Direct Access Storage

Indicate disc or any other special direct access storage devices required. Include size and timing requirements.

13. Growth Potential

Estimate the growth rate of the system, especially as it affects new software or hardware requirements in the future. If possible, estimate the workload that the system could handle without further modification.

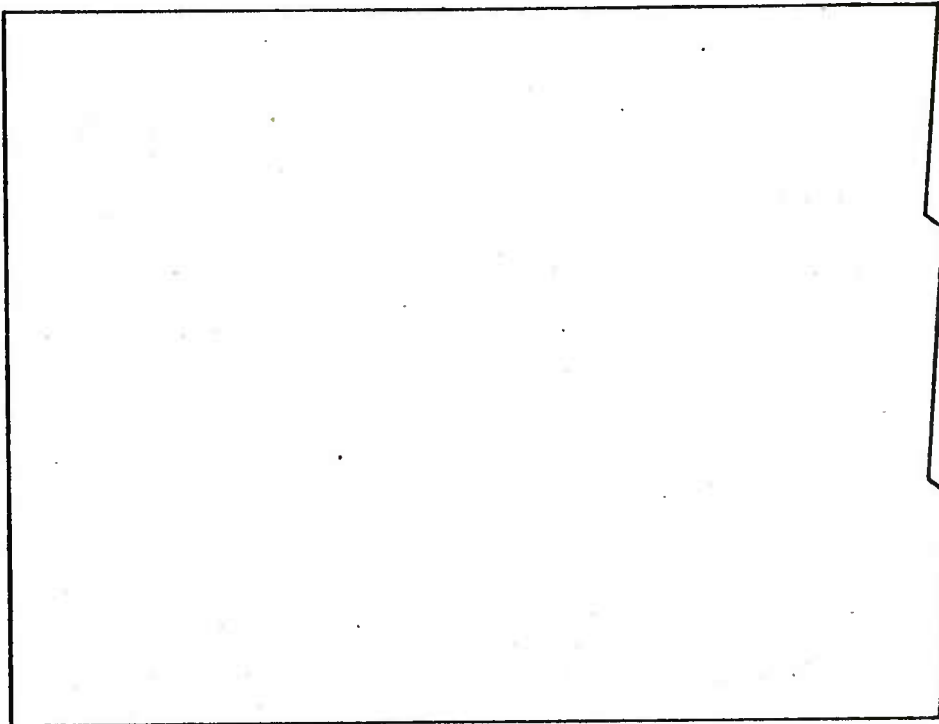
F. Development Plan

Using the following chart, show the planned schedule for the development/modification proposed:

DEVELOPMENT SCHEDULE

Months 1 2 3 4 5 6 7 8 9 10 11 12 13 ...

Activity



Key: o Proposed Milestone

_____ Task

Indicate key milestones, such as specifications complete, programming started/completed, hardware delivered, hardware checkout complete, program checkout complete, testing, system operational, etc. Prepare a task list defining all major tasks to be performed and indicate these in the appropriate place on the development plan chart. Discuss any anticipated schedule problems and their proposed solutions.

G. Resource Requirements

Indicate, to the degree possible, the anticipated resources required for the proposed system or modification. Also, identify those resources which are additional over those now in use. Resource requirements should be specified as being command or Air Force-wide, separately identified within the following groups:

1. Manpower

Categories to be identified include:

- a. Development (man-months or man-years by rank/grade)
 - o Systems analysis
 - o Programming, checkout
 - o File conversion
- b. Operations (number by rank/grade)
 - o Operators
 - o Maintenance programmers

2. Hardware

Identify types of hardware with approximate dollar costs. Include the following itemization:

- a. Development
 - o Hours for checkout and test
 - b. Operations
 - o Hours per month for production
 - o Hours per month for program maintenance
3. Physical Facilities (site preparation, approximate dollar cost).
 4. Communications (identify number of units, approximate dollar cost).
 5. Other (as appropriate).

H. Benefits Analysis

Indicate the economies and other benefits to accrue through the proposed system or modification. Tangible benefits (personnel, equipment, or other savings) should be summarized to indicate an estimated dollar value for a specific time period. Intangible benefits (increased efficiency or responsiveness, accomplishment of tasks not previously feasible or possible, preclusion of increased cost of current operations, etc.) should be outlined in narrative form, with explanation or derivation of the benefit.

Indicate the benefits of alternative approaches compared with the proposed system. Compare workload capacity and growth potential of

the alternative systems. Indicate the results of analyses conducted on possible computer/system sharing.

I. Remarks

Include additional information that would facilitate understanding and evaluation of this ADPS proposal.

APPENDIX B
CURRENT ADPS PROPOSAL PROCEDURES

A. Introduction

One of the major objectives of this contract is to propose tools to the decision makers at HQ USAF to assist them in judging proposals for new automation. For any tool to be constructed in the most useful manner, it is necessary to understand who the decision makers are, what analytical procedures they follow in judging proposals for new automation, and what the form and content of such proposals are. To the extent possible within contract scope, the PRC project team has gathered such data through a study of applicable Air Force regulations and through many lengthy discussions with personnel at HQ USAF.

This appendix summarizes the various regulatory procedures that govern the preparation and submission of proposals involving ADP systems to HQ USAF. It is not claimed that these represent all applicable procedures, but PRC is certain that the majority of all ADPS proposals are covered by the regulations discussed herein. It should be clear, after perusal of this appendix, just how complex the proposal-judging function is and how urgently the decision makers need additional tools.

Specifically, the remainder of this appendix discusses 300 series regulations and the functions of AFADA, 375 and 57 series regulations and system management procedures, 100 series regulations governing communications systems, and AFR 80-2 concerning research and development.

Various organizations within the Air Force are referenced herein and the organization chart presented in Figure B-1 should help identify the position of a given organization within the Air Force structure.

B. AFR 300 Series Regulations

This series deals in general with the design, implementation, and operation of automated data systems for management supporting data systems, operations supporting systems, and research and development supporting data systems. It also pertains to the selection, acquisition, and management of automatic data processing equipment for these systems, with the following notable exceptions:

- o Data systems and/or equipment integral to a weapon system
- o ADPS under development for a particular use through the expenditure of research and development test and evaluation funds
- o Analog computing systems

AFR 300-2 establishes the Air Force general objectives and policies in the area of data automation and specifies that the Senior ADP Policy Official for the Air Force is the Assistant Secretary of the Air Force (Financial Management). In this capacity, he is responsible for the

administration of the Air Force ADP program and the selection and acquisition of ADP equipment; accordingly, all proposals for ADP equipment acquisition must be approved by him. AFADA has been designated by SAFFM as the focal point for coordinating and integrating the Air Force data automation effort. Functions performed by AFADA will be covered in subsequent paragraphs.

1. AFR 300-3, Management Supporting Data Systems

This regulation establishes procedures and responsibilities for the design, implementation, modification, and maintenance of management supporting data systems. In most cases a Data Automation Proposal (DAP) is mandatory. Procedures and formats for DAP preparation and submission are included in this regulation. Program control of design and implementation of management supporting data systems is exercised through the Data System Automation Program (DSAP). HQ USAF makes DSAP entries, reflecting the separate design and implementation phases of automated data systems, as follows:

- o Systems Development Projects Inventory. This entry reflects issuance of a Data Project Directive and indicates data system design activity by location and scheduled completion date.
- o Data System Implementation Schedule. This entry reflects current implementation plans and identification of the support ADP equipment scheduled for each location.
- o Current System Inventory. This entry reflects current active data systems and ADP equipment in use in support of such data systems.

Reporting procedures are those outlined in AFM 171-9.

Systems proposed under this regulation are categorized as either standard or unique. Standard data systems are common to two or more commands or agencies and possess uniformity of inputs, file content, processing logic, and outputs. Unique data systems are peculiar to a single command or agency.

HQ USAF (AFADAC) must review DAP's received to determine the following:

- o Acceptance, and (a) establishment of a system development project, (b) other directed action prior to implementation, or (c) directed implementation
- o Nonacceptance, and (a) return for additional information or development, or (b) return with explanation of nonacceptability

"Evaluates information requirements of the Secretary of the Air Force, Chief of Staff, and other principal Air Staff officers. Assures that valid requirements are in data banks or reports. "

Accordingly, AFADAA's main function with respect to DAP review is to insure that reports, data elements, codes, etc., are in compliance with AFR 174-1 and AFR 300-4 as required.

2. AFADAB. Again quoting from AFM 170-6, key responsibilities of this organization include:

"Serves as focal point and is responsible for data automation objectives, concepts, plans and policies in support of overall Air Force objectives and plans.

"Develops the regulatory structure for effective management of the total data automation effort.

"Serves as the Air Force focal point with DOD on all matters pertaining to data automation objectives, concepts and policies, and as the AFADA coordinating office on all DOD matters.

"Establishes and coordinates Air Force requirements for technical data automation studies and development projects; monitors their progress and evaluates results.

"Establishes policies pertaining to data automation technical standards for Air Force use, and coordinates the development and adoption of technical standards with other agencies or industry.

"Plans for the interface and integration of Air Force management and operational supporting data systems to insure efficiency and elimination of duplication. "

In reviewing a DAP, AFADAB determines whether regulations in addition to the AFR 300 series should apply and whether established standards are involved or suggested.

3. AFADAE. Key functions as stated in AFM 170-6 include:

"Exercises surveillance over USAF data automation installations; evaluates progress and performance against programs and standards; and initiates corrective action when necessary.

"Plans for and monitors the installation, operation, and management of all ADP Equipment after the equipment selection and approval process has been completed.

"Prescribes and manages the USAF Data Systems Automation Program (DSAP) and changes thereto.

"Reviews requests for ADPE and recommends approval action based on budget requirements and current management actions.

"Reviews and approves requests for ADP services through service contracts.

"Compiles Data Automation program cost, ADPE utilization and inventory data for the Air Staff, OSD, BOB and other Government agencies use.

"Performs continuous post installation studies of method of acquisition of ADPE and initiates purchase action when economically advantageous.

"Administers the relocation or disposition of surplus Government-owned ADP Equipment."

Manpower implications in the DAP are analyzed and discussed.

4. AFADO. This organization determines whether the system proposed in the DAP is unique or standard. It might also recommend holding up a proposed unique system because of some standard system already under development. If a proposed unique system has Air Force-wide benefits, AFADO might establish it as a standard system. AFADO maintains the Air Force's standard Management Supporting Data Systems and normally implements such systems.

The instructions for preparing a DAP are included as Attachment 2 of AFR 300-3. A copy of this attachment is presented in Figure B-3. The current instructions call for only additional resources required. Current practice at AFADAC is to request all resources required before a DAP can be properly evaluated.

Several key questions must be answered when evaluating a DAP, all of which are answered, with varying degrees of success, by AFADAC proposal evaluators:

- o. Does the Air Force need it? In other words, does the proposed ADPS fall within the policies and objectives of the Air Force as a whole and the specific mission of the requestor? This is by far the hardest question to answer and, once answered, the one most subject to argument.
- o. If a valid mission requirement exists, is the proposed ADPS the best technical and most economical solution? And, as a

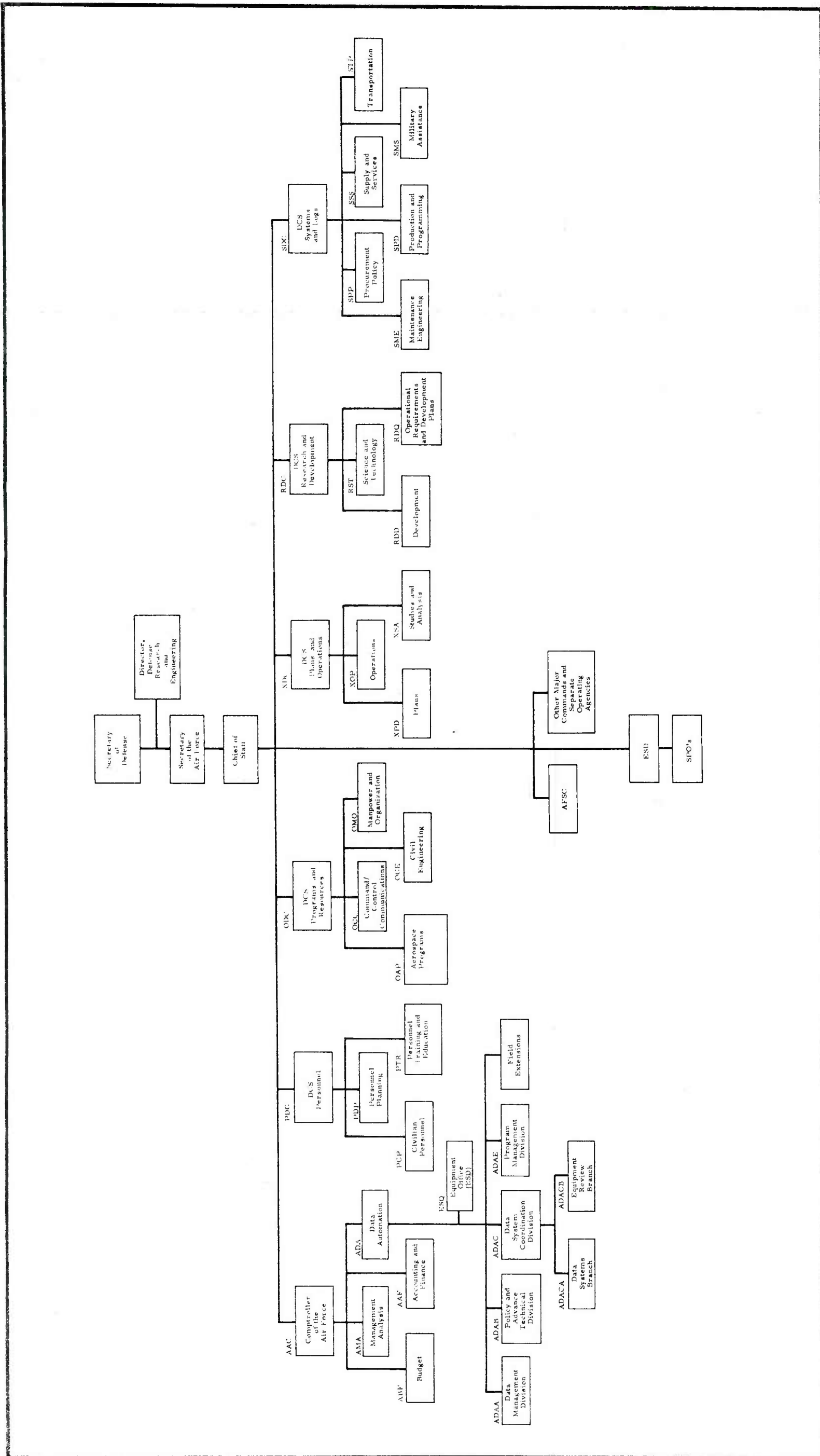


FIGURE B-1 AIR FORCE ORGANIZATION CHART (PARTIAL)

Because AFADA is the decision authority for management, operations, and research and development supporting data systems, something should be said at this point concerning its organization, functions, and overall responsibilities. All of these are covered in detail in AFM 170-6; however, it should prove instructive to describe those functions associated with the approval process for DAP's.

Figure B-2 shows the organization of AFADA. All DAP's go to AFADACA for coordination and evaluation. It is their responsibility to see that all interested members of the Air Staff are involved in the evaluation process. Each DAP is logged in and given a number. The goal at AFADACA is to completely process a DAP in no longer than 45 days. The DAP is subjected simultaneously to an in-house review and a functional review. The functional review consists of sending the DAP to any part of the Air Staff which might be involved or interested (e.g., DCS/Personnel if additional manpower is required).

The in-house review consists of sending the DAP to those parts of AFADA which might have some comment, and almost always includes AFADAA, AFADAB, AFADAE, and AFADO. Typical responsibilities of these organizations are as follows:

1. AFADAA. Key, but not all inclusive, responsibilities as described in AFM 170-6 are:

"Reviews, validates, and has approval authority for all data system content and standard output therefrom (AFR 300 series). Insures standardization of this data to provide interface capabilities and to preclude non-essential overlap or duplication within and between systems and reports.

"Prescribes the system and procedures for a continuous Air Force-wide review, analysis and validation of all reports, data bank content, and standard outputs. Conducts periodic reviews of all reporting requirements placed on the Air Force by other Federal agencies and the public.

"Directs and is responsible for the Air Force Data Elements and Codes Standardization program including the approval, publication and implementation of standard data elements, data items, data codes, data descriptors, and data field designators. Provides guidance and advice to Data Automation Working Groups on these matters. Resolves functional area conflicts.

"Establishes and controls automated file(s) for data elements and related features (data items, codes, descriptors, and field designators), including a repository of the data content of standard data banks and Headquarters USAF directed or implemented reports.

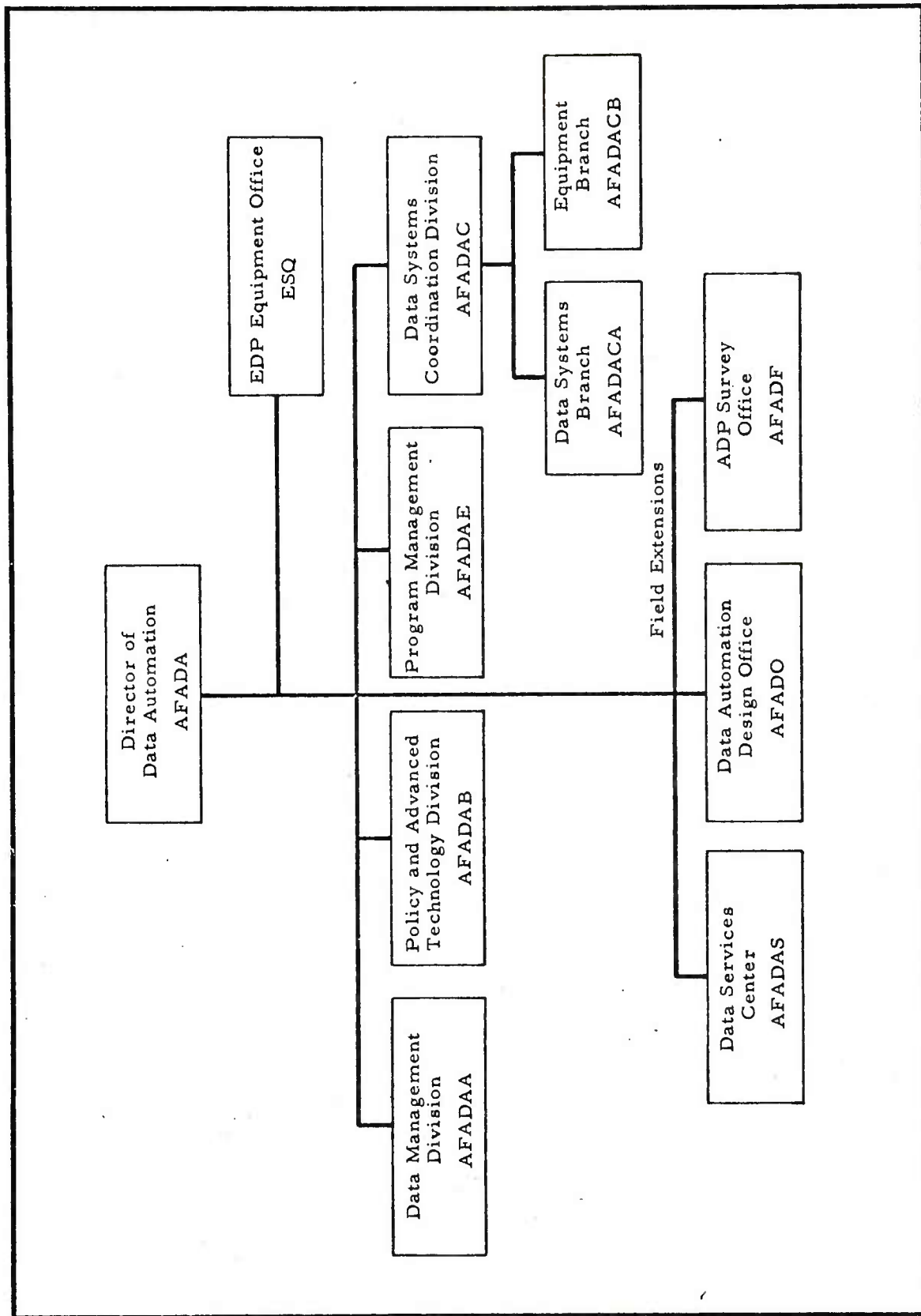


FIGURE B-2 ORGANIZATION OF AFADA

DATA AUTOMATION PROPOSAL (DAP) SUBMISSION

General Instructions. Complete detail pertaining to each DAP item may not be available (or required) at the time of DAP submission. However, each item should be completed to the degree appropriate at the time of submission. Items not directly pertinent to the specific proposal should be marked "Not Applicable." The following format must be followed:

1. **Identification.** Indicate originating base and/or organization, parent command, and preparation date.
2. **Title and Purpose.** Identify the data automation requirement/recommendation; specify what is to be accomplished; and relate this to an established function or responsibility; specify the data automation characteristics involved; and indicate any associated organizational and procedural changes contemplated.
3. **System/Modification Description.** Specify the inputs and file content, and provide a general flow diagram showing processing operation. Identify outputs and their relationship with other data systems. Indicate processing workload, responsiveness criteria, etc., at appropriate points within the processing operation.
4. **Resource Requirements.** Indicate, to the degree possible, the anticipated additional resources required (over those now in use) for the proposed system or modification under normal operating conditions. Resource requirements should be specified as being command or Air Force-wide, separately identified within the following groups:
 - a. Personnel (grade/man months or years).
 - b. Equipment (identify, and include approximate dollar cost).
 - c. Physical facilities (site preparation, approximate dollar cost).
 - d. Communications (identify number of units, approximate dollar cost).
 - e. Other (as appropriate).
5. **Summary of Benefits.** Indicate, to the degree practicable, the economies and/or other benefits to accrue on a command or Air Force-wide basis through the proposed system or modification. Tangible benefits (personnel, equipment, or other savings) should be summarized to indicate an estimated dollar value for a specific time period. Intangible benefits (increased efficiency or responsiveness, accomplishment of tasks not previously feasible or possible, preclusion of increased cost of current operations, etc.) should be outlined in narrative form, with explanation of derivation of the benefit.
6. **Remarks.** Include additional information which would facilitate understanding and evaluation of the submitted DAP. For new Unique Data Systems include a schedule of proposed locations, if applicable.

FIGURE B-3 PRESCRIBED FORMAT FOR DATA AUTOMATION PROPOSALS

corollary to this question, is there an existing Air Force ADPS that will do the job, or do other ADPS proposals in process support or conflict with the subject proposal?

It is in answering these questions that better tools would be most useful to the proposal evaluators. Although they are currently doing an adequate job in this area, they are not equipped to contend with increases in the proposal load and continuing expansion of data processing in the Air Force; current procedures will become increasingly prone to error, and the time to process a proposal will become longer and longer. More than 700 DAP's have been processed by HQ USAF in the last 5 years; of these, over half were submitted within the last 12 months. If the load continues to increase at this rate, better tools and procedures are mandatory.

At present, the tools available to proposal evaluators are essentially a listing of past and current DAP's in numerical order and the Data System Automation Program (DSAP). The officers within AFADAC who perform proposal evaluations have functional areas of responsibility, which minimizes the amount of information with which they must become familiar and remember. However, these procedures can accommodate an increased workload only by adding more people and establishing a finer functional stratification. Furthermore, there are at present no tools, except the experience of the individual officers performing the evaluation, for assessing cost estimates.

Other responsibilities of AFADA covered by this regulation deal with procedures to be followed after a DAP is approved.

In many cases it is deemed desirable to establish a system development project for the design (or modification) of automated data systems, development of associated data system specifications, and demonstration of the operational feasibility of new concepts and techniques. In this event, a Data Project Directive (DPD) is issued by AFADA which provides the charter for command or agency initiation of a system development project. One of the key documents produced by the system development project is the Data System Specifications, which provide a complete description of the specific system, including identification of related standard data systems, pertinent standard data elements and codes, input and output definitions, file and record content, and logical flow diagrams of the functions performed. If the Data System Specifications are approved by HQ USAF, an implementation schedule is prepared and sent to the command or agency, which in turn prepares the following:

- o Available ADP equipment capability
- o Funding requirements
- o Workload confirmation

- o Site preparation requirements
- o Training requirements
- o Verification of benefits

When all approvals have been made, a final implementation plan is developed to ensure orderly and effective implementation of the data system.

2. Operations Supporting Data Systems

ADP systems for operations supporting data systems currently are acquired through AFR 300-3 (DAP's) or AFR 375-1 (ROC's). A draft version of AFR 300-6, which covers this area, is being studied by AFADA; if adopted, these systems will receive uniform treatment.

3. AFR 300-7, Research and Development Supporting Systems

This regulation distinguishes between research and development support and management or operational supporting data systems. It prescribes responsibilities for establishing and providing scientific/computational ADP equipment support required in conjunction with approved research and development activity. Requirements for new or additional ADP equipment needed primarily to support administration and management of research and development programs must be initiated and developed in accordance with AFR 300-3.

Requests are submitted to AFADAC in the form of a letter of transmittal. If new equipment is required, an equipment specification must be attached to the letter of transmittal. The letter must include the following:

- o A statement explaining why augmentation of existing ADP equipment cannot satisfy the requirement
- o An analysis of the feasibility of sharing equipment with other Air Force or Government agencies
- o Justification for special equipment features, etc.
- o A description of the tasks and their associated workload (machine hours and additional manpower)

Although format requirements are different from a DAP, the information required is similar. AFADA actions are also similar. They include the following:

- o Review and evaluate the requests

- o Screen requirements for possible reutilization of available excess Government-owned or -leased ADP equipment
 - o Forward equipment specifications to ESD, AFSC, for initiation of ADP equipment selection process
 - o Obtain higher authority approval for waiver of competitive ADP equipment selection, when required
 - o Advise the major air command to initiate appropriate ADP equipment acquisition action
4. HOI 300-3, Management Supporting Data Systems

This supplements AFR 300-3 and establishes Air Staff responsibilities in accord with DOD Directives 4105.55 and 5100.40. Key functions of AFADA outlined in this document are as follows:

- o Develop and maintain a data system designator (short title) system for data system identification
- o Ensure standardization and avoid non-essential overlap and duplication of data systems
- o Prescribe standard machine programming language(s) to be used
- o Maintain and publish the USAF DSAP
- o Disseminate periodically status of DAP's, DPD's, and related actions
- o Maintain and prepare AFM 300-4, all approved standard data elements and codes

C. AFR 375 and 57 Series Regulations

System management in the Air Force is defined as the process of planning, organizing, coordinating, evaluating, controlling, and directing the combined effort of Air Force contractors and participating organizations to accomplish system program objectives. The documents of primary interest are AFR 375-1 and HOI 375-1, Management of System Programs.

Programs that come under this type of management are defined as follows:

1. Mandatory. All new (or major modifications of existing) production systems, or new engineering and operational systems developments shall be managed according to AFR 375-1 and HOI 375-1 if they fulfill one or both of the following stipulations:

- a. The program is rated in the BRICK-BAT category (AFR 70-24).
 - b. The program is estimated to require total cumulative RDT&E financing in excess of \$25 million; or estimated to require a total production investment in excess of \$100 million.
2. Otherwise Designated. Other system programs may be designated for this type of management when they possess one or more of the following characteristics:
- a. The program significantly affects U. S. military posture.
 - b. The program is closely related and, when taken collectively, would qualify under dollar thresholds given above.
 - c. Significant technical problems are anticipated.
 - d. Unusual organizational complexity or technological advancement is involved.
 - e. Extensive interdepartmental, national, or international coordination or support is required.
 - f. Technological risks are involved that may cause difficulties in many functional areas.
 - g. Unusual difficulties are presented that require expeditious handling to satisfy an urgent requirement.

In general, the purpose of applying systems management is to ensure that efforts by functional activities of the Air Force are accomplished consistent with the objectives of each system program. Complexity, long lead time, extensive resource requirements, and urgent necessity to attain and maintain maximum operational capability are factors that make it mandatory to apply system management procedures.

Until recently, a system project of the type discussed started when a QOR (Qualitative Operational Requirement), SOR (Specific Operational Requirement), OSR (Operational Support Requirement), or ADO (Advanced Development Objective) was written. AFR 57-1, 17 June 1966, establishes the ROC (Required Operational Capability) as the replacement for QOR's, and the RAD (Requirements Action Directive) as the replacement for SOR's, OSR's, and ADO's.

The ROC is a command's official request to HQ USAF for a new or improved operational capability and, although any organizational level may originate such a document, it must be signed by a general officer or a colonel occupying a key staff position.

The RAD is prepared by HQ USAF, signed by a general officer at directorate level; it directs and guides the Air Force actions necessary to translate a required operational capability into an approved and funded program. The RAD is a guidance document, not a funding instrument; however, it transmits the funding information available at the time it is issued.

The focal point within HQ USAF for the coordination of ROC processing is AFRDQ. Key functions performed include the following:

- o Evaluate the requirement and initiate actions to include, but not be limited to, such items as:
 - a. Preparing a plan of action to evaluate the need and satisfy or to disapprove the requirement
 - b. Initiating and conducting further studies involving system analysis, tradeoffs, cost effectiveness, etc.
 - c. Directing and guiding actions required of AFSC, AFLC, and other major air commands through the RAD
- o Evaluate proposed technical approaches submitted by AFSC, AFLC, industry sources, and other commands.
- o Determine the best acceptable approach, with participation of others as necessary, and submit a proposal to appropriate levels of approving authority. An RAD is normally issued within 60 days of receipt of an ROC.
- o Resolve requirements with allied nations and achieve inter-service coordination as required.

Once a system project is established under AFR 375-1, AFSPDO becomes the office of primary responsibility (OPR) for establishing policy and coordinating activities within the Air Staff pertaining to system program documentation and its application to system programs. It is possible for a system to have four phases: conceptual, definition, acquisition, and operational. The HQ USAF OPR for system program management will, through the system life cycle, be transferred to the next deputate having prime responsibility. Some of the major steps involved in most system programs are shown in Table B-1. Key documents involved in the system life cycle are described in the following paragraphs.

1. System Management Directives (SMD's)

These directives provide uniform HQ USAF direction for initiating, changing, and terminating system programs under AFR 375-1. The first SMD establishes the charter for conducting a system program and will designate application of system management, transmit or reference the

TABLE B-1 HQ USAF SYSTEM PROGRAM RESPONSIBILITY

<u>System Life Cycle</u>	<u>Deputy Chief of Staff OPR</u>
Conceptual phase (concept formulation)	
Initial SMD (charter)	
PTDP ₁ review--PCP processing	AFRDC (R&D) or AFSDC (S&L)
PTDP ₂ review	
Memorandum or PCP processing	
Definition phase (contract definition)	
SMD issued	
PA issued	
Budget authority issued by AFABF (Director of Budget)	
FTA issued	AFRDC or AFSDC
Contractor selection	
Memorandum or PCP processing	
PSPP	
Acquisition phase	
SMD issued	
SPP review	
Contracting	
Development effort	
Production	
PCP/PA/BA	AFSDC
Category I, II tests	
Updating changes	
Last article delivered	
Transition agreement	
SMD issued	
Operational phase	AFXOP or other

current requirements document, and request a Program Change Proposal (PCP) and either a Preliminary Technical Development Plan (PTDP) or a Proposed System Package Plan (PSPP). If a formal definition phase is not planned, a PSPP is requested from the implementing command, not a PTDP. Although an SMD reflects policy decisions made within OSD and HQ USAF, including changes in the Force and Financial Plan (F&FP), an SMD in itself does not constitute authority to let a contract. An approved (signed) secretarial Determinations and Findings (D&F) is required before contract negotiations can be initiated or an RFP issued. Fund availability is established and a secretarial statement of Final Technical Approval (FTA) is obtained before a contract containing RDT&E funds may be signed. Separate program authorizations (PA's) issued by AFRRP (Assistant for R&D Programming) and Procurement Authorizations (PA's) issued by AFSPD provide procurement authorization.

2. Program Change Proposal (PCP)

This document, submitted by HQ USAF to the Secretary of Defense, introduces a new program to the F&FP or changes an approved program element in excess of established thresholds. A "proposed PCP" is submitted by AFSC to request an appropriate change to the program. The implementing command initially submits the PCP to the appropriate HQ USAF OPR along with a PTDP, PSPP, or other technical backup data attached.

3. Preliminary Technical Development Plan (PTDP)

This document is submitted by AFSC as the initial response to the RAD indicating approval of the ROC. The PTDP is used by HQ USAF to support the PCP submitted to OSD for approval of the definition phase.

4. Proposed System Package Plan (PSPP)

This document, normally prepared by AFSC, is submitted as a product of the definition phase or on direction of HQ USAF. It includes a system description, cost estimates, resource requirements, performance specifications, schedules, and related information for each alternative proposed. It should be definitive enough to allow incentive and/or fixed-price contracts to be negotiated in the acquisition phase.

5. System Program Directive (SP Directive)

This formal document, issued by HQ USAF, approves a system program defined in the PSPP and authorizes the publication of the SPP. The SP Directive identifies the availability of financial and other resources, the importance category, the impact on other Air Force programs, and other program direction. Subsequent program changes are made as amendments to the SP Directive.

6. System Definition Directive (SDD)

This is the formal document issued by HQ USAF approving the PTDP. The SDD identifies the availability of financial and other resources as applicable, provides authority to AFSC to establish a formal SPO, sets the parameters for the System Program Director (SPD), and establishes the roles of the participating organizations. The SDD also constitutes authority for solicitation of industry sources with the intent to commit the Government within approved fund authorizations.

7. System Package Program (SPP)

The SP Directive requires the System Program Director (SPD), who is head of the SPO and manager of the approved system program during the definition and acquisition phases, to convert the approved portions of the PSPP into the SPP. The SPP specifies the integrated and time-phased tasks and resources required of and by all participating organizations in acquiring and supporting the system.

A complete SPP consists of the following sections:

- o Section 1: Program Summary
- o Section 2: Schedules
- o Section 3: Program Management
- o Section 4: Intelligence Estimate
- o Section 5: Operations
- o Section 6: Acquisition
- o Section 7: Civil Engineering
- o Section 8: Logistics
- o Section 9: Manpower and Organization
- o Section 10: Personnel Training
- o Section 11: Financial
- o Section 12: Requirements
- o Section 13: Authorizations
- o Section 14: General Information
- o Section 15: Security
- o Section 16: Biomedical

In general, the Preliminary Technical Development Plan (PTDP) and the Proposed System Package Plan (PSPP) contain the same type of information and follow the same order. Section 14, General Information, must include (AFR 375-4) a description of all EDP systems used in support of the proposed system (but not an integral part of the system).

D. AFR 100 Series Regulations

The 100 series regulations deal, in general, with communications-electronics activities within the Air Force. In many instances, computers are involved in such systems; hence AFADA becomes involved in the approval cycle (AFR 300-2A).

AFR 100-2 defines a ground communications electronics meteorological (CEM) system as two or more physically separated but interdependent and interrelated equipment or facilities, complete with supporting structures and services. Ground CEM requirements can be of two types: quantitative and qualitative. A quantitative requirement is defined as a need for specific equipment or capability to accomplish a mission wherein the equipment or capability is available without further research and development effort. A qualitative requirement is defined as a need for a particular capability to accomplish a mission wherein the equipment or techniques must be researched or developed.

A qualitative ground CEM requirement is prepared and submitted to HQ USAF (AFORQ) as an ROC (Required Operational Capability). (AFR 57-3 previously required a QOR, but this regulation has been superseded by AFR 57-1, 17 June 1966.) After HQ USAF recognizes and validates a requirement, including OSD approval, presumably an RAD is issued. This document should describe the characteristics of the required CEM equipment and levy the requirement on AFSC to develop a new item of equipment or determine other means of satisfying the requirement. Implementation will be under AFM 100-18 or 375 series as directed by HQ USAF.

Quantitative ground CEM requirements are submitted to HQ USAF (AFSME) for validation as an Advance Communications-Electronic Requirements Plan (ACERP) or a Communications-Electronics Implementation Plan (CEIP). If data processing is involved, ACERP's and CEIP's are also submitted to AFADA and are accepted by this organization in lieu of DAP's.

The ACERP is a statement of a current or future need for ground CEM equipment or facilities that are available without further development or research. Approval of an ACERP by HQ USAF constitutes acknowledgement and recognition of the stated operational requirement (approval in principle) and authorizes preparing and processing a CEIP. In certain instances, the ACERP is accepted, CEIP requirements are waived, and AFLC is directed to implement the approved ACERP.

The CEIP is a detailed plan that provides information essential for final operational evaluation and programming actions.

E. AFR 80-2, Documents Used in the Management of Air Force Research and Development

AFR 300-7, Data Automation, R&D Support, specifically excludes ADP equipment developed for a particular use through expenditure of RDT&E funds. It is therefore possible for computing equipment to be acquired through submission of a development plan, as described in AFR 80-2, Attachment 2. Section 9c of these instructions requires only a minimum of data regarding EDP equipment.

APPENDIX C
SUMMARY OF CURRENT REPORTS
COVERING AIR FORCE ADP EXPERIENCE
AND ASSETS

<u>Number</u>	<u>Name</u>	<u>Preparing Agency</u>	<u>Frequency</u>	<u>Contents</u>
1 AF-E6	Data Systems Automation Program (Volume I)	HQ USAF (AFADAE)	Continually updated	Contains narrative description of all approved system design projects and active data systems. Includes a general description of files, records, input, output, and tie-in with other systems in addition to naming the organizations involved.
1 AF-E6	Data Systems Automation Program (Volume II)	HQ USAF (AFADAE)	Quarterly	Lists, by installation, all equipment systems installed or programmed for installation. Data include location, command, organization level, equipment type, procurement status, dates of installation, and planned phase-out, in addition to application title and implementation date.
4 AF-E6	Data Processing Equipment Inventory	Inventory is maintained by processing locations	Quarterly for leased, semi-annually for purchased; submitted to HQ USAF (AFADSCA)	Lists, by location, all data processing equipment used. Report includes location, machine or component serial number, acquisition code, and date of installation for each EDPE and PLAM component and piece of peripheral equipment.
6 AF-E6	ADPE Cost and Utilization	Installations assigned ADPE	Monthly to HQ USAF (AFADSCA)	Reports cost and utilization data for all data processing equipment assigned to the reporting installation. Data include location, command, machine type, number of like machines, acquisition code along with total hours of use, total hours of unscheduled maintenance, and actual maintenance costs.
8 AF-E6	EDPS by Application and Hours of Use	Installations having EDPS	Monthly to HQ USAF (AFADSCA)	Section I of this report lists application status code, primary and secondary program language code, master file size at close of reporting month, and the total number of actions which were direct input for this application during the reporting month. Section II is a utilization

<u>Number</u>	<u>Name</u>	<u>Preparing Agency</u>	<u>Frequency</u>	<u>Contents</u>
				summary listing, by application, production and preparation times, productive and operational use time, program development and maintenance time, chargeable loss time, set-up and idle times, and scheduled and unscheduled maintenance times, along with a projected average monthly use for the next 6 months.
None	Contract End Item Detail Specification (Computer Program)	Contractor	As required	Computer program contract end items (CPCEI) are required for each computer program. Data contain date of checkout, storage allocation map, and data base configuration, including a detailed description of each file and table as well as storage location of each computer program. Also included is the data organization and detailed definition of the computer program.
DD-I&L(SA) 678	DOD ADPE Program Reporting System	Installations assigned ADPE or major command headquarters	Annual to HQ USAF (AFADAEA)	Report consists of six formats: (1) For contractor operations only; inventory of ADPE giving command, ADPE make and model and installation/removal dates. (2) For contractor operations only; lists ADPE utilization and application including hours of scheduled and unscheduled maintenance, hours of production, program development, and maintenance and set-up; also gives application status codes and program language codes. (3) Gives ADP personnel costs, actual and projected man-years, operating costs, and capital investment. (4) Gives installation address. (5) Reports man-years utilized and salary costs by data systems within each command. (6) Presents analysis of costs of ADP contractual services.

APPENDIX D

DETAILED ITEMS IN DATA BASE OF
INFORMATION STORAGE AND RETRIEVAL SYSTEM

1. Experience
 - 1.1 System name
 - 1.2 Data system designator
 - 1.3 Location
 - 1.3.1 Location of contact for additional information
 - 1.3.2 Location of development
 - 1.3.3 Location of pilot installation
 - 1.3.4 Location of first operational installation
 - 1.3.5 Location of program maintenance
 - 1.3.6 Number of operational installations
 - 1.4 Function
 - 1.4.1 Functional area
 - 1.4.2 Description
 - 1.4.3 Comment
 - 1.5 Organization
 - 1.5.1 First organizational entity
 - 1.5.1.1 Name
 - 1.5.1.1.2 Comment (e.g., developer, user, etc.)
 - 1.5.1.1.3 Level in hierarchy

1.5.2 Second organizational entity

1.5.n nth organizational entity

1.5.n+1 Organizational line connectivity table

1.5.n+2 Technical communication line connectivity table

1.5.n+3 Comment

1.6 History

1.6.1 Description

1.6.2 Comment

1.7 Schedule

1.7.1 Planned

1.7.1.1 First task/event

1.7.1.1.1 Name

1.7.1.1.2 Start date

1.7.1.1.3 Completion date (tasks only)

1.7.1.2 Second task/event

- .
 - .
 - .
 - 1.7.1.1.n nth task/event
- 1.7.2 Actual
 - 1.7.2.1 First task/event
 - 1.7.2.1.1 Name
 - 1.7.2.1.2 Start date
 - 1.7.2.1.3 Completion date (tasks only)
 - 1.7.2.2 Second task/event
- .
 - .
 - .
 - 1.7.2.n nth task/event
- 1.7.3 Comment
- 1.8 System description
 - 1.8.1 Type of processing
 - 1.8.2 Description
 - 1.8.3 Comment

- 1.9 Workload
 - 1.9.1 Planned
 - 1.9.1.1 Input
 - 1.9.1.1.1 Batched
 - 1.9.1.1.1.1 Characters per month of volume
 - 1.9.1.1.1.2 Number of transaction types
 - 1.9.1.1.1.3 Number of data fields
 - 1.9.1.1.1.4 Percent of rejects
 - 1.9.1.1.2 Direct
 - 1.9.1.1.2.1 Characters per month of volume
 - 1.9.1.1.2.2 Number of transaction types
 - 1.9.1.1.2.3 Number of data fields
 - 1.9.1.1.2.4 Percent of rejects
 - 1.9.1.2 Output
 - 1.9.1.2.1 Batched
 - 1.9.1.2.1.1 Characters per month of volume
 - 1.9.1.2.1.2 Number of formats
 - 1.9.1.2.2 Direct
 - 1.9.1.2.2.1 Characters per month of volume

- 1.9.1.2.2.2 Number of formats
- 1.9.1.2.2.3 Seconds of response time
- 1.9.1.3 Data base
 - 1.9.1.3.1 Characters
 - 1.9.1.3.2 Percent of characters on direct access storage
 - 1.9.1.3.3 Milliseconds of average access time for direct access
 - 1.9.1.3.4 Number of logical record types
 - 1.9.1.3.5 Number of logical records
 - 1.9.1.3.6 Percent growth rate per month
 - 1.9.1.3.7 Characters per month of update input
 - 1.9.1.4 Processing functions
 - 1.9.1.4.1 Number of source instructions for base computer(s)
 - 1.9.1.4.1.1 Percent input edit
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 - 1.9.1.4.1.3 Percent query
 - 1.9.1.4.1.4 Percent sort
 - 1.9.1.4.1.5 Percent merge
 - 1.9.1.4.1.6 Percent compute

- 1.9.1.4.1.7 Percent report generation
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- 1.9.1.4.2 Number of source instructions for peripheral computer(s)
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 - 3.1.5.1.2.2.1.2 Source language
 - 3.1.5.1.2.2.1.3 Number of machine instructions
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 - 3.1.5.1.2.2.1.5 Documentation available

- 3.1.5.1.2.2.1.6 Date checked out
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- 3.1.5.1.2.2.1.9 Developer
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- 3.1.5.1.2.3.1.5 Documentation available

3.1.5.1.2.3.1.6	Date checked out
3.1.5.1.2.3.1.7	Frequency of use
3.1.5.1.2.3.1.8	User
3.1.5.1.2.3.1.9	Developer
3.1.5.1.2.3.1.10	Maintainer
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3.1.5.1.2.4.1.3	Number of machine instructions
3.1.5.1.2.4.1.4	Running time
3.1.5.1.2.4.1.5	Documentation available

3.1.5.1.2.4.1.6 Date checked out
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 3.1.5.1.3.1.5 Documentation available
 3.1.5.1.3.1.6 Date checked out

3.1.5.1.3.1.7 Frequency of use

3.1.5.1.3.1.8 User

3.1.5.1.3.1.9 Developer

3.1.5.1.3.1.10 Maintainer

3.1.5.1.3.2 Second program

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3.1.5.1.3.n nth program

3.1.5.1.3.n+1 Comment

3.1.5.1.4 Data files

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3.1.5.1.4.1.2 Storage medium

3.1.5.1.4.1.3 Data description

3.1.5.1.4.1.4 Sequence

3.1.5.1.4.1.5 Frequency of update

3.1.5.1.4.1.6 Updater

3.1.5.1.4.2 Second file

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3.1.5.1.4.n nth file

3.1.5.1.4.n+1 Comment

3.1.5.2 Second computer

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3.1.5.n nth computer

3.1.6 Personnel

3.1.6.1 First man

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- 3.1.6.1.3.1.6 Languages
- 3.1.6.1.3.1.7 Functional area
- 3.1.6.1.3.2 Second experience
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- 3.1.6.1.3.n nth experience
 - 3.1.6.2 Second man
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 - 3.1.6.n nth man
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 - 3.1.7.1 First type
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 - 3.1.7.1.2 Quantity

3.1.7.1.3 Unit of measure

3.1.7.1.4 Unit price

3.1.7.1.5 Description

3.1.7.2 Second type

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3.1.7.n nth type

3.2 Second data processing installation

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3.n nth data processing installation

APPENDIX E
GLOSSARY OF AIR FORCE TERMS

<u>Abbreviation</u>	<u>Meaning</u>	<u>Remarks</u>
ACERP	Advance Communications- Electronic Requirements Plan	Statement of need for Ground CEM Equipment without requirement for further R&D.
AF	Air Force, United States	
AFAAC	Comptroller	
AFAAF	Director of Accounting and Finance	
AFABF	Director of Budget	
AFADA	Director of Data Automation	
AFADO	Data Automation Design Office	
AFADS	Data Services Center	
AFAMA	Director of Management Analysis	
AFAUD	Auditor General	
AFBSA	Scientific Advisory Board	
AFCAV	Assistant Vice Chief of Staff	
AFCCS	Chief of Staff	
AFCVC	Vice Chief of Staff	
AFCVS	Director, Secretariat	
AFDAP	Director of Aerospace Programs	
AFDAS	Director of Administrative Services	
AFESS	Secretary of the Air Staff	
AFFRA	Assistant Chief of Staff Reserve Forces	
AFGOA	Chief, Operations Analysis	
AFHCH	Chief of Chaplains	

<u>Abbreviation</u>	<u>Meaning</u>	<u>Remarks</u>
AFIGA	Deputy, the Inspector General	
AFIGO	The Inspector General	
AFIIC	Assistant of Inquiries and Complaints	
AFIIS	Assistant for Inspection and Safety Services	
AFISI	Director of Special Investigations	
AFISL	Director of Security and Law Enforcement	
AFJAG	The Judge Advocate General	
AFJAL	Director of Civil Law	
AFJAM	Director of Military Justice	
AFLC	Air Force Logistics Command	
AFMSD	Assistant Surgeon General for Dental Services	
AFMSG	The Surgeon General	
AFMSH	Director of Plans and Hospitalization	
AFMSM	Director of Medical Staffing and Education	
AFMSP	Director of Professional Services	
AFMSV	Assistant Surgeon General for Veterinary Services	
AFNIC	Director of Collections	
AFNIE	Director of Estimates	
AFNIN	Assistant Chief of Staff, Intelligence	
AFOCC	Director of Command Control and Communications	

<u>Abbreviation</u>	<u>Meaning</u>	<u>Remarks</u>
AFOCE	Director of Civil Engineering	
AFODC	Deputy Chief of Staff, Programs and Resources	
AFOMO	Director of Manpower and Organization	
AFOWX	Assistant for Weather	
AFPCP	Director of Civilian Personnel	
AFPDC	Deputy Chief of Staff Personnel	
AFPDG	Assistant for General Officer Matters	
AFDPD	Director of Personnel Planning	
AFPDS	Assistant for Personnel Systems	
AFPDW	Director of Women in the Air Force	
AFPDX	Assistant for Colonels Assignment	
AFPTR	Director of Personnel Training and Education	
AFRDC	Deputy Chief of Staff, Research and Development	
AFRDD	Director of Development	
AFRDQ	Director of Operational Requirements and Development Plans	
AFRDR	Assistant for Reconnaissance	
AFRFD	Assistant for Foreign Development	
AFRNE	Assistant for Nuclear Energy	
AFRRP	Assistant for R&D Programming	
AFRST	Director of Science and Technology	

<u>Abbreviation</u>	<u>Meaning</u>	<u>Remarks</u>
AFSC	Air Force Systems Command	
AFSDC	Deputy Chief of Staff, Systems and Logistics	
AFSLP	Assistant for Logistic Planning	
AFSME	Director of Maintenance Engineering	
AFSMP	Assistant for Materiel Programming	
AFSMS	Assistant for Mutual Security	
AFSPD	Director of Production	
AFSPP	Director of Procurement Policy	
AFSSS	Director of Supply and Services	
AFSTP	Director of Transportation	
AFTAC	Technical Applications Center	
AFXDC	Deputy Chief of Staff, Plans and Operations	
AFXJM	Assistant for Joint and NSC Matters	
AFXOP	Director of Operations	
AFXPD	Director of Plans	
AFXSA	Director of Studies and Analysis	
CEIP	Communications-Electronics Implementation Plan	Detailed plan for implementing a quantitative Ground CEM requirement.
DAP	Data Automation Proposal	Proposal for new automation submitted to HQ USAF (AFADA) for approval per AFR 300-3.

<u>Abbreviation</u>	<u>Meaning</u>	<u>Remarks</u>
D&F	Secretarial Determinations and Findings	Document establishing fund availability for a system program.
DPD	Data Project Directive	Issued by HQ USAF (AFADA) to provide charter for command or agency initiation of a System Development Project (AFR 300-3).
DSAP	Data System Automation Program	Periodically issued HQ USAF schedule of all installed and pending data systems --identifies all ADP equipment used in support of these systems.
DSP	Data System Specifications	Detailed specifications prepared by System Development Project to guide development of a data automation system.
F&FP	Force and Financial Plan	List of approved AF programs
FTA	Final Technical Approval	Secretarial statement of final technical approval of a system program. Permits RDT&E funds to be committed.
HOI	Headquarters Operating Instructions	
MAJCOM	Major Air Command	
OPR	Office of Primary Responsibility	
OSD	Office, Secretary of Defense	

<u>Abbreviation</u>	<u>Meaning</u>	<u>Remarks</u>
PA	Program Authorization, Procurement Authorization	Permit procurements to be made in conjunction with system program.
PCP	Program Change Proposal	Submits new programs or changes to programs to the F&FP (AFR 375-1).
PSPP	Proposed System Package Plan	Document submitted as a product of the Definition Phase of a system program (AFR 375-1).
PTDP	Preliminary Technical Development Plan	Submitted by AFSC as initial response to an approved LOC.
RAD	Requirements Action Directive	Prepared by HQ USAF. Directs AF actions necessary to implement a required operational capability.
RDT&E	Research, Development, Test and Evaluation	
ROC	Required Operational Capability	A command's request to HQ USAF for a new or improved operational capability.
SDD	System Definition Directive	Issued by HQ USAF approving the PTDP.
SMD	System Management Directive	Provides HQ USAF guidance to initiate, change, or terminate a system program (AF 375-1).
SP Directive	System Program Directive	Document issued by HQ USAF which approves a system program defined by a PSPP. Authorizes publication of SPP.

<u>Abbreviation</u>	<u>Meaning</u>	<u>Remarks</u>
SPD	System Program Director	Head of the SPO and manager of the approved system program during Definition and Acquisition phases.
SPP	System Package Program	Issued by SPD; includes tasks, resources, and schedules for system program.
SPO	System Program Office	Field organization established to assist the SPD in managing a system project.
SSM	System Support Manager	Appointed by AFLC to assure logistic participation in a system project.
System Development Project		Established by HQ USAF (AFADA) to identify the most appropriate method of satisfying a data automation requirement (AFR300-3).

Unclassified

Security Classification

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13. ABSTRACT This is Volume III of a three-volume final report that covers Phase II of a three-phase project on the Use of Air Force ADP Experience to Assist Air Force ADP Management. In Phase I, a feasible concept and preliminary approach to using experience was synthesized; in Phase II, the approach was refined, the concept was validated, and the potential use of experience was broadened; and in Phase III, the improved and expanded approach will be implemented Air Force-wide. Volume I of the final report covers the following: the history of the project; conclusions of Phase II and recommendations for Phase III, and summaries of Phase II activities, Phase III concept and plan, and the pilot version of the ADP Experience Handbook and Primer. Volume II reviews the four major activities of Phase II: data collection, data analysis, ADP Experience Handbook development, and Phase III planning. Volume III presents the detailed Phase III operational concept and development plan followed by a summary of costs and benefits. This volume presents the concept and plan for Phase III. The operational concept for Phase III includes revised procedures for ADPS proposal submission, experience reporting, and asset reporting to an information storage and retrieval system. This system is the nucleus of a management information system that could be operational by June 1968. The major benefits will accrue from improved cost effectiveness and quality of ADP development and operations in the Air Force, from cost and time savings in large system programs that involve ADP.		

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
1. Data Processing Systems 2. Classification 3. Abstracts 4. Measurement 5. Analysis 6. Effectiveness 7. Mathematical Models 8. Information Retrieval 9. Indexes						

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