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BY THE COMPTROLLER GENERAL

**Report To The Chairman**                      **RELEASED**  
**Committee On Government Operations**  
**House Of Representatives**  
**OF THE UNITED STATES**

**Department Of Commerce Could Save  
\$24.6 Million By Modifying  
Computer Procurement Actions**

The National Bureau of Standards and the Environmental Research Laboratories-- both part of the Department of Commerce-- need more computer capability to support scientific workloads. Because of the size and location of this workload, it would not be cost-effective to meet the requirements of both with one general-purpose computer facility. By modifying current procurements, this capability could be acquired for \$24.6 million less than currently planned.

Further, certain needs of both agencies for a large-scale, scientifically oriented computer could be economically met through sharing. This sharing could take place at a proposed departmentwide scientific data center to be established at either agency.



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

B-207280

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

Dear Mr. Chairman:

At your request we have reviewed the computer requirements of the National Bureau of Standards (NBS) and the Environmental Research Laboratories (ERL). NBS is an independent agency within the Department of Commerce (DOC) and ERL is part of the National Oceanic and Atmospheric Administration (NOAA), also an independent agency within the Department.

Your letter of January 7, 1982, requested that we determine (1) the feasibility of consolidating the requirements of NBS and ERL and establishing a single data processing center for both organizations, (2) the best location for a single data processing center, (3) the expected cost savings from establishing this center, and (4) the feasibility of a single telecommunications network. Your letter also requested information on the workload justification for two ongoing requests for proposals (RFP's) for acquiring computer hardware and support services for NBS and ERL. On March 10, 1982, we briefed your office on the results of our review and, at your request, are providing this written report.

We found that it is feasible to consolidate NBS' and ERL's computer requirements and establish a single data processing center for both organizations. But the cost of a single general-purpose facility to meet the requirements of both agencies exceeds the cost of maintaining two separate general-purpose facilities by several million dollars. Further, the quality of service provided by a single facility may be less than that provided by two. Savings and improved service could result, however, if certain needs of both agencies for a large-scale, scientifically oriented computer were met through sharing.

To permit effective sharing of a computer for large scale scientific work, NBS' or ERL's computer center may be designated as the location for a Department of Commerce scientific data processing center. In our view, either the NBS general-purpose computer, as specified in its RFP, or ERL's current general-purpose computer could provide the technical support for a departmentwide scientific data processing center. We believe that the Department of Commerce should decide where to locate such a center after completing a cost-benefit study.

We found, overall, that the justifications offered by NBS and ERL for their computer requirements contain no significant problems. However, the procurements being planned by these agencies exceed what is needed to meet these requirements. By modifying NBS' and ERL's RFP's, a savings of \$24.6 million could be achieved. NBS and ERL officials concurred with our proposals and said they plan to modify their RFP's accordingly.

#### OBJECTIVES, SCOPE, AND METHODOLOGY

We conducted our review in January and February of 1982. We examined relevant documents for computer requirements at NBS, NOAA, and the Department of Commerce. In addition, we interviewed program officials of all four organizations and visited all of ERL's laboratories. In evaluating computer requirements we examined historical data on actual computer use and comparative data from other laboratories. We also reviewed the documentation supporting NBS' and ERL's RFP's. Our work was done in accordance with our "Standards for Audit of Governmental Organizations, Programs, Activities, and Functions."

With input from NBS we prepared a limited study of the cost of one facility versus two. A key component of this study was the cost of telecommunications. Because of limited data and time, the results of this study are not precise. However, we believe the study provides a reliable basis for concluding that the cost of one facility would exceed the cost of two.

#### BACKGROUND

NBS and ERL are scientific research organizations. NBS is responsible for performing research and establishing standards for the physical sciences. For example, NBS sets standards for weights, time, and building materials. ERL is responsible for research on the environment and for developing meteorological forecasting procedures. The majority of NBS' employees are located at Gaithersburg, Maryland, and NBS also has a small staff co-located with ERL at Boulder, Colorado. ERL has its main facility at Boulder and has four laboratories located in Miami, Florida; Ann Arbor, Michigan; Seattle, Washington; and Norman, Oklahoma.

NBS and ERL both operate central computer facilities which provide support for their scientific and administrative users. NBS' staff at Boulder uses ERL's central computer facility. This computer center also supports ERL's other laboratories through a telecommunications network. NBS' central computer facility is at Gaithersburg and ERL's is at Boulder.

Until recently, NBS and ERL had been operating obsolete computers with limited capacity. Both organizations have recently

acquired more modern computers of limited capacity on an interim basis. Moreover, both organizations lag behind comparable laboratories in their use of computer technology. In our 1979 report 1/ on NBS' automatic data processing (ADP) resources and information needs, we concluded that NBS' ability to meet mission requirements was hindered by inadequate computer capability.

### NBS' AND ERL'S COMPUTER REQUIREMENTS

Overall, NBS' and ERL's computer requirements consist of two broad categories--interactive and batch. Interactive computer use involves a user who is in direct communication with the computer by means of a computer terminal. The computer and the user interact as the machine executes the user's instructions. Unlike interactive uses, batch operations do not require the user's active involvement with the computer. A batch computer program is submitted to a computer center to be processed when computer time is available.

The primary computer requirements of NBS and ERL are similar. For both, the workload consists of program development, small and medium-sized numerical models, data base management systems for manipulating information, graphics, word processing and text editing. Most of these are interactive as contrasted with batch operations. NBS has an average of 50 simultaneous interactive users between 8 a.m. and 5 p.m. During this same period ERL's central facility has an average of 100 simultaneous interactive users.

Based on NBS and ERL estimates, we conclude that the average simultaneous interactive users of both organizations combined will exceed 300 by 1983. Current general-purpose computers are unable to handle an interactive workload of this size. As a result, both NBS and ERL require a general-purpose computer, not only for interactive work but for other local processing needs such as graphics and data base management. We believe NBS' and ERL's interactive workloads justify having such a computer at each organization.

To meet processing needs, two types of computers are available: (1) computers which process both interactive and batch

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1/"National Bureau Of Standards Needs Better Management of Its Computer Resources To Improve Program Effectiveness" (CED-79-39, Apr. 17, 1979).

applications and (2) high-speed, large, scientifically oriented computers. These latter computers are designed to process large scientific applications very efficiently and at speeds three times faster than the largest nonscientifically oriented machines. They have very large memories to process large mathematical arrays, and they efficiently handle big numbers and small fractions. Because of these attributes, such computers are generally not operated as stand-alone equipment but are supported by a second machine--a general-purpose computer--which handles such functions as input/output of data, telecommunications, and interactive processing. Although neither organization has sufficient workload to justify a large, scientifically oriented computer at this time, their projected requirements combined with those of other agencies within the Department justify the acquisition of such a computer in the mid-eighties.

CONSOLIDATING NBS' AND ERL'S  
GENERAL-PURPOSE COMPUTER  
FACILITIES HAS FEW ADVANTAGES

Establishing a single data processing center for general-purpose computer work at NBS and ERL would not result in cost savings. First, a single computer facility would not reduce the amount of general-purpose equipment needed to support NBS and ERL. Two large general-purpose computers would be required whether the machines were in one or two locations because of the size and location of the workloads, particularly interactive processing. Second, although a single facility should reduce direct operational support personnel, the potential savings in this area could be offset by an increase in telecommunications costs.

With input from NBS, we estimated the net cost effect of one computer facility versus two. We found that over the next 5 years, operating one facility would cost approximately \$6 million more than operating the two existing facilities. This estimate includes the use of satellite links as a telecommunications approach. However, satellites are used primarily for batch data transmission, not for interactive computer use. As a result, there is a risk that this approach may not provide reliable and high-quality service. Other telecommunications approaches are available, but at higher costs.

A SINGLE DEPARTMENT OF COMMERCE  
DATA CENTER FOR PROCESSING LARGE  
SCIENTIFIC APPLICATIONS IS NEEDED

NBS' and ERL's combined needs for a computer to support large-scale scientific requirements present the Department of Commerce an opportunity to consolidate. The establishment of a

departmentwide scientific data center would enable both organizations, as well as other Commerce agencies, to share the cost and use of such a computer facility. Sharing this center's computer would make large-scale scientific computer support available to NBS and ERL before either could individually justify such a facility.

Large-scale, scientifically oriented computers are commonly devoted to complex mathematical operations while support functions, i.e., telecommunications, input and output operations, interactive processing are usually handled by nonscientific, general-purpose computers. In preparing for this computer center, both organizations will have the general-purpose computer capability to support the proposed departmentwide scientific data processing center.

In discussions with NBS, NOAA, and Commerce ADP managers, we found strong support for the establishment of a Commerce scientific data processing center to meet common computer needs. Since the Department of Commerce has the overall authority and resources for establishing such a center, it would be in the best position to initiate the proposed departmentwide scientific facility. Establishing such a center at NBS or ERL would result in considerable savings. NBS would not require a second general-purpose computer in 1986, a savings of \$5.2 million. Also, ERL's long-range requirement for a large-scale scientific computer would be satisfied.

#### NATIONAL BUREAU OF STANDARDS PROCUREMENT

NBS developed a plan to upgrade its computer capability in a series of measured steps rather than attempting to catch up in a quantum leap. From 1978 to 1982 NBS significantly increased its resources for management, better requirements analysis, and improved central software support. These changes were all closely in line with recommendations made in our 1979 report.

NBS' 1982 RFP also follows a strategy of gradually increasing capability. According to NBS, its plan calls for a general-purpose computer in 1983 and another general-purpose computer in late 1986 or 1987. In addition, it specifies an increase in special equipment for printing, graphics, and peripheral equipment support. The Department's large-scale, scientifically oriented computer should satisfy the needs this second computer was intended to meet.

We reviewed NBS' current requirements analysis to determine whether the projected workload was adequately stated. A current top-of-the-line, general-purpose computer provides approximately twice the capacity NBS is currently using. An increase of this

size appears reasonable considering the nature and volume of the current and projected workload. NBS conducted a study which showed that after acquiring all the computer support called for in its 1982 RFP, it would still have significantly less computer capacity than any comparable laboratory it evaluated. Further, NBS' computer requirements have been evaluated by two additional independent review groups. Both groups reported that NBS has significant ADP problems and stated that the computer requirements specified in the current RFP were fully justified.

One major requirement in NBS' RFP that we found to be unsupported was the need for a mid-range, general-purpose computer for its facility at Boulder. This facility is currently supported by ERL's central computer. Since the support being provided by ERL is adequate, it is not cost-effective to provide a separate NBS computer facility at Boulder. We proposed that this requirement for a computer in Boulder be deleted. NBS officials agreed and said they plan to modify the RFP accordingly.

COMMERCE'S UNIVAC COMPUTER  
CONSOLIDATION MAKES NBS'  
COMPUTER NEED CRITICAL

Recent actions by the Department of Commerce make it critical that NBS's RFP not be delayed. In early 1982 NBS acquired a UNIVAC 1100/82 computer as an interim computer until it could competitively acquire a general-purpose computer for scientific work. Subsequently, the Department of Commerce assumed control of the UNIVAC 1100/82 computer to carry out its UNIVAC computer consolidation. This plan calls for consolidating administrative applications of several Commerce agencies on a single UNIVAC. These applications include payroll, personnel, and accounting. Commerce plans to close three UNIVAC computer centers which are currently operating obsolete hardware and to use the UNIVAC 1100/82 to meet their needs. This consolidation plan was based on NBS acquiring its own computer through its current RFP.

As a result of the UNIVAC consolidation, NBS' scientific computing requirements cannot be satisfied. We are concerned that as other users transfer administrative work to the UNIVAC 1100/82, NBS' scientific users will receive less computer support than required. Capacity problems may develop at NBS even under the current schedule of transferring administrative work to the UNIVAC. Therefore, if the acquisition of NBS' scientific computer is delayed, these computer capacity problems will be increased.



ENVIRONMENTAL RESEARCH  
LABORATORIES ACQUISITION

Until 1980, ERL operated two old and obsolete computers. In 1980 ERL acquired a Cyber 170/750 computer as an interim upgrade until it could complete a fully competitive acquisition in 1982. At the time ERL acquired the Cyber 170/750, it was already involved in completing its RFP for a replacement computer. ERL's RFP is stated in functional terms. As a result, until the bidding process is completed, it is difficult to precisely specify the computer capability to be acquired. In general terms the RFP is designed to (1) replace ERL's central facility (Cyber 170/750) by a general-purpose computer in 1983, (2) acquire mid-range, general-purpose computers for ERL's geographically separated laboratories and certain sublaboratories at Boulder, and (3) upgrade ERL's central computer facility with the addition of a large-scale, scientifically oriented computer in late 1985.

Since preparing this RFP, ERL incurred program cuts and has reevaluated the projected growth in its workload. As a result, we found that ERL's current central facility, equipped with the Cyber 170/750 computer, is adequately meeting its needs. In addition, this computer can be augmented with another central processing unit which would increase its capacity approximately 50 percent.

We also found that ERL's requirement for laboratory computers could be adequately met by minicomputers rather than the large general-purpose computer. This modification is also appropriate because ERL lacks the support staff needed to operate such computers. In light of recent events, ERL management agreed that it would be feasible to retain the Cyber 170/750 and to acquire minicomputers for its laboratories.

POTENTIAL COST SAVINGS FROM  
MODIFYING NBS' AND ERL'S RFP'S

The combined procurement cost of NBS' and ERL's current proposals is \$65.7 million. We estimate that modifying NBS' and ERL's RFP's would result in procurement costs of \$41.1 million, a net saving of \$24.6 million. When we discussed our proposals with NBS and ERL officials, they agreed that these potential cost savings can be realized. Based on our analysis of agency data, the changes we recommend and the savings we estimate are as follows:

<u>Current procurement actions through NBS/ERL RFP's</u>	<u>GAO recom- mendations</u>	<u>Net cost savings</u>
		--(000)--
NBS acquire a general-purpose computer in 1983	No change	-
NBS acquire a second general-purpose computer in 1986	Delete	\$ 5,209
NBS acquire a general-purpose computer in Boulder	Delete	1,006
ERL replace its CYBER 170/750	Delete	8,187
ERL acquire mid-range computers in 1982 for regional laboratories	Acquire minicomputers	9,533
ERL acquire a large-scale scientific computer in 1985	DOC acquire it in 1986	<u>654</u>
<b>Total</b>		<b><u>\$24,589</u></b>

CONCLUSIONS

A single computer facility using general-purpose computers to process the interactive workload of both organizations would not result in cost savings or improve operations. A single facility could increase costs by several million dollars. In light of these costs and other management factors, we believe ERL and NBS can best meet their interactive and other local needs through two separate facilities, each equipped with a general-purpose computer.

NBS and ERL could improve service to their users at a cost savings by sharing the use of a large-scale, scientifically oriented computer in a departmental computer facility. This machine could be located where the Department study determines to be most appropriate. Commerce needs to take the lead in establishing a departmentwide scientific data center and acquiring this large-scale scientific computer capability.

NBS has a requirement for a general-purpose computer in Gaithersburg, but it does not need a mid-range computer at its Boulder laboratory. Commerce's UNIVAC consolidation of administrative applications may result in computer capacity problems until NBS can acquire its own computer for scientific work. Additionally, because of the heavy administrative workload

planned for the UNIVAC 1100/82, Commerce may need to defer part of the planned UNIVAC consolidation until NBS completes its acquisition.

ERL's central facility has adequate capacity to meet most of its current and projected needs until the mid-1980's. We believe ERL should cancel its RFP. However, ERL requires smaller computers than currently planned for its major laboratories. We believe this requirement can best be met by a separate RFP.

#### RECOMMENDATIONS

We recommend that the Secretary of Commerce:

- Cancel ERL's current computer procurement and develop a new proposal to acquire minicomputers.
- Proceed with NBS' computer procurement after deleting the requirement for the NBS Boulder computer.
- Establish a Department of Commerce scientific computer center to provide for a large-scale, scientifically oriented computer capability for departmentwide use.

#### BUDGETARY IMPACT OF OUR RECOMMENDATIONS

The approach outlined above would result in a net cost savings of \$24.6 million. These savings would be cost avoidances rather than outlay reductions. Appropriations involve the Scientific and Technical Research and Services (NBS) 13(06-52) 0500. The authorizing committees are Senate Commerce, Science, and Transportation and House Science and Technology.

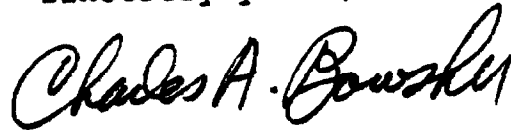
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At your request, we did not obtain formal agency comments. Further, as arranged with your office, we will not distribute this report until 30 days from this date. We will then send it to the heads of the Department of Commerce, the National Bureau of Standards, the National Oceanic and Atmospheric Administration, and the Environmental Research Laboratories; the Director, Office of Management and Budget; and the Administrator of the General

B-207280

Services Administration and will make copies available to others on request.

Sincerely yours,

A handwritten signature in black ink, reading "Charles A. Bowsher". The signature is written in a cursive style with a large, prominent initial "C".

Comptroller General  
of the United States



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