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Report to Rep. Jack Brooks, Chairman, House Committee on Government Operations; by Elmer B. Staats, Comptroller General.

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Organization Concerned: Department of Commerce; Bureau of the Census.

Congressional Relevance: House Committee on Government Operations; House Committee on Post Office and Civil Service; Senate Committee on Commerce, Science, and Transportation. Rep. Jack Brooks.

Authority: Brooks Act (P.L. 89-306). OMB Circular A-109. Federal Management Circular 74-5. F.P.M.R. 101-35.2.

A review of the Bureau of the Census' management and use of automatic data processing (ADP) resources concentrated on the Bureau's justification for a noncompetitive acquisition of an additional large-scale computer system at an estimated cost of over \$13 million. The Bureau's study of its needs was inadequate and resulted in overstating certain workload requirements. Its projection of its capacity excluded weekend capacity and productivity increases and underestimated the improvement of current capacity through augmentation of the existing systems. GAO's analysis of revised requirements versus existing capacity indicated that a noncompetitive acquisition of another large-scale computer system is unnecessary at this time. The Department of Commerce and the Bureau should study the Bureau's requirements, objectives, and management policies and actions needed to meet their needs through 1982 and properly plan and acquire the capabilities needed for the 1980s.
(Author/HTW)



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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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B-115369

December 13, 1978

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

Dear Mr. Chairman:

At your request, we are reviewing the Bureau of the Census' management and use of automatic data processing (ADP) resources. Background on the Bureau's ADP planning deficiencies was given to the Secretary of Commerce in our prior report "Inadequacies in Data Processing Planning in the Department of Commerce" (FGMSD-78-27, May 1, 1978).

As you requested, we concentrated the first phase of this review on the Bureau's justification for a noncompetitive acquisition of an additional large-scale computer system at a cost estimated at over \$13 million. This acquisition was planned as part of a \$42 million ADP equipment acquisition plan to support the Bureau's needs through fiscal year 1982. A competitive acquisition for the replacement of all or most of the Bureau's major computer systems (all of which were acquired noncompetitively) was targeted for 1982.

We reviewed the Bureau's study of its needs, computer resource usage statistics, and a Federal Computer Performance Evaluation and Simulation Center study and interviewed users and management. We found that:

1. The Bureau's study of its needs was inadequate and resulted in overstating certain workload requirements for fiscal years 1980 through 1982 by as much as 25 percent.
2. The Bureau's projection of its capacity excluded weekend capacity and productivity increases and underestimated the improvement of current capacity through augmentation of the existing systems.
3. Our analysis of the revised requirements versus existing capacity indicates that a noncompetitive acquisition of another large-scale computer system is unnecessary at this time.

FGMSD-79-5
(91340)

Major questions remain unanswered concerning the Bureau's planning for the 1980 Decennial Census processing, the Bureau's short- and long-range ADP objectives, the definition of the mission-essential requirements and their priorities, and whether needed management actions will be developed and implemented.

Acting on your Committee's suggestion, we urged the Department of Commerce and the Bureau to study the Bureau's requirements, its short- and long-term objectives, and management policies and actions needed to both meet their needs through 1982 and properly plan and acquire the capabilities needed for the 1980s. Commerce's Assistant Secretary for Administration and the Bureau's Director have formally agreed to make the study, and we have agreed to monitor it (see enclosure). The Bureau's management has made a substantial commitment of resources to this new study and solid progress has been made. Details of our findings follow.

INADEQUATE STUDY

The Bureau, as required by the General Services Administration Federal Management Circular 74-5 1/ and other policies and regulations implementing the Brooks Act (Public Law 89-306), had not

- performed a well-documented requirements study to define its specific needs;
- revalidated its current workload to determine whether it was mission-essential or whether it could be performed more effectively, efficiently, or economically;
- properly planned and justified the projected new workload by defining its mission need and determining the workload's worth, need, and feasibility; and
- taken needed management actions to increase the efficiency of ADP operations and software and to make more of its present computer capacity available to end users.

1/In effect during the period under review. This is now incorporated in Federal Property Management Regulation 101-35.2.

Further, the Bureau had not, as required by the Office of Management and Budget Circular A-76, studied or demonstrated that its Government installation was more economical than commercial computer services. Use of commercial services might permit the Bureau to avoid both another noncompetitive acquisition and additional Government investment.

Workload overstated

Our analysis indicates that, in certain areas, the Bureau overestimated its stated requirements by as much as 6,500 central processing unit (CPU) hours or about 25 percent of its annual requirements for fiscal years 1980 through 1982. The Bureau estimated that its annual workload would increase from 15,123 CPU hours in fiscal year 1978 to 29,088 CPU hours in 1982, an increase of about 92 percent.

Much of the growth, over 55 percent of the increase, was for new applications of computer terminals for support of (1) functional analysts (39 percent of the increase), (2) computer-assisted telephone interviewing and instruction (12 percent), and (3) interactive graphics development (4 percent). Another 34 percent of the increase was to come from a steady increase of its recurrent workload, while only 11 percent of the increase was to come from a periodic census and survey programs (including the 1980 Decennial Census).

Weak justifications

The Bureau's documentation justifying the new applications of computer terminals to support functional analysts is weak. These applications, 39 percent of the workload increase, are not adequately justified. The requirement was not even documented until after the submission of the acquisition plan for final departmental approval, and the justifications that were prepared were inadequate because

- half did not relate the need for the application to mission or programs;
- most did not contain any analysis of cost, benefits, or workload data and failed to relate the need to any operational problem(s);
- none indicated what, if any, corrective actions had been taken to resolve problems caused by a lack of terminals; and

--nearly all failed to indicate what, if any, alternatives had been considered.

Interviews with senior management in the Bureau's functional areas indicate they perceive a real need for such applications. In some cases the applications were requested several years ago but implementation plans were not developed by the data processing activity. The Bureau has few procedures and no formal process by which such requests are studied, reviewed, approved, planned, and implemented. We believe a properly scoped and planned implementation of these applications would eliminate at least 3,000 CPU hours from the Bureau's annual requirements for fiscal years 1980 through 1982.

We studied one of the oldest requests--for 39 terminals and substantial computer system support--to upgrade an application with on-line inquiry and updating capability and expanding it to distribute data to other Federal agencies. We found it to be (1) unsupported because end users do not need quick updating, (2) improbable that it can be performed as the Bureau's equipment acquisition plan indicates, and (3) probably not needed in the near future because necessary implementing legislation regarding the distribution of confidential data to other Federal agencies has not been enacted.

We are conducting a separate study of the legislative and confidentiality issues associated with the expansion of this application. However, we believe the other issues could have been resolved and the basic portion of the application fully developed and operational if the Bureau had had a good process for developing new applications.

Other new applications

The computer-assisted telephone interviewing and instruction applications and the graphics development applications have been studied by the Bureau. However, the Bureau has not adequately planned or evaluated the implementation of these applications. The Bureau's plan indicated that these applications were to be primarily supported by minicomputers. Thus, while remaining an open question until properly planned, they do not have much bearing on the decision relating to the acquisition of another large-scale computer system.

Workload performed on contract

Another portion of the stated workload requirements in the Bureau's acquisition plan is work that is being satisfactorily performed on contract. It is improper to include such workload as justification for a noncompetitive acquisition, and the Department disallowed these requirements. This eliminated over 2,000 CPU hours annually from the Bureau's stated requirements for large-scale computer systems in fiscal years 1980 through 1982.

Conclusion

The Bureau's inadequate study led to an overstatement of workload requirements for fiscal years 1980 through 1982 of at least 5,000 and as much as 6,500 CPU hours annually. In addition, other new workload requirements have not been adequately planned and evaluated.

CAPACITY UNDERESTIMATED

The Bureau estimated the combined capacity of its existing computer systems (three single processors and one multiprocessor) at 13,260 CPU hours annually. This estimate was based on implementation of several equipment additions and replacements (augmentations) to the existing computer systems and a 5-day normal workweek (15 shifts). The Bureau's plan forecasted a 15,828 CPU hour capacity shortfall by fiscal year 1982 against its projected requirements of 29,088 CPU hours. It planned to meet this shortfall primarily by (1) acquiring about 25 minicomputers (mostly to support the new applications mentioned previously) and (2) acquiring an additional large-scale computer system. The minicomputers were to provide about 5,842 CPU hours by fiscal year 1982, and the additional large-scale computer system, most of the balance.

The Bureau's estimates of CPU requirements and capacity for fiscal years 1978 through 1982 were:

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
Requirements	15,123	21,698	25,438	28,015	29,088
Capacity	<u>13,260</u>	<u>13,260</u>	<u>13,260</u>	<u>13,260</u>	<u>13,260</u>
Shortfall	<u>1,863</u>	<u>8,438</u>	<u>12,178</u>	<u>14,755</u>	<u>15,828</u>

The Bureau's plan for meeting this shortfall was through:

Minicomputers		2,694	4,791	5,646	5,842
New large system		<u>5,353</u>	<u>9,329</u>	<u>9,771</u>	<u>9,729</u>
New capacity		8,047	14,120	15,417	15,571
Weekend Work (underuse)	<u>1,863</u>	<u>391</u>	- <u>1,942</u>	- <u>662</u>	<u>257</u>
Total	<u>1,863</u>	<u>8,438</u>	<u>12,178</u>	<u>14,755</u>	<u>15,828</u>

After eliminating some of the questionable requirements and minicomputer capacity, we estimate the Bureau's large-scale system CPU hour requirements to be as follows:

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
Requirements	15,100	17,500	16,300	18,700	20,000

We estimate the CPU hour capacity of the currently installed systems to be:

Normal	15,200	17,100	17,500	18,000	18,400
Weekend	<u>5,100</u>	<u>5,700</u>	<u>5,800</u>	<u>6,000</u>	<u>6,100</u>
Total	<u>20,300</u>	<u>22,800</u>	<u>23,300</u>	<u>24,000</u>	<u>24,500</u>

Thus, a reserve capacity is left of:

5,200	5,300	6,500	5,300	4,500
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Our analysis of the production statistics of the installed computer systems, one of which has been partially augmented with additional memory, indicates a production capacity of at least 15,200 CPU hours for the normal 5-day (15 shift) workweek. Another 5,100 CPU hours is available annually from five of the six shifts on the 6th and 7th days of the week which may be used either as regularly scheduled operations or as reserve capacity for peaks in the workload.

Thus, we estimate that 20,300 CPU hours of capacity, annually, are available from the existing computer systems.

We estimate that at least 10 percent more capacity can be obtained through additional augmentation of the currently installed computer systems with, for example, a front-end communications processing system and additional disk storage, which would eliminate inefficient functions from the current CPUs. Further, we believe that additional useful capacity can be gained (we used 2-1/2 percent annually in our estimates) through a well-directed performance evaluation and an improvement program aimed at maximizing the availability and efficiency of use of the computer resources. The program should, as a minimum (1) analyze workload and workflow characteristics to identify areas needing improvement and provide the basis for better scheduling, (2) establish a performance reporting system that provides resource utilization data for the computer center and user management, (3) develop the performance data and objectives that will lead to cost charges that penalize wasteful use of resources, and (4) use monitors to identify application computer programs that are resource wasters.

Concurrently, a strong management improvement program should begin by establishing performance agreements between the user management and the data processing center management. These agreements should be based on the results of the performance monitoring program and should lead to user related procedures and controls promoting efficiency while making more capacity usable. Examples of needed procedures are:

- A mass storage restriction on computer terminal sessions to stop large applications from being inefficiently executed from such terminals.
- A purging procedure to remove seldom referenced files from disk storage because this storage is expensive.
- Rules encouraging better scheduling of jobs.

The Bureau's analysis of current computer systems capacity understated total system capacity by (1) assuming only a 5- or 6-day workweek, (2) understating the capacity of one of its computer systems, (3) underestimating the potential increase in capacity of the installed computer systems through augmentation, and (4) disregarding potential increases from more efficient operational policies and software.

MAJOR QUESTIONS REMAIN UNANSWERED

Our estimate of the Bureau's requirements is based largely on requirements as stated by the Bureau. Because of a lack of documentation, we were not able to confirm the Bureau's estimates. The rates of increase for the periodical censuses and surveys and the recurrent workload (the bulk of the large-scale computer system requirements) are supported by historical data.

However, the periods of historical data used involved frequent machine failures and reprocessing of work. Thus, the Bureau's estimates for the bulk of its ongoing applications were probably higher than if the historical data had been adjusted. A more deliberate, well-documented study would have tied the estimates to program workloads, adjusted the historical data, and left less doubt concerning the basic workload estimates.

Uncertainty of 1980 Decennial
Census workload estimates

We have not been able to determine what system alternatives are available to the Bureau to help it meet its 1980 Decennial Census data processing requirements. Bureau management has expressed serious concern that the present equipment (even if fully augmented) will not be able to handle both the critical workload of the 1980 Decennial Census and the processing requirements of other important Federal statistical programs.

One issue raised by management is that insufficient capacity exists to cope with the peaks in the workload. Another concern is that a lengthy disruption of service on the Bureau's major computer system could cause it to miss its target dates for completion of the Decennial Census or other current survey reporting deadlines (such as for monthly estimates of unemployment and monthly statistics on foreign trade).

Sufficient capacity

As of August 1978, we were unable to obtain firm plans and estimates from the Bureau for the Decennial Census data processing workload. In addition, the Bureau's study did not tie the estimates of other workload directly to programmatic requirements and prioritize the requirements and workload. Nor has the Bureau fully determined what workload could be

deferred or offloaded to other Government or private installations and what installations could provide backup capacity in a short-term emergency. In our opinion, neither issue can be resolved without these elementary pieces of information and good contingency planning.

Based on the Bureau's study estimates, which are in large part substantiated by its experience with the last Decennial Census, the Bureau does not need additional CPU capacity, either primary or reserve, that would be provided by an additional large-scale computer system. Although the estimates for the critical processing period of the 1980 Decennial Census workload are vague, our calculations indicate that the additional computer system is not needed.

Except for potential peaks of workload in the 12 months of critical processing (April 1980 through April 1981) of the Decennial Census, our estimates indicate that additional large-scale computer capacity is not needed before fiscal year 1983. However, should completion of a reliable forecast of the Decennial Census indicate a needed capacity beyond that available from the existing configuration, we believe that one alternative would be to shift workload to other installations or delay lower priority tasks instead of acquiring more equipment. A contingency plan that contains an updated schedule of priorities and the impact of offloading or delaying lower priority tasks would provide senior management with a much sounder basis for investment decisions in this area.

In our opinion, the acquisition of another large-scale computer system would provide only a minimal amount of backup capability. If the system were located within the same facility, as the Bureau planned, it would be subject to most of the same risks of calamity and difficulties as the current systems. Thus, it would provide backup only in the case of a mechanical failure or other breakdown which is generally short lived, and the acquisition of another large-scale computer system as a backup machine to the present systems would not provide any real insurance against a lengthy disruption of service.

Other questions

Other questions have also surfaced during our review. First, we wonder what priority the new applications proposed

by the Bureau have vis-a-vis the mandated workload of the Decennial Census and other reporting deadlines? What are the short- and long-term goals and objectives for the Bureau's programs and ADP activities? What are the hard requirements for data processing through 1982 and beyond? What are the most effective ways of meeting these requirements? Is the enlargement of the existing in-house installation's capacity the only way to meet these requirements effectively and economically? And finally, can Bureau management develop and implement the needed policies and controls to curb the present ineffective uses of the capacity?

Without a firm assessment of its program and ADP activities, the Bureau is guessing as to its needs for (1) mini-computers, (2) developing new applications for the existing large-scale systems, or (3) an additional large-scale computer system. Without sound management control and answers to the above questions the Bureau should not proceed.

NEW STUDY IS UNDERWAY

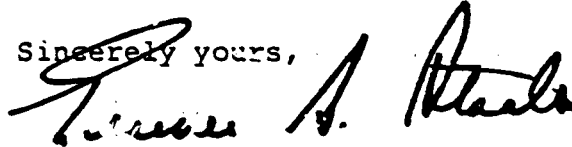
On May 31, 1978, we discussed with Bureau and Department management our initial findings and the preliminary conclusion that an additional large-scale computer system was not needed at this time. Acting on a suggestion from your Office, we urged the Department and Bureau management to jointly perform a new, comprehensive study of the Bureau's requirements, short- and long-term objectives, and the relevant aspects of its ADP planning, management policies, and operations. In July the Director of the Bureau and the Assistant Secretary for Administration of the Department formally agreed to make such a study (see enclosure) and we agreed to monitor it.

The study team made its first progress briefing to the Assistant Secretary for Administration and the Chief Economist of the Department on August 25, 1978. The study plan calls for completion of the study by April 1979 with recommendations concerning the fiscal years 1979 through 1982 period and a mission needs analysis through fiscal year 1994 (following the Office of Management and Budget Circular A-109 guidance). The Bureau's management has already made a substantial commitment of resources to the project and solid progress has been made.

As you requested, we have not obtained agency comments. As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time we will send copies to interested parties and make copies available to others upon request.

Our review of the Bureau's management and use of ADP resources and available system alternatives for the Decennial Census processing workload will continue in parallel to our monitoring of the new study. We will keep you informed of our progress.

Sincerely yours,



Comptroller General
of the United States

Enclosure

Agreement for a
Joint Project to Develop a Requirements Study
for the Bureau of the Census

I. Background

The Census Interim Requirements Study (CIRS) dated January 31, 1978 for upgrading the Census ADP facility to handle the 1980 Decennial Census and other Census projects through the 1982 timeframe has been reviewed by the Department (OADPM). Subsequent to the Departmental review of the Census study, the GAO performed an audit of Census requirements and determined that a requirements study in accordance with DAO 212-1 must be conducted to develop and validate workload statistics, processing priorities and to evaluate feasible alternative processing methodologies. GAO has volunteered 2-3 professionals for a six month period to advise and monitor the preparation of the new requirements study. The study will be conducted primarily by the Bureau of the Census with assistance from the Department of Commerce and monitoring from GAO.

II. Project Organization

A. Project Leadership

The requirements study team will be co-chaired by Bruce Ramsay, Associate Director for EDP of the Census Bureau and Mirco Snidero, Director of the Office of Management and Computer Systems of the National Oceanic and Atmospheric Administration (NOAA). The co-chairmen will be responsible for all activities of the requirements study committee including organization and work assignments, periodic progress reporting and preparation, coordination and issuance of a final report.

B. GAO Participation

Dr. Carl Palmer will head the GAO team of auditors. The auditors will provide advice on the conduct of the study, monitor progress, review interim output and validate key portions of the workload requirements.

C. OADPM Participation

Mr. Orin Tobey of the OADPM will serve as Administrative Officer of the Committee. Mr. Tobey will be responsible for integration of outputs from the Committee working groups, preparation of reports on progress of the Committee against established milestones and all administrative tasks associated with production of a final report and adherence to the requirements of

P.L. 89-306, FMC 74-5, DAO 212-1, DAO 208-3 and other pertinent regulations.

D. Census Participation

The Census Bureau will provide approximately 15 technical personnel, with contractor assistance as needed, full-time under the direction of the co-chairmen to conduct the requirements study. At the direction of the co-chairmen, the Census personnel will organize into subgroups to study and define mission essential processing requirements leading to specific ADP resource workload requirements (e.g., terminal requirements, program development needs).

III. Requirements Study Form and Content

Attachment 1 is an outline of the format that the requirements study will follow. Within the prescribed format, the following areas must be considered as major objectives of the study:

- (1) To derive a clear statement of near- and far-term ADP objectives.
- (2) To derive a sound, management-backed strategy for achieving these objectives with full development, exploration and documentation of feasible alternatives.
- (3) To obtain a concise, well-documented statement of existing and future requirements for computer support across all divisions. This will start with an inventory of all current computer applications.
- (4) To analyze and define the Census Bureau processing workload, with special emphasis on timing of the Decennial Census timeframe requirements, an alternative ways of meeting them at minimum cost and disruption to other important activities. This analysis will consider offloading of suitable work. This item will be considered a priority objective of the study in order to meet the October 1, 1978 requirements definition of Section V.
- (5) Maximize availability of present Census Bureau processing capacity to its user divisions.
- (6) To define top management actions needed to implement sound management control, project results assurance, and needed improvements in ongoing systems.

- (7) To identify the mission-essential (core programs) processing workload demands, rank the incremental demands above the core requirements and, after consultation with OMB and sponsoring agencies, rank the reimbursable program workload demands. The purpose of this ranking is so that trade-off decisions can be made in the face of constrained resources.

IV. Detailed Study Plan and Work Assignments

The co-chairmen will produce the detailed study plan as the first order of business. The plan will include work assignments, schedules and reporting milestones.

V. Reporting Milestones and Procedures

The first task will be to complete a detailed schedule with associated reporting milestones within two weeks from the date of the latest signature to this Agreement. The schedule should include: (1) estimated time for completion of the project; (2) completion of catalog of all computer applications and files (30 days); (3) completion of the Decennial Census timeframe requirements definition by October 1, 1978; (4) Definition of out-year requirements in one-year increments.

The project status will be reported bi-weekly to the Assistant Secretary for Administration, the Chief Economist, and the Director, Bureau of the Census, with advice and consultation provided by the Assistant Secretary for Science and Technology. This briefing will be accompanied by a written report which will be made part of the project record. The status report will consist of not less than: (1) progress against plan; (2) resources expended; (3) technical or management difficulties outstanding; and (4) confirmation or change in the established milestones.



 Manuel D. Plotkin, Director
 Bureau of the Census

July 12, 1978
 Date



 Elsa A. Porter, Assistant Secretary
 for Administration

July 14, 1978
 Date



 Carl Palmer, Audit Manager
 U. S. General Accounting Office (FGMSD)

July 13, 1978
 Date

ATTACHMENT 1

DAD 212-1

REQUIREMENTS STUDY

- I. **Conclusions and Recommendations**
Briefly describe the problem and how you propose to solve it.
List major benefits and the cost.
- II. **Problem Description**
Discuss the problem to be resolved in detail.
Explain how the problem developed and what impact it has on the mission.
- III. **Workload**
 - A. Present
 - B. Future
- IV. **Proposed Solution**
Describe in detail how you plan to solve the problem.
Quantify where possible. Describe what other ADP resources will be required through the life of the system. Why is this the best alternative?
- V. **Summary of Benefits**
Quantify:
Cost savings or avoidance
Manpower savings or avoidance
How will the proposed solution support the mission?
Other benefits.
- VI. **Other Alternatives Investigated**
Describe each alternative investigated and tell why it was not selected.
- VII. **Resource Requirements**
Space, site preparation, personnel, maintenance, etc.
- VIII. **Financial Summary**
How will the ADP resources cost by year for the life of the system?
Identify where the initial funds will come from.
Budget line item should be used if applicable.
- IX. **Lease vs. Purchase Analysis**
Consider lease, purchase and maintenance costs for the life of the system.
- X. **Implementation Schedule**
List the important events which will lead up to

DAO 212-1

acceptance of the system. These events will include issuing the RFP, award, site preparation, training, installation of the system, and acceptance of the system.

- XI. A-76 Analysis (if applicable)
- XII. Sole Source Justification (if applicable)
- XIII. Telecommunications Requirements (if applicable)
See 41 CFR 101-32.11