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REPORT BY THE
Comptroller General
OF THE UNITED STATES

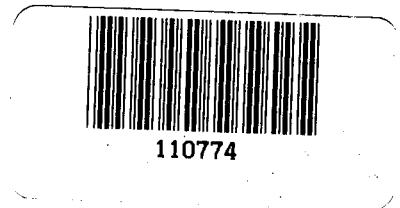
RELEASED

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The Air Force Should Cancel Plans To Acquire Two Computer Systems At Most Bases

The Air Force plans to install two computer systems at about 105 air bases to perform administrative and operating functions, such as accounting, finance, personnel, and supply. GAO estimates that this computer acquisition program will cost about \$600 million to \$1 billion more than a one-system approach over its expected life of 20 years. GAO believes that the Air Force's approach is unnecessarily expensive and restricts competition on the largest computer acquisition ever attempted by the Government.

GAO believes that the Air Force should cancel its current request for proposals for this program. The Air Force should develop a simpler, more flexible request for proposals with functional performance requirements representing actual base-level operations and needs.



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COMPTROLLER GENERAL OF THE UNITED STATES

WASHINGTON, D.C. 20548

B-163074

The Honorable Jack Brooks
Chairman, Committee on
Government Operations *H5601500*
House of Representatives

Dear Mr. Chairman:

This report describes how the Government could save hundreds of millions of dollars if the Air Force redirects its Phase IV computer system acquisition program. As you requested on March 20, 1979, we specifically reviewed Air Force requirements, vendor competition, and the handling of unsolicited proposals. As requested, we did not discuss our findings, conclusions, and recommendations with the Air Force.

Phase IV is a computer system replacement program with estimated 20-year life cycle costs of about \$4 billion. It is intended to provide a safe transition from current computer systems to responsive and reliable computer systems that can grow as needed for up to 20 years.

We have found the Air Force's stated requirement for a minimum of two new computer systems, that can run the same computer programs, at about 105 bases:

- has never been justified as mission essential or operationally required,
- was established without developed or defined base-level user requirements, and
- would probably result in \$600 million to \$1 billion of additional cost over the 20-year expected life of the program.

The Air Force Audit Agency has also questioned the lack of justification and need for two computer systems at most air bases. They noted this requirement might cost at least \$250 million more than a single computer system alternative and had not been determined to be mission essential.

Our review of current base-level data processing operations and currently validated or projected requirements indicates:

- A single computer system can be acquired "off the shelf" that would provide effective support for all base-level data processing requirements.
- Current base-level computer systems have been quite reliable and generally available when needed.
- No base-level computer system hardware problem, to our knowledge, has been so severe as to require extensive back-up capability at each base.
- The risks associated with software conversion are being minimized by the current Phase IV acquisition approach and any further risk reduction possible by installing two computer systems at most bases is too small to justify the added costs.

The Air Force intends to initially lease and then purchase the computer systems. We estimate that over 20 years, the two separate computer systems at about 105 bases would incur about \$663 million more costs than a one-system approach. The savings of a one-system approach result from lower costs of equipment acquisition and maintenance (about \$240 million), site construction (about \$40 million), and personnel required to manage and operate the computer systems (about \$383 million). If the Air Force leases these computer systems, and augments as planned over the 20 years, which is a distinct possibility based on current practice, the added costs of the two-system approach could exceed \$1 billion.

We believe that the present Air Force Phase IV program is not the most economical and effective approach to acquiring replacement computer systems for the air bases. We think the program's primary problems stem from:

- Top management's premature commitment to a two-system approach without proper definition and validation of base-level requirements.
- Top management's acceptance of this \$4 billion program plan, which promises only minimal savings, over other alternatives that had much greater indicated potential for savings.
- Lack of a detailed analysis of base-level operations and user requirements and of alternative ways of providing effective computer support in the future.

--Not following established regulations and procedures in developing the specifications of features and the quantities of computer equipment and software. The resulting requirements and specifications are neither "functional" nor "performance" in nature. The lack of a sound survey of the market to establish the availability of equipment compounded the problem of restrictive specifications developed by the ad hoc process.

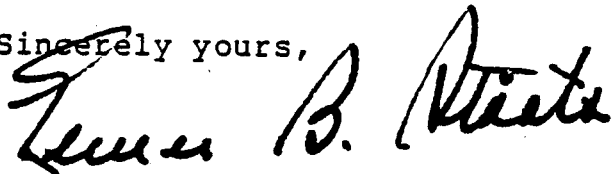
We believe it would be in the best interest of both the Government and the Air Force to cancel the current request for proposals because:

- the minimum requirement for two computer systems at most bases will cost much more than necessary,
- the Air Force has not provided convincing evidence that two computer systems are needed at most bases, and
- competition is restricted by the terms, conditions, and specifications in the current request for proposals.

We believe that a simpler, more flexible request for proposals, is needed. It should be developed around a more functional and performance oriented set of requirements representing actual base-level operations and needs.

This report includes our statement delivered in testimony on October 10, 1979, and supplemental information to support our findings. As you requested, we will not make distribution of this report until 30 days from this date. At that time we will send it to interested parties and make copies available to others upon request.

Sincerely yours,



Comptroller General
of the United States

Enclosure

C o n t e n t s

	<u>Page</u>
STATEMENT OF OCTOBER 10, 1979, ON AIR FORCE PHASE IV COMPUTER SYSTEM ACQUISITION PROGRAM	1
Conclusions	9
Recommended course of action	10
SUPPLEMENT TO THE STATEMENT OF OCTOBER 10, 1979, ON AIR FORCE "PHASE IV" COMPUTER SYSTEM ACQUISITION PROGRAM	11
 CHAPTER	
1 INTRODUCTION	12
Background	12
Scope of review	16
2 THE NEED FOR TWO SYSTEMS AT MOST BASES	18
On-line processing capabilities	20
System availability	20
Classified and priority processing	24
Program risks	27
3 ADDED COST OF THE AIR FORCE APPROACH	29
Savings in the cost of equipment acquisition and maintenance	30
Savings in facility construction costs	31
Savings in personnel required to manage and operate the new equipment	33
4 WHY ARE SUCH A SMALL NUMBER OF VENDORS PURSUING THE COMPETITION?	38
Old technology is required	38
Mandatory specifications reduce competition	41
Phase IV procurement approach reduces competition	43
Need for more complete use of functional specifications	46
5 HOW SHOULD INTERIM SUPPORT NEEDS BE MET?	49
 APPENDIX	
I March 20, 1979, letter from the Chairman, House Government Operations Committee	51

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

Dated
October 10, 1979

STATEMENT OF
Donald L. Scantlebury
Director
Financial and General Management Studies Division
Prepared for the
Subcommittee on Legislation and National Security
Committee on Government Operations
House of Representatives
on
Air Force "Phase IV" Computer system Acquisition Program

Mr. Chairman and Members of the Subcommittee:

We appreciate your invitation to be here today to discuss the results of our review of the Air Force "Phase IV" program. With me today are Walter Anderson, Senior Associate Director, and Carl Palmer, Group Director, in our Financial and General Management Studies Division.

INTRODUCTION

The Air Force's overall objective in the Phase IV program is to provide cost-effective, responsive and reliable computer support for a variety of its base-level administrative and operating functions. The Phase IV acquisition is intended to provide a safe transition of current applications software and responsive computer support, growing as needed for up to twenty years (1983 up to 2002). This is to be done by acquiring about 229 fixed-site computer systems to replace the existing base-level Phase I (Univac) and Phase II (Burroughs) computer systems located at about 118 air bases and stations around the world. The specific objectives of the program are:

- (1) replacement of current computer systems with new software compatible computer systems from a single manufacturer's product line;
- (2) consolidation of the replacement computer systems within a single data processing facility under a single manager, where feasible; and

- (3) provision of modular, add-on growth to the replacement computer systems to support future workload growth.

In simple terms, they plan to put in two new computer systems that can run the same computer programs, at most major air bases. It should be noted that potential personnel reductions were not a stated objective of the program.

Background

The Air Force has been pursuing a program of standardizing its base-level data processing support for almost two decades. Phase I of this program began in 1962 with standardizing the base-level supply function. In the late 1960's, the Phase II program began standardizing the non-supply functions, such as accounting, finance, personnel, and maintenance. Phase III was the Air Force effort to standardize its major command management programs.

In 1969, the Air Force began studying how future base-level computer systems processing needs should be met. This effort also began with an approach of supply/logistics versus other applications. However, in December of 1973, and again in 1975, the Secretary of Defense restricted future ADP resource funding and twice directed the Air Force to submit one plan to satisfy all base operating needs. In April 1976, after cancellation of its two prior efforts, the Air Force initiated the Phase IV program to meet the Secretary's directive.

The Phase IV life cycle costs, according to the official Air Force budget estimates, will be about \$4 billion for the period of fiscal year 1976 through 1995. This amount includes approximately \$600 million for ADP equipment and maintenance and over \$50 million for site construction to house the systems in a single facility at most bases. Continued operation of the existing computer systems until their replacement, by about 1985, is estimated to cost about \$1.5 billion. The remainder, approximately \$1.8 billion, is the estimated operating cost for the new computer systems which is predominantly the cost of the personnel to manage and operate the computer systems.

These cost estimates are stated in constant, fiscal year 1977 dollars. They do not include any provision for cost growth or inflation. In addition, the official program cost estimates do not include costs for the years from 1996 through the year 2002 even though this period is part of the Air Force's stated program life. The estimates also do not include the costs of any replacement or augmentation acquisitions over the

life of the program, or the cost of utilities and facilities maintenance. These cost elements should normally be included in a total life cycle cost estimate. If these cost elements were included in the total estimate it would exceed \$5 billion, based on a projection of the Air Force budget estimates in constant dollars.

As of February 1979, the Air Force estimate shows a minimal savings of only \$10 million over the baseline estimate for continuing to operate the existing computer systems. This low amount of savings is due principally to the acquisition approach and the official position of minimal personnel reductions even with the collocation of the two new computer systems in one facility at nearly all bases.

Scope of Review

As requested by your letter of March 20, 1979, we reviewed the following aspects of the Phase IV program:

- (1) the Air Force requirements for two computer systems at most bases to replace the existing computers;
- (2) the small number of vendors reputed to be actively pursuing the Phase IV competition; and
- (3) the Air Force's handling of unsolicited proposals from the Burroughs Corporation (an incumbent vendor);

and other matters.

We made our review at the Headquarters of the Air Force and five of the major commands, the project manager's office, the Air Force computer acquisition center, and at 14 air bases.

We reported our preliminary findings to your office in briefings on June 12th, July 9th, and August 27th, as well as, discussions at other times. As you know, we were inhibited in completing our review at several points by Air Force delay in turning over key documentation which they termed "source selection sensitive" and by the difficulties in obtaining summaries of key base-level operating statistics on the current Phase I and Phase II programs. We thank you, Mr. Chairman, for your help in obtaining this documentation.

At this time, I would like to discuss briefly the three primary points we investigated. We will subsequently submit for the record a more detailed summary of the results of our review.

Our review was fast-paced, and we directed it to the specific questions stated in your request. Thus we did not address the broader management oversight issues at the Department of Defense and the General Services Administration which we understand are also a subject of these hearings.

As requested, we have not reviewed our findings, conclusions, and recommendations with the Air Force.

ARE TWO COMPUTER SYSTEMS NEEDED?

The Need for Two Systems at Most Bases

The Air Force's stated requirement for two complete computer systems at most major air bases (about 105 locations requiring 210 systems):

- has never been justified as mission essential or an operational necessity;
- was established without an adequate study of user requirements; and
- would probably result in \$600 million to \$1 billion in additional cost over the 20 year expected life of the program.

The Air Force Audit Agency questioned the lack of justification and need for two computer systems at most air bases in an interim report on the Phase IV program in February 1979. The auditors noted that this requirement might cost \$250 million more than a single computer system alternative for the 12 year operational period covered by the Air Force economic analysis and had not been determined to be mission essential or really needed. In its response to the report, the program management stated that "two processors" were needed at most major bases in order to:

- (1) improve responsiveness to on-line users and allow flexibility for greatly expanded on-line processing,
- (2) enhance computer system availability,
- (3) alleviate disruptions caused by processing of classified information, and
- (4) reduce overall program risk by an incremental installation and conversion at each base.

While this explanation provides some rationale for two processors (that is two central processing units), it does not respond to the question of why two separate computer systems are needed. Further, this explanation is not based on approved base-level requirements or any detailed study of these requirements. A staff paper has been recently prepared to buttress these arguments, yet no detailed study of base-level requirements has been made to determine the actual needs and the expected courses of future growth and development. Both the prior studies of base-level computer system support and the Phase IV program planning studies were not supported by a detailed analysis of the functional needs at the bases.

To put our work in perspective, I would like to explain that the Phase IV request for proposals calls for two separate computer systems to be located in most cases in two different facilities. Yet, the stated objective and the current plans call for collocation of nearly all computers. One computer system, termed the "X1 system," is to support the standard base supply system, and the other, termed the "X2 system," is to support almost all other functional applications, such as personnel, payroll, accounting and finance, engineering, and maintenance. The Air Force estimates that 116 "X1 systems" and 113 "X2 systems" will be required at initial installation starting in 1983. These applications, supply and all others, are presently supported by the incompatible Univac and Burroughs computer systems, with back-up Univac and Burroughs computer systems at only a small number of the 118 installations. For the past two decades, back-up support has been provided by required agreements or ad hoc arrangements with other bases.

Our review of current ADP operations at the bases and currently validated or projected requirements indicates:

- A single computer system can be acquired "off the shelf" that would effectively handle all of the on-line and other processing requirements of the Air Force.
- Current base-level computer systems have been quite reliable, considering their age, and generally have been available for use when needed. We found adequate data processing support had been provided even though the Burroughs and Univac machines are incompatible and applications cannot be switched from one to the other. While some hardware problems have occurred, none that we know of has been so severe as to warrant extensive back-up capabilities at each base.
- The small amount of classified data processing, averaging less than 1 percent of the workload, is now being performed with minimal impact on users, and

base officials stated that it would not change much during surge or crisis conditions.

--The risks associated with software conversion are being minimized by the dual vendor acquisition approach and extensive testing of converted software in the transition phase. Any further risk reduction possible by installing two computer systems is, in our view, too small to justify the added costs.

The Air Force has stated that it needs two computer systems at each location to get a very high degree of assurance that it will have continuous computer support. They apparently desire near 100 percent assurance that they will have an operating computer system at all times. One stated objective is to collocate the two or more computer systems in the same facility in nearly all cases so the question is not one of redundancy to protect against attack, destruction, or site environment failure. The question is one of computer system reliability and availability.

Ninety-five percent reliability is a stated requirement in the Phase IV request for proposals; there is no corresponding requirement stated for availability. We believe that manufacturers could provide this--or an even higher level of reliability with current technology--without the expense of two separate computer systems. We also believe that manufacturers can provide a high level of computer system availability, but it is not a stated requirement in the request for proposals.

Added cost of the Air Force approach

The Air Force currently intends to initially lease and then purchase the computer systems at the most economical point in time. We estimate that the Air Force approach of replacing the existing computer systems with two separate computer systems at about 105 bases and single computer systems at other locations would incur about \$663 million in additional cost over a twenty year span as compared to a one-system approach.

The primary savings of a one computer system approach over the Air Force budget estimates for a two-system approach are in the cost of equipment acquisition and maintenance (about \$240 million), site construction (about \$40 million), and personnel required to manage and operate the computer systems (about \$383 million). We estimate the cost of a one computer system approach for 12 years would be about \$420

million less than the current Air Force life cycle cost estimate which is based on two computer systems.

We made these estimates of savings for a one computer system approach by comparing the cost of the required number of computer systems to the Air Force's official life cycle cost estimate for 12 operational years. Our estimate is based on current technology medium-sized computer systems, using the same assumptions as the Air Force's official life cycle cost estimate.

The assumptions in the Air Force cost estimate are, in our view, somewhat optimistic. If the Phase IV competition were to result in purchase-to-lease cost relationships similar to the current Phase II contract, it is distinctly possible that the Air Force might lease the new computer systems for twenty years, that is, the initial eight-year contract and two six-year optional extensions. If so, we estimate the additional cost of having two computer systems instead of one for each major base would exceed \$1 billion (in constant FY 77 dollars) for the 20 years of the program.

WHY ARE A SMALL NUMBER OF VENDORS PURSUING THE COMPETITION?

The Air Force management has described Phase IV as a model competitive acquisition. It is the largest computer system acquisition program ever attempted by the Government. It is a major system acquisition by any definition. However, the acquisition strategy and approach, while funding a "fly-off" or a "compute-off" between two vendors, does not incorporate the mission needs definition or competitive exploration of alternative system designs judged essential by the Commission on Government Procurement and incorporated into OMB Circular A-109 guidance on major system acquisitions. In our opinion it suffers from the lack of these key elements and from the extensive set of very detailed specifications, mandatory for a "responsive" proposal. We also believe two key sets of these specifications--for the two systems per base and for remote computer terminals--are restrictive to competition above and beyond any valid Air Force requirement.

We surveyed most of the major equipment and software vendors before the proposal due date, in order to determine how many vendors were seriously pursuing the procurement. We also inquired as to whether there were any problems with the procurement as stated in the request for proposals. In addition, we analyzed the vendor and other expert comments on the draft request for proposals and Air Force communications with the vendors.

In coming to our conclusions, we gave more weight to the comments made in writing to the Air Force on the draft request for proposals, circulated in the Summer of 1978, than the weight given to oral comments in our survey. We have also reviewed the Air Force's evaluation and responses to the comments on the draft request for proposals and the reasons stated in writing to Air Force by vendors who stated they were withdrawing from the competition.

Some of the problems cited by a majority of the vendors who received the request for proposals are:

- the requirement for a long-term fixed price contract;
- the requirement for software conversion to be managed or accomplished by the hardware vendor;
- the short period provided for proposal preparation (4 months later extended to 6 months);
- the use of very detailed specifications for hardware and software rather than more functionally-oriented requirements;
- unclear and inadequate or insufficient data in the request for proposals; and
- a belief that incumbent vendors had a significant, and probably unfair, advantage.

Some of these comments are perhaps "sour grapes" or common gripes concerning many Government competitive procurements. However, the lack of Air Force responsiveness to serious criticisms, made in writing before the release of the request for proposals, by two or more of the largest computer manufacturers, causes us to believe that the competition obtained will be far less than could be obtained.

HOW SHOULD INTERIM SUPPORT NEEDS BE MET?

Computer support is needed until Phase IV implementation is completed. The Burroughs computer systems are mostly lease while the Univac computer systems are owned. The Burroughs contract will expire in June 1982 and the Univac contract for maintenance will expire in January 1984. The Air Force believes that negotiating to change the existing Burroughs contract is more practical than writing a new contract, since the three years until their planned replacement is relatively short. Burroughs Corporation has made two unsolicited offers for the lease of substitute equipment with increased capabilities. The Air Force has evaluated this equipment and found

it to be a technically viable substitute and its lease would be more economical than continuing to lease the existing equipment.

However, the Air Force has not firmly defined any near term need for increased computer system capability. Further, it has not fully costed out and evaluated the two alternatives to substitute this new equipment or to continue leasing the present systems -- and has not evaluated other available alternatives, such as purchasing the existing equipment or acquiring other potential substitute equipment. Therefore, to assure that the Government's best interests are served, we believe a more complete evaluation and negotiation of all practical alternatives, including the potential purchase of existing equipment where it is adequate, should be undertaken before selecting an interim support approach. We think the selection should be governed by economic and governmentwide policy considerations and not dominated by the prospect of increased computer capabilities at the same or lower lease costs.

CONCLUSIONS

We believe the Air Force Phase IV program does not meet the goals of an economical and effective acquisition of computer systems. It also would most likely commit the Air Force to a more expensive solution than necessary to fully satisfy its base-level needs. We think the primary problems are caused by:

- (1) Early agreement and commitment of top management to a two system approach without prior definition and validation of requirements.
- (2) Acceptance of a \$4 billion program plan that produced minimal estimated savings over other alternatives that indicated greater potential savings.
- (3) Lack of a detailed study and analysis of base-level operations and alternative ways of providing effective computer support for these operations in the future. The Air Force did not choose to use the methods of OMB Circular A-109 to develop mission needs and to explore alternative solutions developed by private industry.
- (4) Not following established regulations and procedures in developing the specifications for qualities and the quantity of computer equipment and software.

- (5) Requirements and specifications contained in the request for proposals were not "functional" or "performance" in nature. In several key instances they were restrictive to competition. The use of various managers and specialists from the major commands, the design center, and the computer acquisition center in an advisory role in an extensive series of reviews failed to offset the lack of proper needs determination and a bias in the development of the specifications toward incumbent and outdated technology. The lack of a sound survey of the market to establish the availability of equipment compounded this problem.

RECOMMENDED COURSE OF ACTION

Because of the much higher cost of the two-computer system minimum requirement, as well as the restrictive effect on competition of this and other terms, conditions and specifications of the request for proposals and the lack of convincing evidence supplied to us by the Air Force supporting a need for two computer systems at most bases, we believe it would be in the best interests of both the Government and the Air Force to cancel the current request for proposals for replacement computer systems. We believe that a simpler, more flexible request for proposals should be developed around a more functional and performance-oriented set of requirements. We think a modest study of the actual base operations and a new procurement action can be completed in about two or three years, if prompt action is taken.

We recognize that several questions remain unsolved as to interim period computer support, and the negative effect this cancellation will have on the morale of many fine professionals who have worked on this program. Nevertheless, we believe it is the only course of action that would prove to be a viable solution to the defects of the planning and management of the program and the current request for proposals.

I thank you, Mr. Chairman, for the opportunity to testify on this matter, and will be glad to answer any questions you or the other members of the Subcommittee may have.

SUPPLEMENT TO THE STATEMENT OF OCTOBER 10, 1979,
ON AIR FORCE PHASE IV COMPUTER SYSTEM ACQUISITION PROGRAM

Donald L. Scantlebury, Director
Financial and General Management Studies Division
U. S. General Accounting Office

Before the

Subcommittee on Legislation and National Security
Committee on Government Operations
House of Representatives

CHAPTER 1

INTRODUCTION

The overall objective of the the Air Force Phase IV program is to provide cost-effective, responsive, and reliable computer support for a variety of its base-level administrative and operating functions. Phase IV is intended to provide a safe transition of current applications software as well as responsive computer support for up to 20 years (1983-2002). About 229 fixed-site computer systems will replace the existing base-level Phase I (Univac) and Phase II (Burroughs) computer systems located at about 118 air bases and stations around the world. The specific objectives of the program are to:

- Replace current computer systems with new software compatible computer systems from a single manufacturer's product line.
- Consolidate the replacement computer systems within a single data processing facility, where feasible, and under a single manager.
- Provide for modular, add-on growth to the replacement computer systems to support future workload growth.

In simple terms, they plan, at most major air bases, to put in two new computer systems that can run the same computer programs. It should be noted that potential personnel reductions were not a stated objective of the program.

BACKGROUND

The Air Force has been pursuing a program of standardizing its base-level data processing support for almost two decades. Phase I of this program began in 1962 with standardizing the base-level supply function. In the late 1960s, the Phase II program began standardizing the nonsupply functions, such as accounting, finance, personnel, and maintenance. Phase III was the Air Force's effort to standardize its command management programs.

In 1969, the Air Force began studying how future base-level computer processing needs should be met. The most significant studies were of (1) the best way to satisfy the data processing needs of base-level logistics activities (STALOG) and (2) future base-level ADP support for all functions (SADPR-85). These two studies provided the

foundation for a later effort to provide a framework for preparing a plan to satisfy all base-level ADP needs and for managing such a program (BASE-TOP).

The initial study (STALOG) analyzed five basic computer support alternatives:

- (1) Continuing the Phase I and II computer systems.
- (2) Modifying the Phase I and II computer system.
- (3) Acquiring a new computer system for logistics and keeping the Phase II computer systems.
- (4) Acquiring regional computer systems to replace both the Phase I and II computer systems.
- (5) Replacing both the Phase I and II computer systems with a single computer system at the base level.

The last alternative was recommended by the study group because it provided an opportunity to upgrade the Air Force's aging computer systems while realizing certain economies of scale by consolidating operating facilities.

The SADPR-85 study also considered a number of alternatives similar to those considered by the STALOG study. Its two major alternatives were a single base-level computer system and regionalization (large-scale consolidation). The study group recommended regionalization but the steering committee considered that too risky even though it was by far the most economical. Therefore, the single base-level computer system alternative was recommended.

The BASE-TOP program was to implement the recommendations of these prior studies and respond to the Secretary of Defense's December 1973 directions that ADP resources be restricted until a plan to satisfy total base-level ADP needs could be developed. Two years later, in 1975, the Secretary indicated that his earlier direction had not been fully complied with and he again restricted future ADP resource funding. Further, he again directed the Air Force to submit one plan to satisfy all base-level ADP needs through competitive selection of a single manufacturer's family of computers with modular, add-on capability to support differing workloads.

The reassessment of ADP user needs confirmed that the Air Force base-level ADP user requirements had been significantly overstated. Air Force general officers met

in March 1976 to consider discontinuing the BASE-TOP program and starting a base-level program to just replace the existing computers.

The replacement program was proposed because:

- The BASE-TOP approach computer solution was based upon undefined or undeveloped user needs.
- The Phase I and II computer systems were deteriorating because of age.
- Modification potential of the Phase I and II computer systems was considered limited.
- Cost estimates for replacing the Phase I and II computer systems showed that approximately \$60 million could be saved over 17 years (fiscal 1976-1992).

Therefore, the BASE-TOP program was terminated and on April 5, 1976, the Phase IV replacement program was begun with a directive to employ a minimum of "two processors" at each base. The initiating memorandum did not state the need or provide supporting economic analysis for this two-processor approach.

The Phase IV acquisition consists of a 2-year software transition and demonstration period and a 20-year systems life made up of an initial 8-year system implementation period and two 6-year optional extension periods. The acquisition strategy calls for two contractors to assure transition of current software and to compete for a production contract. According to the agency procurement request, this approach greatly reduces risks.

The proposed methods and capabilities for the transition of the software from the current computer systems to the proposed equipment will be technically evaluated for each contractor. Two vendors will be awarded contracts to make the software transition, and only those two contractors will be allowed to compete for the production contract. At the end of 20 months, the systems of each contractor will be tested and evaluated, and one of the contractors will be selected to furnish the necessary computer equipment during the 8-year system implementation period.

Each of the two optional periods is 6 years, and according to the agency procurement request, the prices of each of the optional extension contracts would be obtained

early enough to allow the Air Force to reopen its requirements to competition if the contracts are unreasonable.

The Air Force will analyze each functional area to determine its long-range requirements. This functional analysis would be completed after the award of the initial 8-year contract, but before the first 6-year followon contract is begun.

For cost evaluation purposes, the Air Force assumes a 12-year system life. For the software transition period contract, all the costs included in the offerors' proposals for the transition period and the system implementation period will be evaluated. The evaluation will also include Government-assessed, in-house costs (facilities, operations, etc.). During this evaluation, a cost ceiling for the system implementation period will be calculated by extending the 8-year proposed prices out to 12 years. This total cost figure would then be used when new price proposals for the implementation period are evaluated (2 years after the transition period contract is awarded). If one of the contractors proposes a new price for the system implementation period that exceeds the previously established ceiling, that contractor would be declared ineligible for the award of the system implementation period contract.

According to the official Air Force budget estimates, the Phase IV program life cycle costs will be about \$4 billion for the period fiscal 1976 through 1995. This amount includes approximately \$600 million for new ADP equipment and maintenance and over \$50 million to construct a single facility at most bases to house the computer systems. Continued operation of the existing systems until their replacement by about 1985 is estimated to cost about \$1.5 billion and the estimated operating cost for the new computer systems is \$1.8 billion, which will be used largely to pay personnel to manage and operate the computer systems.

These cost estimates are stated in constant, fiscal 1977 dollars. They do not include any provision for increased cost or inflation. In addition, the official program estimates do not include costs for 1996 through 2002 even though this period is part of the Air Force's stated program life. The estimates also do not include the cost of planned replacement or augmentation acquisitions over the life of the program or the cost of utilities and facilities maintenance. These cost elements should normally be included in a total life cycle cost estimate. If these costs were included, the total life cycle costs

would exceed \$5 billion, based on a projection of the Air Force budget estimates in constant dollars.

As of February 1979, the Air Force estimated that only about \$10 million will be saved by Phase IV over the baseline estimate for continuing to operate the existing computer systems. This small amount of savings is due principally to the approach of acquiring two computer systems at most bases and the official position of minimal personnel reductions even though the two new systems will be located in one facility at nearly all bases.

SCOPE OF REVIEW

We examined applicable documents and records, Department of Defense and Air Force directives, instructions, and regulations. We also interviewed the Air Force officials responsible for managing the Phase IV program. We performed our review at Air Force headquarters, Washington, D.C.; the Data Systems Design Center and Phase IV Program Management Office, Gunter Air Force Station, Alabama; the Computer Acquisition Center, Hanscom Air Force Base, Massachusetts; and the headquarters of the major commands and the air bases listed below:

Major commands

Air Training Command, Randolph Air Force Base, Texas.
Alaskan Air Command, Elmendorf Air Force Base, Alaska.
Military Airlift Command, Scott Air Force Base,
Illinois.
Strategic Air Command, Offutt Air Force Base, Nebraska.
Tactical Air Command, Langley Air Force Base, Virginia.

Air bases

Carswell Air Force Base, Texas.
Eglin Air Force Base, Florida.
Eielson Air Force Base, Alaska.
Elmendorf Air Force Base, Alaska.
England Air Force Base, Louisiana.
Hurlburt Air Force Base, Florida.
Kelly Air Force Base, Texas.
Langley Air Force Base, Virginia.
McChord Air Force Base, Washington.
McConnell Air Force Base, Kansas
Offutt Air Force Base, Nebraska
Randolph Air Force Base, Texas
Scott Air Force Base, Illinois
Tinker Air Force Base, Oklahoma

We reported our preliminary findings to your office in oral briefings on June 12, July 9, and August 27, as well as during other discussions. At several points we were inhibited in completing our review by the Air Force's delay in turning over key documents which it termed "source selection sensitive" and by difficulties encountered in obtaining summaries of key base-level operating statistics on the current Phase I and II programs.

On July 11, 1979, the Chairman of the House Government Operations Committee wrote the Secretary of the Air Force concerning these delays, and the Air Force supplied the requested information to the extent it existed or could be obtained. The initial data was supplied on July 26th and the remainder by the end of August. In a July 25 meeting with the Committee staff, the Assistant Secretary of the Air Force for Financial Management, Phase IV program officials, and GAO, it was established that certain key items of documentation did not exist. This point was confirmed by the Assistant Secretary in his July 26 letter to the Committee Chairman.

Our review was directed at the specific questions stated in the Chairman's request. Thus, we did not address the broader management oversight issues at the Department of Defense and the General Services Administration.

CHAPTER 2

THE NEED FOR TWO SYSTEMS AT MOST BASES

The Air Force's stated requirement for two complete computer systems at most major air bases (about 105 locations requiring 210 systems) has never been justified as mission essential or as an operational necessity. The requirement was established without an adequate study of user requirements. If implemented, it would probably cost \$600 million to \$1 billion more than necessary over the 20-year life of the program.

In an interim report on the Phase IV program in February 1979, the Air Force Audit Agency questioned both the lack of justification and the need for two computer systems at most air bases. In a later briefing, the auditors noted that this requirement would cost at least \$250 million more than a single-system alternative for the 12-year operational period covered by the Air Force's economic analysis.

Responding to that report, Air Force Headquarters concluded that, while economics suggested a single processor, effectiveness and mission support were overriding considerations that indicated multiple processors were required. Headquarters officials further argued that improved capabilities and other benefits justified the added cost of acquiring multiple processors.

According to the Air Force, a multiple processor would allow managers at all levels to respond to changing environments with minimal disruption or degradation to the Air Force mission. Specifically, the Air Force stated that at least two processors were needed at most major bases to

- improve responsiveness to on-line users and allow flexibility for greatly expanded on-line processing,
- enhance system availability,
- alleviate disruptions caused by processing classified information, and
- reduce overall program risk by installing equipment at each base on a phased basis.

While this explanation provides some rationale for two processors (central processing units), it does not respond to the auditor's basic question of why two separate computer systems are needed.

The Phase IV request for proposals calls for two separate computer systems, in most cases, to be located in two different places. Yet, the stated objective and the current plans call for collocation of nearly all computers. One computer system, termed the "X1 system," is to support the standard base supply system, and the other, termed the "X2 system," is to support almost all other functional applications, such as personnel, payroll, accounting and finance, engineering, and maintenance.

These applications are presently supported by the incompatible Univac and Burroughs computer systems with backup Univac and Burroughs computer systems at only a few of the 118 installations. For the past two decades, back-up support has been provided by required agreements or more commonly by ad hoc arrangements with other bases. The Air Force estimates that 116 "X1 systems" and 113 "X2 systems" will be required at initial installation starting in 1983.

Our review of current ADP operations at the bases and of currently validated or projected requirements indicates:

- A single computer system can be acquired "off the shelf" that would effectively handle all of the base-level, on-line, and other processing requirements of the Air Force.
- Current base-level computer systems have been quite reliable, considering their age, and have generally been available when needed. We found that adequate data processing support had been provided even though the Burroughs and Univac machines are incompatible. While some hardware problems have occurred, none that we know of has ever been so severe as to warrant extensive back-up capabilities at each base.
- The small amount of classified data processing (averaging less than 1 percent of the workload) is being performed with minimal impact on users, and base officials stated that it would not change much during surge or crisis conditions.
- The risks associated with software conversion are being minimized by the dual vendor acquisition approach and by extensive testing of the converted

software in the transition phase. Any further reduction in risk possible by installing two computer systems at most bases is, in our view, too small to justify the added costs.

ON-LINE PROCESSING CAPABILITIES

Air Force officials believe that the two-system configuration would provide more management flexibility in responding to future processing requirements. They expect on-line processing requirements to increase significantly over the next few years and believe that the projected number of on-line terminals at the base level will necessitate a configuration which can reduce contention within the central processor and accommodate the input/output requirements. To achieve these goals, the Air Force's specifications require two separate systems, each of which can meet an average 10-second response time to a remote terminal command.

Further, the specifications call for an expansion capability whereby both of the new systems must be capable of achieving a minimum 100-percent expansion in the total number of remote terminals supported. However, the Air Force expects to need three times as many remote terminal devices--from 4,454 terminals at initial installation of new equipment to over 13,300 during future augmentation within 8 years--which is about a 200-percent increase.

An analysis of each base's requirements indicated that the largest number of terminals estimated for any single system was 115 and the largest total for both systems was about 200 terminals. Our knowledge of current ADP technology and existing Federal computer installations indicates that a single computer system, with one or more processors, can be configured to effectively handle these large numbers of remote terminals. In fact, Air Force plans call for an individual system at each of two bases which would support more remote terminal devices than the number that would be required for both systems at all other bases at the point of initial installation of new equipment. Thus, the Air Force recognizes that individual systems, which might be composed of more than one processor, can effectively handle the projected terminal requirements in the request for proposals.

SYSTEM AVAILABILITY

According to the Air Force, system availability is greatly enhanced with two or more "processors." The Air Force, in a response to the February 1979 Air Force Audit Agency interim report, stated that a "multiple-processor"

configuration will increase reliability--to as high as 99.5 percent. Also, according to program management a two or more processor configuration provides increased flexibility in scheduling ADP maintenance and in supporting priority workloads while one processor is undergoing preventive maintenance, processing classified data, or undergoing repairs.

Actually, the Air Force's response does not address the main issue identified in the audit report--justification for two separate computer systems. The response skirts the issue by discussing the benefits of a multiple-processor configuration. Under the Air Force two-system approach, either system of the two computer systems might require multiple processors to achieve the Air Force's intended purpose. A single computer system at each base might also result in multiple processor systems at some or all bases.

A more recent attempt to buttress the arguments for the requirement for two separate computer systems at most air bases was made by the Air Force in a September 25, 1979, memo to the Assistant Secretaries of Defense (Comptroller) and (Manpower, Reserve Affairs, and Logistics). That memo states that two or more computer systems (rather than one large system) would provide increased availability of computer resources to satisfy priority requirements. In addition, it states that the base-level data processing installation manager will have increased flexibility to support classified processing, respond to day-to-day changes in functional workload, and support priority workload if one computer system fails.

The memo states that although computers are commercially available (off the shelf) with sufficient capability to handle all workloads, the single large-scale computer approach was the only one not acceptable under Phase IV. The memo states that this approach was rejected because it imposed too high a risk of failure and adverse mission impact.

In the September 25 memo, the Air Force defines system availability as the net time a computer system is available to support priority users after subtracting the time dedicated to three elements--classified processing, preventive maintenance, and remedial maintenance. To our knowledge, this is the first time system availability has been defined by the Air Force. We did not find it among the important data processing installation management indicators used by the bases in the four major commands we visited. In fact, to satisfy our request for the amount of classified processing at each base (one of

the ingredients in computing system availability), in two of the major commands visited, the command personnel had to call each base in that command and require that available logs be reviewed manually to make estimates.

The September 25 memo states that classified applications account for approximately 1 percent of the workload at the Burroughs installations. Information we obtained for about 70 bases indicated the amount of classified processing to be, on the average, less than 1 percent each month per base.

Processing of classified information is scheduled when it would have minimal impact on the users. For example, at one base it is scheduled when most on-line users go to lunch. At another base, it is scheduled for a Saturday when no other users are scheduled to use the machine. The classified processing is usually a monthly reporting requirement with a specific due date. The bases have a good deal of flexibility to schedule the processing to satisfy this requirement. Although the September 25 memo indicates the level of classified processing is likely to increase, we found no support for this statement when we talked to the users and managers of the base-level computer systems.

The September 25 memo states that during 1978, the downtime for preventive maintenance was 3 percent for the Burroughs systems in the Strategic Air Command. Data we obtained for about 70 bases, including those of the Strategic Air Command, shows downtime for preventive maintenance to average 3.5 percent per month per base. Preventive maintenance is usually scheduled late in the third shift, between 5:00 a.m. and 7:00 a.m., after the batch workload is completed and before the daily on-line processing workload begins. The impact on users is minimal. When we asked users of the base-level systems to identify problems associated with obtaining adequate data processing support, some complained about poor terminal response time during the day, none complained of poor data processing support because of preventive maintenance.

The amount of, and even the necessity of, preventive maintenance is under discussion in the industry today. One manufacturer recommends no preventive maintenance for its new central processing unit because the equipment has been greatly improved, and because a defective part can be identified and replaced relatively quickly and easily. We expect to see this become a trend toward much lower levels of required preventive maintenance.

Remedial maintenance is unscheduled maintenance on a computer component which has failed. The failure of one computer component does not always cause the entire system to go down. If the failure occurs when the computer system is scheduled to operate, one or more users may be deprived of data processing support.

The September 25 memo used 5 percent downtime for remedial maintenance--the maximum allowable under the current Phase II contract or under a Phase IV contract. Actual experience for about 70 bases shows significantly less downtime because of remedial maintenance, averaging 1.5 percent per month per base. We expect that current technology systems would experience a lower percentage of downtime.

The same memo states that the intended Phase IV configuration of two systems has a net availability of 99.75 percent to support a priority workload. However, such a level of system availability is not a stated requirement of the Phase IV request for proposals and is not supported by any detailed study of base-level data processing requirements. Also, experience with current systems does not support 99.75 percent system availability as a mission need.

The following chart shows that net availability ranged from 92 to 96 percent with the current computer systems. None of the commands listed, however, used all the capability currently available to them. The percent of net availability actually used ranged from a low of 68 to a high of 87 percent.

Use of Computer Resources
When Available

Com- mand	Burroughs		Univac	
	<u>Net avail- ability</u>	<u>Percent of net availability actually used</u>	<u>Net avail- ability</u>	<u>Percent of net availability actually used</u>
AAC	96	84	93	84
SAC	94	70	93	82
MAC	95	78	93	86
TAC	94	76	92	87
ATC	93	68	93	72

We believe that industry could provide a higher level of system availability if shown to be a requirement in a proper mission needs study. Even with the presently experienced levels of classified processing and remedial maintenance (for current older computer systems), new technology computer systems could still have a net availability of 94 to 97.5 percent (depending on the amount of system down time for preventive maintenance).

Another factor in system availability is the capacity of the machines acquired. The Air Force plans to oversize the new computer systems. Each system will be sized to accommodate all of the following:

- Surge requirements (an additional 25-percent capacity) on one of the two systems.
- The average peak workload of on-line processing.
- Anticipated growth in workload.

Such oversizing provides a cushion to handle peaks in the workload and some space in the schedule for both preventive and remedial maintenance. Considering the newer, more reliable technology and system oversizing, we believe that adequate computer resources would be available to handle crisis and emergency workloads in a one-system configuration.

Statements from general officers quoted in the September memo primarily emphasize that the Air Force requires good, responsive, reliable computer support to meet its mission effectively and efficiently. We concur with the importance of computers to the Air Force mission, but we are not convinced that two separate computer systems at most air bases are essential to provide such support.

CLASSIFIED AND PRIORITY PROCESSING

The Air Force also believes that the backup capabilities provided by multiple systems would (1) alleviate disruptions caused by classified processing and (2) allow for adjusting workloads between the two systems to support special processing requirements due to major command unique systems, wartime situations, and base-level mission priorities.

The time needed to process classified data at Air Force installations is minimal in relation to the workload processed on either the Univac or Burroughs systems. Classified data is usually processed on weekends or

during other periods when workload levels are characteristically low or nonexistent. The following examples typify the small amount of classified processing time required in a month:

- Military Airlift Command bases averaged from 37 minutes to 13 hours, 50 minutes on Burroughs computers and from 7 minutes to 1 hour, 49 minutes on Univac computers. Only one base processed a significant amount of classified information during the period reviewed.
- Alaska Air Command averaged about 2 hours of classified processing each month on Burroughs computers and about 1 hour each month on the Univac computers.
- Tactical Air Command bases averaged from 47 minutes to 2 hours, 45 minutes on Burroughs computers and from 17 minutes to 1 hour, 25 minutes on Univac computers.
- Strategic Air Command bases averaged from 25 minutes to 6 hours, 41 minutes on Burroughs computers and from 19 minutes to 1 hour, 44 minutes on the Univac computers.
- Some Burroughs computers in the Air Training Command processed up to 2 hours of classified data while seven bases had no record of any recent requirements for classified processing. Very little classified processing was done on Univac computers in this command. Some ATC bases required about 2 minutes of central processing unit time during a recent month while the rest had none at all.

The minimal disruptions caused by processing of classified data do not warrant a backup capability at each base.

The Air Force states that multiple systems provide additional flexibility because they can process classified data during surge or crisis conditions. Surge conditions occur during major military buildups where some bases experience high levels of flight, personnel, and supply activities. Data processing activity correspondingly increases as the base activity increases.

The Air Force made several studies to determine the effect of surge conditions on computer needs at the base

level. These studies of both peacetime crisis (natural disasters, war exercises, and riot control) and wartime activity (Vietnam conflict) showed similar results. Based on its findings, the Air Force factored a 25-percent increase in workload need for the X1 supply computer.

We reviewed the computer operations of McChord Air Force Base, a possible staging area for conflict in the Pacific, and Elmendorf Air Force Base, a strategic base for servicing both Asian and European fronts. Both locations have seriously considered surge or crisis conditions and how they might meet their computer processing needs. Supply and data processing personnel said that some disruption in normal processing could occur and priority processing would take place. They were confident, however, that an adequate level of data processing support could be provided with the present computer systems.

At other bases we visited, users said that surges have occurred infrequently and have been adequately handled by setting priorities and making appropriate adjustments. We do not believe that surge processing requirements support the need for multiple computer systems at each base.

According to Air Force officials, command-unique systems account for approximately 5 to 10 percent of the total data processing workload. Because of a command's varied missions, all of the unique systems within a command are not processed at each base--several are only processed at command headquarters. In any event, these unique requirements are included in daily processing schedules and were considered in workload projections for the Phase IV equipment replacement. Further, the new hardware will be sized to accommodate these known command-unique requirements as well as any other unusual processing needed to meet individual base-level mission priorities.

Under the Air Force's concept of operations for Phase IV, the X1 and X2 computer systems would be sized to meet known processing requirements at each base. The systems would be sized to provide continuous support of both the standard base supply system and the largest X2 application system should either computer encounter problems. This concept states that the supply data files would not be removed while processing should the X2 system become inoperable.

Further, even if failures occurred under the two-system concept, the Air Force would not transfer the processing from the disabled computer until attempts were made to remedy the problem. Thus, some downtime would be incurred

before workloads could be adjusted between the two systems. As pointed out earlier, downtime on existing hardware has been minimal and should be even less on new computers.

PROGRAM RISKS

According to Air Force officials, significant risks are associated with replacing the base-level computer systems because of the magnitude and critical nature of the functions involved. Software conversion has been and still is considered the highest risk in the Phase IV program. Because of this high risk, the system contractor acquisition approach was adopted.

Under this approach, two competing contractors will be selected to independently convert and update a large portion of the Air Force's standard application systems with a production contract contingent upon successful conversion, test, documentation, and demonstration of the proposed systems. During this period, approximately 1.6 million lines of source code would be converted by both contractors.

Following this transition period, a single vendor will be selected to provide the software and hardware for all Air Force bases. Using this approach, the Air Force maintains that risks would be minimized by

- maintaining competition for the hardware until after system integration, thus inducing a contractor to hire and retain the best personnel;
- making the transition of application software before buying the hardware or operating software;
- using two or more contractors to increase the probability that one will succeed;
- testing and evaluating the proposed system in a live environment with maximum user participation before making a selection;
- having two or more contractors independently provide for transition of the software with a production contract contingent upon successful transition;
- testing system performance before selecting and/or deploying the system;
- making a single contractor responsible for performance, hardware, system software, Air Force standard application software, and system integration; and

--maintaining competition until a minimum mandatory level of performance is attained.

After this "compute-off," the winning contractor would convert the remaining Air Force standard software, which involves about 350,000 lines of source code, and start an incremental implementation of computer systems at the base level. During this same implementation period, major commands will make the transition of their own unique application software, which involves about 3.5 million lines of source code.

To insure a smooth transition of this software, 10 Air Force bases, including most of the major command headquarters, are to receive one or more development computers about 5 to 17 months ahead of "X2 system" implementation. Further, the contractor must supply an automatic program conversion facility which is expected to automatically convert about 90 percent of the Burroughs COBOL-68 source statements to the COBOL-74 statements required in Phase IV, and to identify all remaining code. Additionally, the contractor must provide all programming tools and aids used to make the transition and implement the standard application systems.

Our review at four major commands indicated that little risk was involved in converting unique systems. For example, a preliminary study by one major command concluded that the time frame for conversion was more than adequate and no problems were foreseen. The major risk, according to command officials, is the efficiency of the translator provided by the contractor. An inefficient translator would require more personnel to accomplish the conversion tasks.

In summary, the Air Force has already taken steps to reduce the risks of software conversion with the dual vendor transition approach and the extensive testing of converted software in the transition phase. Any further risk reduction possible by installing two computer systems is, in our view, too small to justify the added costs. With good planning, the installation and transition to new computer systems at each base could be accomplished on a single system just as well as with two systems.

CHAPTER 3

ADDED COST OF THE AIR FORCE APPROACH

The Air Force currently intends to initially lease and then purchase the computer systems at the most economical time. We estimate that the Air Force approach of replacing the existing computer systems with two separate computer systems at about 105 bases and single-computer systems at other locations, would add about \$663 million in costs over a 20 year span as compared to a one-system approach. We estimate the cost of a one-system approach would be \$420 million less than the current Air Force life cycle cost estimate based on two systems, for a comparable period of 12 years of operation.

The primary savings of a one-system approach over the Air Force budget estimates for a two-system approach are:

	<u>Estimated savings</u>	
	<u>12 years</u>	<u>20 years</u>
	------(millions)-----	
Equipment acquisition and maintenance	\$150	\$240
Site construction	40	40
Personnel to manage and operate the computers	<u>230</u>	<u>383</u>
Total	<u>\$420</u>	<u>\$663</u>

We made our savings estimates for the one-system approach by comparing our estimate of the cost of the required number of computer systems to the official life cycle cost estimate for 12 years, and as extended linearly to 20 years. Our estimate is based on current technology, medium-sized computer systems using the same assumptions as the Air Force's official life cycle cost estimate.

However, the assumptions in the Air Force cost estimate are, in our view, somewhat optimistic. Should the Phase IV competition result in purchase-to-lease cost relationships similar to the current Phase II contract, the Air Force might lease the new systems for 20 years--the initial 8-year contract and two optional 6-year extensions. If this happens, we estimate the additional cost of having two computer systems instead of one for each major base would exceed \$1 billion (in constant fiscal 1977 dollars) for the 20 years of the program.

SAVINGS IN THE COST OF EQUIPMENT
ACQUISITION AND MAINTENANCE

Based on the Air Force's detailed configuration charts and equipment lists for the two-system approach and its subsequent analysis for a one-system approach, we developed a detailed set of comparable configurations and equipment lists for current technology, medium-sized computer systems from two major manufacturers. We applied the same costing and pricing assumptions as the Air Force had in its official economic analysis completed in September 1978 (and as subsequently updated to February 1979).

Our configurations differed from the Air Force one-system estimate in sizing computer systems at nine medium-to-large-scale sites. We also reduced the number of tape drives per system to match the existing number of base-level tape units. We confirmed our assumptions with representatives of the two manufacturers. We used official price lists from these two manufacturers to price the computer systems. To our total estimate for the computer systems, we added the cost of all other equipment (remote computer terminals, satellite terminal clusters, transportable computer systems, extra tape transports, and front-end communications systems) on the same basis as the Air Force included them in its official life cycle cost estimate.

Consistent with the Air Force, we computed an operational life cost estimate for 12 years for basic equipment acquisition and maintenance assuming all of the equipment is to be leased initially and then purchased. A comparison of our estimate of the total cost for equipment lease, purchase, and maintenance with the Air Force's official estimate showed a difference (reduction) of about \$150 million for the 12-year operational life. We linearly extended both estimates to 20 years and showed that an estimated \$240 million would be saved using the one-system approach.

Our basic estimates do not include the 200-percent increase in the number of remote computer terminals by the end of the initial 8-year contract as provided for as options in the Air Force request for proposals. We estimate this increase would cost over \$200 million for the additional 8,900-plus terminals, alone. This dramatic increase is, however, the reason for our estimate of a large augmentation of communications equipment and the computer systems in the 20-year leasing scenario discussed below.

We also did not include the cost of the optional five transportable computer systems. The estimated cost of this

optional equipment was not included to compare fairly our estimate to the official Air Force economic analysis and budget estimates. However, we are concerned that these optional quantities are included in the request for proposals. We could not find any defined requirements for either the 8,900-plus terminals of various specifications or the additional five transportable computer systems.

To estimate the cost in a more pessimistic purchase situation, we extended to 20 years the lease costs for all equipment in both our estimate and the Air Force's. For this purpose only, we estimated the effect on savings of the additional computer systems equipment needed to support the planned 200-percent terminal augmentation about 8 years after installation. The resulting estimate of cost savings for the one-system approach as compared to the two-system approach is over \$1 billion.

Except for our projection for this 20-year leasing scenario, we did not include a cost estimate for augmentations to the equipment which are expected by the Air Force and provided for in the Phase IV request for proposals. These costs were excluded from the Air Force official cost estimate along with the costs of utilities and facilities maintenance, and the operational costs for 1996 through 2002.

SAVINGS IN FACILITY CONSTRUCTION COSTS

We estimate that the Air Force could save about \$40 million in facility costs by changing its construction plans. About \$35 million can be saved under either the current Phase IV approach or the one-system approach, and another \$5 million could be saved by the one-system approach alone.

According to a revised Air Force estimate, the cost to house the Phase IV computer systems (X1 and X2) in the same facility will be about \$89 million. This estimate is based on expected construction costs in the year the construction is projected to occur. The projected amount provides for the construction of about 50 new facilities and the alteration or modification of the remaining facilities. The \$89 million does not, however, include about \$27 million for extensive environmental features to increase the chances that base-level computer facilities in Europe would survive a biological or armed attack.

The Air Force has stated that all known deficiencies in the existing facilities can be corrected for \$89 million. In terms of floor space, this will provide at least 8,700 square feet for each collocated facility--2,500 for the

computer room, 2,400 for special purposes (tape library, supply, production control, etc.); 1,600 for administrative offices, and 2,200 for utilities (communication, janitorial functions, restrooms, etc.). The Air Force estimates that a consolidated facility with 8,700 square feet would allow for future expansion of between 10 and 25 percent.

The Air Force also estimated the cost for adequate but less elaborate, base-level computer facilities. It estimated that about \$54 million would provide for the construction of 26 new facilities and the alteration and modification of the remaining facilities. Officials in the Phase IV Program Management Office said that this amount would not be sufficient to correct all known deficiencies in the existing facilities or provide the desired floor space for the computer facility (8,700 square feet) or the computer room (2,500 square feet) for a two-system installation.

We found that the \$54 million would provide at least 1,725 square feet of floor space in the computer rooms of all facilities. This is the minimum requirement stated in the Phase IV request for proposals. In addition, we found that the 26 facilities to be constructed and 64 of the existing facilities to be altered and modified would have more than the minimum desired floor space. About 26 facilities could be expanded or relocated to provide the minimum required floor space (1,725 square feet) and to correct other major deficiencies.

The \$54 million, however, does not include the estimated cost for correcting four facilities which are located in buildings made of combustible materials--a situation regarded by the Air Force as a major deficiency. The estimated cost for new facilities at these bases is about \$4 million. On the other hand, the \$54 million does include about \$3 million to construct new facilities which we believe are unnecessary. Thus, in our opinion, the \$54-million estimate is reasonably accurate to provide adequate Phase IV facilities, especially for a one-system approach.

For a briefing to the Assistant Secretary for Financial Management, the Phase IV Program Management Office prepared an analysis showing the costs of facilities to house a single-computer system. The analysis showed that 102 locations could receive a single system and 3 locations would receive two or more systems. The analysis showed that by reducing floor space requirements in each facility by approximately 900 square feet, the Air Force can reduce facilities costs by another \$5 million.

Summarized below are the estimated savings in facility construction costs:

	(millions)
Cost of Air Force <u>optimum</u> facilities approach	\$89
Less construction costs that would provide <u>adequate</u> facilities	<u>54</u>
Subtotal	\$35
Plus savings resulting from reducing floor space requirement under one-system approach	<u>5</u>
Total estimated cost savings	<u>\$40</u>

We believe that space requirements could be reduced even more if the Phase IV request for proposals included incentives for the vendors to reduce their requirements for equipment space. The request for proposals contained no such incentives. In fact, the request for proposals states that the computer systems will be in separate facilities at over 90 bases, and the mean distance between the facilities will be 3 miles, and the maximum distance 5 miles.

We believe that facility costs can be reduced about \$40 million if the Air Force takes advantage of currently available construction alternatives. In addition, even more might be saved if vendors are allowed to offer a single system to satisfy base-level data processing needs and are given incentives to reduce floor space requirements to house equipment.

SAVINGS IN PERSONNEL REQUIRED TO MANAGE AND OPERATE THE NEW EQUIPMENT

Potential staffing reductions are not a stated objective of the Phase IV program. DOD guidance in 1975 states that savings from potential reductions in personnel cannot be used to justify the computer replacement program. The Air Force policy has been to maintain existing base-level computer system personnel levels until the new computer systems are implemented and staffing requirements can be validated. The Air Force believes such a policy is "most prudent." However, we believe personnel savings cannot be reasonably ignored in comparing alternatives for the Phase IV program. Personnel expense is about 55 percent of the operational cost of the two system approach or about \$1.2 billion over a 12-year span.

Two earlier Air Force studies (STALOG and SADPR-85 discussed in the background section) concluded that base-level data automation needs could be adequately provided by replacing the Burroughs and Univac systems with a single "base-general system." These studies estimated the base-general system would eliminate the need for between 1,300 and 1,500 personnel.

The Air Force has not established staffing standards for the current Burroughs system, although the Air Force has used these computer systems for over a decade. Present staffing levels for the current Burroughs and Univac systems show that more personnel are necessary to operate two systems than one system. For example, the average staffing level was 24 at bases with a single Burroughs system and 33 at bases with two Burroughs systems. Likewise, the average staffing level was 10 at bases with a single Univac 1050/II system and 15 at bases with two Univac 1050/II systems.

We estimate that about 3,216 personnel will be required to manage and operate a single, medium-sized computer system with the capability to handle all base-level data processing needs during an 18-shift work week at most air bases. This represents a reduction of about 1,050 personnel below the President's fiscal 1980 budget estimate.

Our estimate includes staffing needs for the remote processing stations (an enhanced terminal) which will be located in the base supply activity and will essentially replace the Univac 1050/II systems there now. We used the general staffing criteria contained in Air Force Regulation 25-5 because staffing standards for the remote processing stations have not been established. Our estimated staffing levels include those bases where two systems may be required because of workload and the two bases where the Air Force requires two computer systems to be installed at separate physical locations because of mission needs.

Using, for the most part, the current base-level staffing of the Burroughs systems and the guidelines provided in Air Force regulations, we developed a computer system configuration for each workload category for each base, and staffing estimates for each of the system configurations. Our estimated personnel requirements were based on 18 work shifts per week, the same as was suggested in the Phase IV request for proposals. The following chart shows our estimated personnel requirements for a one-system approach.

Staffing Model for the Phase IV Program One-System Approach
as Estimated by GAO

<u>Work functions</u>	18 Shifts/Week					<u>Total all bases</u>
	<u>Separate systems (note a)</u>	<u>Consol- idated system</u>	<u>Single systems</u>			
			<u>Supply and nonsupply</u>	<u>Non- supply</u>	<u>Supply only</u>	
Management	3	3	3	2	1	
Operations support	3	3	3	2	1	
Tape librarian	1	1	1	1	1	
Production control	3	2	2	1	-	
System monitors	5	5	5	3	1	
Computer operators	18	13	10	8	4	
Remote processing stations (note b)	<u>-</u>	<u>5</u>	<u>5</u>	<u>-</u>	<u>-</u>	
Personnel needed for each site	33	32	29	17	8	
Multiplied by number of bases	<u>2</u>	<u>c/ 1</u>	<u>103</u>	<u>3</u>	<u>10</u>	
Total	<u>66</u>	<u>32</u>	<u>2,987</u>	<u>51</u>	<u>80</u>	<u>3,216</u>

a/The Air Force stated that these systems must be separated geographically because of mission requirements.

b/Our estimate for personnel to operate these terminals is based on the criteria contained in Air Force Regulation 25-5.

c/The training activity at this location appears to justify two separate computer systems.

Recent information provided by the Air Force on 88 bases shows that for six major commands (ATC, MAC, PACAF, SAC, TAC, and USAFE) the average weekly staffing ranges from 17 to 21 shifts with only the Tactical Air Command bases operating the maximum number of shifts. We also developed estimated staffing levels for 15 and 21 work shifts each week--2,900 and 3,410 personnel, respectively. A recent survey by the Air Force shows the average number of shifts worked per week to be just over 19 for all air bases, worldwide.

To determine the total number of personnel assigned to base-level operations, we used the President's fiscal 1980 budget. According to it, the Air Force requires 6,802 personnel to perform data automation functions worldwide. Not all of these personnel will be affected when the Phase IV program replaces the existing Burroughs and Univac systems. Accordingly, we made the following adjustments based upon discussions with and documents furnished by officials at the Phase IV Program Management Office and the Data Systems Design Center.

		<u>Personnel authorized</u>
President's budget		6,802
Less personnel assigned to:		
Remote job entry terminal stations	397	
Major command unique applications	1,437	
The Data Systems Design Center	378	
Data enter activities (PCAM functions)	179	
Data automation support functions at major commands	87	
Other	<u>54</u>	<u>2,532</u>
Total assigned to base-level ADP functions		<u><u>4,270</u></u>

Using our estimated staffing levels, we prepared the following table showing the potential reductions in program life cycle costs associated with managing and operating one base-level computer system.

	<u>Number of weekly work shifts</u>		
	<u>15</u>	<u>18</u>	<u>21</u>
Number of personnel authorized (FY 1980 budget)	4,270	4,270	4,270
Staffing requirements for the Phase IV systems	<u>2,900</u>	<u>3,216</u>	<u>3,410</u>
TOTAL REDUCTION IN PERSONNEL REQUIREMENTS	<u>1,370</u>	<u>1,054</u>	<u>860</u>
REDUCTION IN PROGRAM LIFE CYCLE COSTS (note a):	----- (millions) -----		
12 years	\$299.1	\$230.1	\$187.7
20 years	\$498.4	\$383.5	\$312.9

a/These amounts are based on an average annual salary of \$15,606 plus 16.57 percent for base operations support, the same assumptions used by the Phase IV Program Management Office in its economic analysis (i.e., in fiscal 1977 dollars).

Our estimated staffing level is consistent with guidelines used by the Phase IV Program Management Office to develop program life cycle cost estimates. While developing our estimates, the Air Force officially disclaimed these guidelines in a letter to GAO. They continue to be used, however, by the Project Management Office. We believe, based on the Air Force budget estimates and life cycle cost estimate for the two-system approach, that the Phase IV request for proposals would result in additional costs ranging between about \$313 million and \$498 million for personnel to manage and operate the replacement systems over the 20-year life of the program.

CHAPTER 4

WHY ARE SUCH A SMALL NUMBER OF VENDORS PURSUING THE COMPETITION?

Air Force management has described Phase IV as a model competitive acquisition. It is the largest computer acquisition program ever attempted by the Government and is a major system acquisition by any definition. However, the acquisition strategy and approach, while funding a competition between two vendors, does not incorporate the definition of mission needs or competitive exploration of alternative system designs, which are judged essential by the Commission on Government Procurement and incorporated into OMB Circular A-109--guidance on major system acquisitions. In addition to the lack of these key elements, in our opinion, Phase IV suffers because of the extensive set of detailed mandatory specifications. We also believe there are two key sets of specifications -- for a minimum of two systems per base and for remote computer terminals -- that restrict competition beyond any valid Air Force requirement.

To investigate these points, we surveyed equipment and software vendors before the proposal due date to determine how many vendors were seriously pursuing the procurement. We also asked them whether any problems existed with the procurement as stated in the request for proposals. In addition, we analyzed vendors' and other experts' comments on the draft request for proposal as well as Air Force communications with potential offerors.

OLD TECHNOLOGY IS REQUIRED

In recent years, technological advances in computer design and development have contributed significantly to reducing computer equipment cost and, at the same time, have increased computing capacity. The computer industry is continually seeking innovative ways to meet user demands for faster and more powerful equipment. Today's computer equipment is becoming so reliable that traditional on-site maintenance will soon be a thing of the past and on-call maintenance the preferred method for having a cost effective and responsive computer operation. Potential Phase IV offerors have said that the Air Force should redefine its statement of requirements to take advantage of the technological advances of modern equipment.

Required magnetic tape units outdated

The Air Force requires vendors to propose 7-channel (track), 556 CPI (characters per inch) and 800 CPI tape units. An industry research company stated in 1974 that 7-track tape units were considered obsolete. Further, the vendors are required to propose 9-channel, 800 CPI tape units. Today the industry commonly uses the 1600 CPI as a baseline for operations, with higher tape densities becoming the industry trend.

By using higher density tapes, more data is stored per inch of tape. This would reduce both the overall cost of tapes and physical storage costs. Also fewer tapes and tape units would be required. In the present Burroughs installations, higher data transfer rates would increase data processing speeds. Air Force officials disagree, however, stating that the cost of converting the present inventory of 800 CPI tapes to 1600 CPI would be uneconomical and their tape inventory could not be used on the higher density tape units. This argument does not appear to be valid because (1) we found that the average Air Force tape life is about 3 years--easily allowing the Air Force to move to the higher density tapes during the early years of the Phase IV replacement program and (2) the higher density tapes can initially be used at lower densities. For example:

--Randolph AFB is using the same type of high-density-rated magnetic tapes on both their Honeywell (1600 CPI) tape drives and Burroughs (800 CPI) tape drives.

--All computer tapes purchased through GSA, according to GSA officials, are tested and rated for both 800 CPI and 1600 CPI and higher density use.

In addition, commercially available higher density tapes cost the same and can be used on lower density tape units.

Punch card equipment costly and unnecessary

The Air Force requires card punch and card reader capability for use primarily with the Automatic Digital Network (AUTODIN) system. Both the existing Burroughs and Univac computer systems receive cards from and transmit cards to AUTODIN. The number of cards produced by the Univac for AUTODIN ranges from 1,000 per month at smaller bases to around 90,000 at larger bases. Burroughs transactions range from 7,000 to 136,000 transmitted to and 90,000 to 710,000 cards received from AUTODIN each month. Air-Force-wide, this amounts to about 750 million cards a year, or more than \$290,000 annually just for the card supplies.

used to support this Air Force base-level interface with AUTODIN.

Because direct computer-to-computer interface is possible with today's technology, moving such a large number of cards is not only cumbersome, but unnecessary. Also, data entry equipment today allows for direct input to either tape or disk, which then can be entered at high speed directly into the AUTODIN system. Our review of the AUTODIN system documentation showed that no technical barriers to the use of such high-speed, input/output media exist for transmitting base-level data into and out of the AUTODIN system. Therefore, we believe that the costly card processing being perpetuated by Phase IV could be eliminated.

Disk units

The Phase IV request for proposal requires all disk (immediate access storage) devices to have removable disk packs that are interchangeable among all systems proposed. This requirement restricts proposing newer, more cost-effective, equipment. For example, a recent industry announcement stated that fixed disk pack devices have

- nonremovable disk packs, allowing for protection against contamination and mishandling,
- twice the recording capability, and
- data transfer rates that are 1-1/2 times faster than removable disk drives.

All of these improvements are available for substantially lower prices for both acquisition and maintenance. Also, the industry trend for several years has been away from removable disk pack storage devices.

Handheld cassette units no longer produced

The Air Force is requiring vendors to supply handheld tape cassette unit terminals. Industry representatives said that such equipment is no longer produced and newer technology, floppy-disk, handheld units have replaced the cassette units. In fact, new production lines will have to be started so that these outdated units can be produced. However, Air Force officials maintain that handheld cassettes are required in Phase IV for compatibility with the Air Force Combat Supply System. Thus, this requirement may be a case where the Air Force's specification of obsolete technology is necessary to meet a real need.

MANDATORY SPECIFICATIONS REDUCE COMPETITION

Phase IV program equipment and equipment capability requirements are all mandatory and must be satisfied by a vendor's offer if the offer is to be considered "responsive" or acceptable. Usually, a major procurement action attempts to avoid specifications which, by themselves, limit competition. However, our review of the Phase IV request for proposals and discussions with industry representatives showed several requirements--beyond those requiring the continued use of obsolete technology--that could restrict competition.

Single and multi-processor

The Air Force requirement for two computer systems automatically excludes proposals for a single system. Several vendors said they currently have off-the-shelf, multi-processor or single-processor models that are large enough to handle the Air Force base-level data automation requirements, but they were restricted from proposing such equipment because it would be considered unacceptable as a response to the stated Air Force requirements. Thus, vendors whose product-line emphasizes such computer systems were prevented from, or restricted in, offering price-competitive proposals for the Phase IV program.

Minicomputers

Also excluded from competition was the use of minicomputers in a distributed network. Studies by the Federal Evaluation and Simulation Center (FEDSIM) and a private consultant indicate that the Air Force Phase IV specifications exclude proposals for such a network. We recognize that the minicomputer market does not have all the available software to meet Air Force specifications, but such software is being developed and support for it could come from the larger minicomputer vendors. However, it is the specifications in the request for proposals, rather than minicomputer software deficiencies, that restrict the minicomputer manufacturers from competing.

Video display remote computer terminals

Air Force officials did not perform the normally required market survey to assure equipment availability and competition before issuing the request for proposals. We believe they would have found that the specifications in the request for proposals severely limited the market's ability to respond to the request for video display remote computer terminal units. For example, we reviewed a survey

of such terminals published before the draft request for proposals was circulated in the Summer of 1978, for features offered on over 150 alphanumeric video display terminals made by 43 different vendors, including the seven largest manufacturers of computer systems. We could find only one set of off-the-shelf units that appeared to meet all of the mandatory requirements stated by the Air Force.

The specifications for the video display units appeared to be taken directly from the features available on currently installed Burroughs terminals without any determination of need for these features or user requirements for other features. System users told us that the capabilities required in the video display unit, such as contrast control, reverse video, text editing features, and forms control features, such as reverse tabulation, were nice to have but were not necessary for their work, and need not be acquired especially if additional cost were involved. Our review of the video display unit survey also disclosed that if a few such requirements were not imposed by the request for proposals, at least nine to twelve other off-the-shelf terminal units could probably meet the remaining Air Force requirements.

No market survey was ever made to insure the possibility of competition. Since vendor proposals must be responsive to every mandatory feature cited in the request for proposals, we believe the specifications in the Phase IV request for proposals for video display unit terminals clearly restrict competition. We believe this is a serious restriction because of the large dollar value of the acquisition of just the computer terminals (primarily the above video display units but also others). This acquisition cost is estimated to be over \$100 million for the minimum initial quantity cited in the request for proposals and is estimated to be over \$300 million (which would equal about 50 percent of the total Phase IV contract acquisition cost) if all optional quantities for terminals are acquired. We can find no sound reason for the restrictive definition of these terminal requirements, either in the detailed requirement statements of the currently operating applications, or in the projected requirements of these applications and proposed new applications.

PHASE IV PROCUREMENT APPROACH
REDUCED COMPETITION

We believe that competition in the Air Force's Phase IV computer systems procurement is lacking. The Air Force will, therefore, not likely be able to obtain the same benefits (e.g., the lowest possible price) had a large number of vendors competed for the contract. Many vendors said they were discouraged from offering because of unconventional, restrictive, unclear, and high risk requirements in the Phase IV request for proposals.

We believe that the Air Force could have taken advantage of increased vendor competition without sacrificing Phase IV system capabilities if it had changed some of the requirements in the Phase IV request for proposals. Our opinion is based on the comments that interested vendors made on the Air Force's draft request for proposal, circulated in the Summer of 1978. We also considered the Air Force's evaluation and responses to these comments and the reasons given the Air Force by vendors who withdrew from the competition or said they were not pursuing it.

Some of the problems cited by a majority of the vendors who received the request for proposals were:

- The requirement for a long-term, fixed-price contract.
- The requirement for software conversion to be managed or accomplished by the hardware vendor.
- The short period allowed to prepare a proposal.
- The use of technical specifications for hardware and software rather than more functionally oriented requirements.
- Unclear and inadequate or insufficient data in the request for proposals.
- A belief that the incumbent vendors had a significant, and probably unfair advantage.

Most vendors were dissatisfied with more than one feature of the Phase IV request for proposals and it is not possible to state in most cases whether a particular feature was enough to dissuade a vendor from offering. Some of the vendor comments may be "sour grapes" or common gripes concerning many Government competitive procurements. However, the lack of Air Force responsiveness to serious criticisms, made in writing before the release of the request for proposals by two or more of the

largest computer manufacturers, causes us to believe that the competition will be far less than could be obtained.

Requirement for a fixed price

Seven vendors said a fixed-price contract over such a long period was unfair. They suggested including an economic adjustment clause to cover uncontrollable or unpredictable costs over the long contract period.

The Air Force said it considers a fixed price to be fair because ADP hardware costs are declining and most of the hardware and software will be acquired during the early years of the contract. The Air Force also said that industry has accepted 8-year, fixed price maintenance contracts in the past.

The hardware procurement and software conversion combined in the same contract

Combining hardware procurement and the software conversion in the same contract was objected to by a majority of the vendors receiving the request for proposals. This request for proposals feature, in effect, requires software and hardware vendors to form teams with one acting as a prime contractor and the other as a subcontractor. Software firms generally complained that they were unable to find hardware firms to team with. Hardware firms were reluctant to rely on software firms because of the large investment involved and difficulties in ensuring that a software firm will do its best work. One hardware firm mentioned the possibility that some other vendor could steal the hardware procurement by underbidding the competing firms after the software conversion phase is completed.

The Air Force said that based on its experience, when hardware procurement was separated from software conversion the systems that resulted never ran properly once the software was converted. As a result, new systems were seriously delayed in beginning operations; or unless additional hardware was purchased, applications ran inefficiently.

Proposal preparation period too short

Vendor comments on the draft request for proposals objected to both the short time frame (3 months) for proposal preparation and the lack of access to technical material before release of the request for proposals. Several vendors said it would take a minimum of 6 months to evaluate the large volume of pages (1,300) and the amount of technical data (over 400 pounds) in the request for proposals.

The Air Force increased the proposal preparation period from 3 to 4 months in the request for proposals and released a subset of the supporting technical data a few weeks before the request was officially released to address this complaint. When an incumbent vendor requested a 90-day extension to the proposal preparation time in December 1978, 2 more months were allowed. However, this modification to the request for proposals did not take place until February 1979, almost 2 months after the request for proposals was released and well after the management of many of the potential offerors had decided not to participate in the Phase IV competition.

Proposal preparation time was also reduced by the industrial security procedures and agreements required from potential offerors for safeguards of certain sensitive data (contained in the 400 or more pounds of magnetic tapes and microfiche records that made up the technical data package). The Air Force required an industrial security clearance for this data equal to "Top Secret." Because one major vendor could not readily accept the Air Force's terms, his receipt of this data was delayed almost 6 weeks after the proposal was issued.

Use of technical design specifications for hardware and software rather than functional performance specifications

The use of technical instead of functional specifications for hardware and software was mentioned by over half of the vendors who received the request for proposals. Of particular note were the requirements precluding innovation and competition. Vendors claim that to meet the Air Force requirements they would have to open up expensive new production lines, whereas if the Air Force had stated its requirements in functional terms, they could have been met by current vendor product lines and at the same time provided the hardware and software at a lower cost.

The Air Force stated that changes to its mandatory requirements could result in systems which would not meet its operational needs and that any changes to its requirements would cause significant delay and cost increases.

In addition, one vendor pointed out that the Phase IV detailed technical design specifications deviated from OMB Circular A-109 guidelines. The Air Force said OMB Circular A-109 was published after they had completed the Phase IV specifications and the cost and time necessary to restate the specifications in functional terms was prohibitive and infeasible. However, OMB Circular A-109 was issued on April 5, 1976,

the same date the Air Force Phase IV planning approach was announced and 5 months before this approach was approved by Air Force management.

OMB Circular A-109 encourages attempts to obtain competition from as many vendors as possible on major system procurements. Recent ADP procurement experience in DOD suggests that competition on the Air Force's Phase IV procurement is below average. Over the past 2-1/2 years, the number of vendor proposals received on Army, Navy, and Air Force ADP procurements exceeding \$5 million averaged 22.

Unclear and inadequate data

Seven vendors said they were dissatisfied with the clarity or completeness of the data in the request for proposals. For example, one vendor said the Air Force put in very detailed design specifications for certain peripheral devices but did not specify enough detail for the central processing units, primary memory, or auxiliary storage devices. Various vendors said the lack of clarity made sizing the hardware impossible and, therefore, they were unable to arrive at a reasonable price proposal.

Incumbents have significant advantage

Nearly half the vendors said they believe the incumbent hardware firms have a significant advantage in the competition. Vendors mentioned that the short time frame for proposal preparation would not permit nonincumbent firms to become sufficiently familiar with the software, and the transition pricing was difficult for anyone other than an incumbent vendor to estimate. One vendor said the procurement was slanted toward Burroughs because of the requirements to convert applications software that has been developed for Burroughs' equipment and operating systems.

The Air Force does not believe the incumbent vendors have an advantage. They said the transition cost will be less than 1 percent of total Phase IV life cycle cost, thus making an incumbent advantage due to familiarity with Air Force software minimal. Although perhaps small in relation to the overall \$4 billion life cycle cost of the program, we estimate that the conversion and transition costs will be about 10 to 15 percent or more of the Phase IV contract cost.

NEED FOR MORE COMPLETE USE OF FUNCTIONAL SPECIFICATIONS

The Federal Government is moving toward requiring major procurements to be specified in functional rather than

technical terms. This concept has been specifically recommended for the procurement of ADP resources by the President's Reorganization Task Force on Federal Data Processing. The task force suggested that guidelines be established so that functional specifications could be used in solicitation documents during the procurement process.

Functional specifications describe the mission or objective that the system is intended to accomplish and the data processing required to meet that objective. Such specifications would include a description of data input, volume, files and record content, the type of processing and intended use of the data, frequency of processing, interprogram and data dependencies, and other factors that may be necessary to fully describe the functions to be performed by the computer system.

The use of functional performance specifications offers several benefits over the technical design specifications concept. The use of the functional performance concept requires system users to fully describe their processing needs, which results in greater assurance that the final system will be user oriented. This concept encourages innovation and the application of new technology which thereby increases competition and ultimately reduces cost. The functional concept also requires that the user provide a comprehensive set of benchmark performance criteria for their applications which will be used as a valid measure of vendor performance.

System description

The Air Force has attempted to write the request for proposals in functional terms by providing a detailed description of the systems that will be processed by the new computers. However, a few vendors have said that the descriptions are not detailed enough to determine the size of the computer necessary to meet the system requirements. An example is the Air Force's requirement that the computer's memory be several times larger than the memory required to store certain programs. But, the Air Force did not tell the vendors what size memory is required for these computer programs on the existing computer systems.

Computer equipment

The Air Force has provided detailed technical design rather than functional performance specifications for the Phase IV computer equipment. Potential vendors have been told they must offer at least two computer systems at each of the air bases as replacements for the existing equipment, but the Air Force does not explain the purpose(s) of this requirement,

such as to provide high availability or to provide high on-line performance.

In addition, the request for proposals for the video display terminal units (remote computer terminals) specifies in a lengthy detailed list of equipment features rather than user requirements. An appropriate analysis of user requirements would probably reduce the number of mandatory options and thereby enhance possible Phase IV competition.

The requirement for tape drives (tape transport devices) in the Phase IV request for proposals details the number and specific designs of the tape units thought to be necessary instead of the sequential data storage requirements that reflect user requirements. If the Air Force had specified the user data storage requirements in more functionally-oriented performance terms, most vendors would have been able to propose more modern tape unit technology that would be more economical, reliable, and better fitted to their product line of computer systems than the old technology that is specified in the request for proposals.

Other input/output media

The Air Force has not encouraged competition to prepare innovative proposals utilizing, for example, such output media as computer output microfilm (COM) and microfiche. Our discussion with some system users suggest that these types of output media could be useful in reducing the large quantities of printed paper, which is a major burden at most base installations.

CHAPTER 5

HOW SHOULD INTERIM SUPPORT NEEDS BE MET?

Computer support is needed until Phase IV implementation is complete. The Burroughs contract for lease of computer systems at about 100 bases will expire in June 1982. The Air Force has been working since January 1977 toward extending their Phase II contract. The Air Force believes that modifying the existing contract is more practical than creating a new contract since the interim support would only be needed for about 3 years beyond 1982. Burroughs Corporation has, within the present contract, made two unsolicited offers to the Air Force offering the lease of substitute equipment with increased capabilities.

The Air Force has evaluated this equipment and found it to be a technically viable substitute and its lease would be more economical than continued lease of existing equipment. Air Force officials said that this equipment is the only substitute equipment that can be used with existing peripheral equipment, requiring a multi-line controller for central processor interface. Thus, if more technically advanced systems can be substituted, the installed peripheral equipment would also have to be replaced. However, Burroughs officials said that this limitation only existed with its newest line of computer systems. Other Burroughs computers, more advanced than those presently installed, could be used without making any more changes than would be made to use the offered substitute.

However, the Air Force has not (1) defined any near-term need for increased computer capabilities, (2) fully costed out the two alternatives, and (3) considered other potentially more economical alternatives. The Air Force's evaluation only considered the continued lease of existing equipment or the lease of substitute equipment. Our analysis of limited data from the Air Force on the cost of the present contract shows that over \$140 million has been spent to rent existing Burroughs computers and if this equipment continues to be leased, rental charges for the years 1980 through 1985 could approach an added \$184 million. Also, if some or all of the existing computers are to be used for more than 4 years, the purchase of selected computer equipment would appear more economical than its continued lease.

Thus, to pursue acceptance of the lease of the substitute equipment as the preferred alternative for interim base-level support would be premature at this time. To assure that the Government's best interests are served, we believe a more

complete evaluation and negotiation of all practical alternatives, including the potential purchase of existing equipment, should be seriously considered before selecting an interim support approach. Also, the General Services Administration has told the Air Force that other procurement alternatives should exist and all should be completely negotiated before the alternative serving the Government's best interest is determined.

Therefore, we believe that selection of an interim support alternative should take place only after all available alternatives and related total life cycle costs have been developed. We think the selection should be governed by governmentwide policy and economic considerations and not dominated by the prospect of increased computer capabilities at the same or lower lease costs.

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NINETY-SIXTH CONGRESS
Congress of the United States
House of Representatives

COMMITTEE ON GOVERNMENT OPERATIONS
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March 20, 1979

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Honorable Elmer B. Staats
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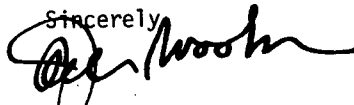
Dear General:

For the past year the Committee has been conducting an investigation of the Department of the Air Force's management and use of its ADP and telecommunications resources. As part of this effort, we recently completed a review of their proposed replacement of all existing base level computer systems. This program, referred to as Phase IV, is a \$3 billion procurement of approximately 200 large-scale ADP systems designed to replace the entire complement of Univac 1050-II and Burroughs B3700/4700 systems installed worldwide. As a result of our review, the Air Force agreed to modify various aspects of the procurement prior to formally releasing the request for proposals. Accordingly, the RFP was released in December, 1978 and currently has a due date for vendor responses of June, 1979.

Since the release of the procurement documents in December, it has come to my attention that the procurement has been overshadowed by problems relative to 1) the small number of vendors who are seriously pursuing the competition, 2) the Air Force's evaluation of an unsolicited proposal from the Burroughs Corporation, and 3) a recent Air Force Audit Report which questions the need and justification for attempting to procure a minimum of two separate systems for each base. Given the severity of the problems outlined above, I feel a follow-up investigation to review these and other problems is necessary to ensure that this program is brought to a successful completion in the most efficient and effective manner possible.

Accordingly, I am requesting that you initiate an immediate review of this matter and report back to the Committee prior to the scheduled receipt of vendor proposals by the Air Force in mid-June.

With best wishes, I am,

Sincerely,

JACK BROOKS
Chairman

(913420)