



UNITED STATES GENERAL ACCOUNTING OFFICE

WASHINGTON, D.C. 20548

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PROCUREMENT AND SYSTEMS
ACQUISITION DIVISION

OCTOBER 5, 1979

B-163074



The Honorable
The Secretary of the Navy

Attention: Comptroller of the Navy
(NCB-4)

Dear Mr. Secretary:

Subject: Potential Savings by Streamlining Grumman's
Computer Operations Supporting Navy
Contracts (PSAD-79-111)

DLG 00501

The Navy ^{AGC00001} has an opportunity to save about \$335,000 annually by reducing excess capacity in the data processing and computer operations used to support primarily Navy contracts at Grumman Aerospace Corporation. While the Navy buys such things as aircraft from Grumman Aerospace, that corporation buys data processing services--needed to support manufacturing and testing operations--from Grumman Data Systems Corporation. Both corporations are subsidiaries of the Grumman Corporation. We believe your adoption of the recommendations on page 8 will reduce the cost for data processing services which the Navy pays through the overhead accounts of Grumman Aerospace Corporation.

ELIMINATING EXCESS
STORAGE CAPACITY

Grumman Data operates several computers at the Bethpage, Long Island, New York, center. In April 1978 the center had a capacity of about 42 billion characters of disk storage costing about \$1.4 million yearly. We believe that as much as 60 percent of this capacity is unneeded. Eliminating the costs associated with excess storage capacity could reduce Grumman Data's yearly equipment expenditures by \$217,000.

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Unused storage

We evaluated the use of 54 permanently mounted disks ^{1/} that provide about 38 percent of total storage capacity. As shown in table 1, about 59 percent of available disk storage capacity was unused.

Table 1

<u>IBM model</u>	<u>Number of disks</u>	<u>Capacity</u> (millions of characters)	<u>Unused</u>	
			<u>Amount</u>	<u>Percent</u>
3330-11	12	2,400	1,075	45%
^{a/} 3350 (native)	13	4,125	2,675	65%
^{a/} 3350 (compatible)	<u>29</u>	<u>9,210</u>	<u>5,525</u>	60%
Total	<u>54</u>	<u>15,735</u>	<u>9,275</u>	59%

^{a/}At the time of our review, the contractor was using some model 3350 units as the equivalent of 3330-11 type units. These are termed compatible for purposes of this report. IBM 3350 disk units operated as 3350s are termed native. Two 3350s operating in the native mode have more storage capacity than three 3350s operating in the compatible mode. Hence, there is a substantial disadvantage in operating in the compatible mode.

About 37 percent of the unused capacity was the result of operating the 3350s in the compatible mode. Grumman Data people said that the company generally likes a 25 to 30 percent excess disk storage capacity for batch processing and 10 to 20-percent excess for online processing. Thus, a 30-percent level of excess capacity should provide a reasonable cushion for short-term growth, unforeseen needs, and routine operations.

^{1/}Certain disks are not removed from the disk drive because they are physically not removable (as with the 3350 units) or because, although removable, the disk must remain mounted to meet schedule requirements since the data is in almost constant use. These are termed permanent mounts for purposes of this report.

The data files on the disks we examined contained 6,460 million characters of information. An additional 3,065 million characters constitutes a reserve of 32 percent and would require the storage capacity of 30 model 3350 drives operated in the native mode. Hence, if Grumman Data converts its files to native mode operations and eliminates the remaining excess capacity, it should be able to release 12 IBM 3330-11 and 12 IBM 3350 disk drives. The reduction in equipment costs would amount to a yearly savings of \$217,000.

Use of less expensive tape storage
may be practical for some data

Disk storage costs have been decreasing in terms of cost-per-bit, and disk storage provides more rapid access time than magnetic tape storage. It is, however, not cost effective to store infrequently used data files on disk storage devices compared to tape storage.

We attempted to determine the date of last usage and the frequency of usage for each of the data files stored on the disks examined. We were unable to do this because the manufacturer's standard operating system did not record the information we required on the disk table of contents. Grumman Data representatives said the company elected not to produce system measurement facility records containing this information because the overhead cost of producing the records in question was too high. Thus, there was no assurance that only necessary, frequently used, and current data was stored on the disk files. To the extent that redundant or seldomly used data can be purged, additional storage space becomes available.

Contractor actions to improve
control over disk use

The contractor generally agreed that there was an excess capacity. However, Grumman Data representatives explained that the contractor had not completed its overall cost-reduction efforts. They gave us a memorandum indicating an annual savings of \$528,000 had been achieved by switching from model 3330-11 to 3350 disk drives. They also explained that the additional capacity which had been acquired would be available to meet future growth. However, they said that they had not been able to convert any of the 29 compatible mode disks to native mode, although they still planned to do so. Conversion would be accomplished during a period of low usage.

Grumman Data officials have said they are taking a number of actions to improve their visibility and control over the usage of disk space. These include acquiring additional software packages which will generate reports on space used, date of last usage, and frequency of use. The software packages will also provide for filing and retrieving infrequently used data and the automatic release of unused space.

ADDITIONAL SAVINGS POSSIBLE BY
REDUCING COMPUTER CAPACITY

Grumman Data maintains one of its computer centers at the Grumman Aerospace facility in Calverton, Long Island, New York. At the time of our review, the Calverton center had two computers. We believe that the center's workload does not justify the cost of maintaining the entire second system.

The center provides computer services to the Grumman Aerospace Automated Telemetry Station. This telemetry station provides real-time processing for aircraft flight testing. Also, the center performs data processing for some Grumman Aerospace engineering and product support work and for other Grumman Data work. Since 1974 costs have been allocated between work performed for Grumman Aerospace and other Grumman Data purposes. In 1978 Grumman Aerospace work absorbed about 80 percent of the computer center direct costs.

Excess capacity

In 1977 Grumman Data acquired a second computer for the Calverton center and in August 1978 restructured the data processing system. These changes were made to accommodate a predicted 4.7 percent growth resulting from increases in commercial sales and Grumman Aerospace engineering work. Grumman Data officials estimated that the computer changes would cost an additional \$727,000 for equipment and maintenance from September 1978 to June 1982.

If Grumman Data is unable to expand its non-Grumman Aerospace work, the Government work will bear most of the additional cost. The usage actually experienced in 1978 was about the same level as 1976 when Grumman Data operated with only one computer. Usage declined in 1978 compared to 1977. This was mainly the result of a significant decrease

in Grumman Aerospace use of the Calverton center for flight test work. Although Grumman Aerospace engineering work increased, it was insufficient to offset the decline in flight test usage.

Total usage for all work performed by Grumman Data from 1975 to 1978 did not exceed the practical workload capacity (as defined by Grumman Data) of one computer system. As shown in table 2, usage at Calverton represented only 64 and 42 percent of capacity in 1977 and 1978, respectively. For 1977 and 1978, monthly usage was on a declining trend. Based on the average use for 1976-78, current capacity is 2.9 times the amount required solely for Grumman Aerospace work.

Table 2

<u>Year</u>	<u>Number of central processors at year end</u>	<u>Computer system capacity</u>	<u>Usage</u>	<u>Percent of capacity used</u>
		(thousands of kiloword hours (KWHs))		
1975	1	a/1,725	944	55%
1976	1	1,150	910	79%
1977	2	a/1,725	1,111	64%
1978	2	2,300	958	42%

a/In 1975 Grumman Data eliminated one of its computers which had been in use previously. In 1977 Grumman Data acquired the second computer as noted above. The capacities shown for these years are based on an average of 1-1/2 computers for the full year.

During January 1978 to November 1978, weekly use ranged from 14 to 38 percent of central processor capacity, with an overall average of 24 percent. If only one central processor had been available, the highest weekly use on it would have been 77 percent. We believe that any peak periods which might occur can be reduced by scheduling noncritical jobs to less busy times. If this is not practical, work can be transferred to another commercial facility or to the contractor's other computer centers.

Our analysis showed that 90 percent of the jobs were in the input waiting line 5 seconds or less. We also calculated a job lengthening factor. This factor is the ratio of the actual time spent in executing a job to the minimum amount of time necessary for executing the job in an otherwise idle machine. For example, if a job is executed in 300 seconds on an otherwise idle machine and in 3,000 seconds on a busy machine, the job lengthening factor would be 10 (3,000 seconds/300 seconds). We found that 80 percent of the jobs we reviewed had a job lengthening factor of 6.1 or less. The median job lengthening factor was 2.8. We believe this further substantiates low use of the existing resources.

By eliminating one of the two central computer processors and a portion of the memory capacity, savings averaging \$118,700 yearly in direct computer equipment and related maintenance cost could be obtained during the period January 1980 to June 1982 without adversely affecting Grumman Aerospace Government work.

Grumman Data representatives agreed that there was an excess capacity at Calverton. They advised, however, that substantial added capacity was acquired for a relatively small (about 7 percent) increase in yearly costs. They said that this extra capacity provided them with a large growth potential.

Information provided to us indicated that for the period January 1979 to April 1979, central processor hours experienced were running about 9-percent higher than the comparable period in 1978 when Grumman Data experienced the highest weekly usage during all of 1978. Grumman Data representatives said that they expected this increased use to continue. However, as pointed out earlier, until Grumman Data is able to increase its commercial sales, the Government will bear the cost of this growth potential.

POTENTIAL FOR INACCURATE ALLOCATION
OF COSTS TO GOVERNMENT WORK

Grumman Data uses two algorithms 1/ to calculate the KWHs used. One algorithm is used for the real-time

1/A procedure for solving a mathematical problem in a finite number of steps that frequently involves repetition of an operation.

telemetry system, the other for all other work. Resource accounting should provide consistent measuring and charging for computer resources used. We believe, however, that accurate charging is not being done.

For the 8 weeks we analyzed (during December 1977 to May 1978), 61,000 KWHs were recorded for real-time telemetry system work. However, use of the telemetry algorithm understated resources used by 19 percent. This variation could have resulted in an erroneous allocation of costs to jobs. Grumman Data had revised the real-time algorithm because the KWHs associated with real-time use could have been kept artificially low by the user. The contractor said that its objective is to provide a practical, representative allocation of resources. It appears, on the basis of our tests, that the Grumman Data algorithms still favor real-time users and might result in an understatement of real-time costs charged to Grumman Aerospace and, in turn, to Government work.

In another case, however, the Government work was being overcharged. At the time of our review, Grumman Data had 13 disk drives at the Calverton center with equipment and maintenance lease costs of about \$108,000 for 1978. Four drives, used by one of the computers, were part of a cost pool charged entirely to real-time jobs. In 1978 Grumman Aerospace (and thus the Government) absorbed about 89 percent of the cost of real-time KWHs used. The costs for the use of the remaining nine drives were allocated to batch and real-time jobs. The Government absorbed about 71 percent of this cost. However, these nine drives were not used for real-time work. We believe their cost, therefore, should not have been subject to allocation to real-time users. Grumman Data said that sharing the costs of the nine drives resulted in the most equitable distribution of the disk resources. However, our analysis of the contractor's method showed that it resulted in an overallocation of disk drive costs to real-time work.

Grumman Data provided computer services to another company, which was considered a commercial account. All the computer usage being incurred for this work was not charged to the customer. Grumman Data said that the KWHs generated for the customer's work was held in a holding account. This account was analyzed weekly and the KWHs for successful processing were transferred to chargeable subtasks. Information

provided by Grumman Data showed that only 72 percent of the 39,000 KWHs recorded were charged to the customer accounts between January 1977 and September 1978.

Grumman Data representatives said that the KWHs which were not charged represented computer time related to equipment failures in the automated telemetry station. They stated that the procedure used was consistent with the way that regular preventive and remedial maintenance of the computer system was handled. Grumman Data had also said, however, that the work performed for the customer was different from its typical telemetry processing.

The effect of this was to shift part of the cost of the customer's work to Government work, principally that being performed for Grumman Aerospace. We believe that all the KWHs should have been charged to the customer task. This would accurately reflect the amount of KWHs generated by the job and provide a more accurate allocation of Calverton computer costs.

RECOMMENDATIONS

We recommend that the Secretary of the Navy:

- Declare as unallowable for Navy work any cost incurred by Grumman Aerospace as a result of excess data storage and computer capacity maintained by Grumman Data.
- Request the Defense Contract Audit Agency to determine whether Grumman Data's cost allocation methods used to distribute the Calverton computer center costs to projects are equitable.

As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of this report.

We would appreciate being informed of actions taken or planned on our recommendations, and we would be pleased to discuss these matters with you or your representatives.

We are sending copies of this report today to the chairmen of the House Committee on Government Operations; the Senate Committee on Governmental Affairs; the House and Senate Committees on Appropriations and Armed Services; the Director, Office of Management and Budget; and the presidents of the Grumman Corporation, Grumman Aerospace Corporation and Grumman Data Systems Corporation.

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Sincerely yours,

J. H. Stolarow
Director