REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Improvements Needed In Defense's Efforts To Use Work Measurement

Department of Defense

Defense's military services are devoting some 4,483 staff-years at a cost of $58 million to their application of work measurement--a proven technique for improving labor productivity.

GAO has found that the services were not providing sufficient management emphasis to realize their full potential. For the last 10 years, emphasis has been on the depot-level activity, a major segment of workload susceptible to coverage. Improvements are needed in this area as well as in other areas not now covered by work measurement.

Until the Secretary of Defense provides strong leadership in the direction and control of these efforts, the potential value of work measurement in the services will not be realized.

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

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To the President of the Senate and the
Speaker of the House of Representatives

This report points out opportunities for the Department of Defense to improve its efforts to use work measurement.

We made this review to highlight deficiencies found in the application of work measurement under the Defense Integrated Management Engineering System. Our review was made pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget; the Secretary of Defense; and the Secretaries of the Army, Navy, and Air Force.

Comptroller General
of the United States

Contents

ABBREVIATIONS

DIMES	Defense Integrated Management Engineering System
DOD	Department of Defense
GAO	General Accounting Office
OSD	Office of the Secretary of Defense

COMPTROLLER GENERAL'S
REPORT TO CONGRESS

IMPROVEMENTS NEEDED IN DEFENSE'S EFFORTS TO USE WORK MEASUREMENT
Department of Defense

D I G E S T

(The Department of Defense is one of the largest single users of work measurement in either the public or the private sector.) Its military services employ approximately 4,483 work measurement personnel at an annual cost of some $58 million. In fiscal year 1974 (the latest year for which data is available) the services reported savings of $121 million associated with its work measurement.

The Senate Armed Services Committee, in its May 19, 1975, report (94-146) accompanying S. 920 recommended that, to improve the productivity of Defense's employees, the Secretary of Defense develop overall workload indicators for each staff category.

(Because of the recognized importance of work measurement efforts to improving productivity, GAO reviewed these efforts. In 1975 Defense eliminated the requirement for the services to submit their yearly work measurement progress reports. Consequently, neither GAO nor Defense could effectively evaluate the progress the services made in their work measurement efforts.)

Although Defense has tracked work measurement efforts carefully in such areas as the Defense Supply Agency's supply operations, data on such efforts, in total, no longer is reported to the Assistant Secretary of Defense (Installations and Logistics), the focal point for this effort.

From the available data (before 1975), (it was clear that the full potential of Defense's work measurement efforts was not being realized.) For example:

--Earlier GAO reports had shown continuing deterioration of the standards developed through work measurement. In some cases

the standards were allowing 27 percent more time than was necessary. (See p. 15.) In other cases GAO had standards developed in areas where there had been no standards and found that it was taking up to three times as long as it should have for tasks associated with the J-57 engine overhaul. (See pp. 10 and 11.)

--The services' progress in developing standards for depot-level maintenance, their primary area of emphasis, is vastly different--Air Force, 98 percent coverage; Army, 70 percent coverage; and Navy, 42 percent coverage. (See p. 12.)

--Between fiscal years 1973 and 1974, the Air Force intensified its work measurement effort by increasing its staff by 13 percent, whereas Army and Navy decreased their staffs by 18 percent and 25 percent, respectively. (See p. 12.)

--Neither the Army, nor the Navy, nor the Air Force had a consistent definition for the type of activities susceptible to work measurement. (See p. 10.)

The services approach work measurement efforts with different interests; assign different priorities to these efforts; provide varying degrees of independence to the work measurement staffs; and define the universe for potential application of work measurement methods differently.

It is for these reasons, as well as the findings in the many reports GAO has issued in the past 3 years dealing with productivity improvements in industrial areas, that GAO concluded that the full benefits from the work measurement technique and the 4,483 personnel involved have not been realized. Even though the last-reported data showed savings of $121 million, GAO is convinced that these savings could be considerably greater if the work measurement potential had been fully realized under a strong leadership within the Office of the Secretary of Defense.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense insure strong leadership, direction, and control over work measurement activities within Defense so that the scarce work measurement skills can be applied to service areas having the greatest potential benefit. GAO further recommends that, in so doing, the Secretary of Defense:

--Establish a reporting system for periodically measuring and evaluating the contributions of work measurement to Defense's objective of obtaining best resource allocation.

--Monitor and review each service's actions with respect to the number of personnel assigned to work measurement, to insure that adequate attention is given to the program.

--Encourage the service secretaries to realine the functions of work measurement, to insure its maximum independence.

--Survey the services' activities, to identify those areas, such as below-depot maintenance operations, where it is cost beneficial to develop labor standards.
(See p. 18.)

AGENCY COMMENTS AND GAO EVALUATION

Defense concurred with GAO's recommendation to periodically measure and evaluate work measurement activities. However, since Defense has eliminated its only work measurement reporting-monitoring system, GAO has no idea how Defense can effectively carry out this task. GAO will cover this matter in follow-on reviews.

Defense did not concur with GAO's recommendation that the services aline the work measurement activities, to insure maximum independence. Defense's position was based on its belief that organizational alinements are service prerogatives.

As currently alined most of the work measurement activities report directly to those

applying the standards. This is analogous to the home baseball team's owning the umpires. Their ability to render independent and unbiased judgments is questionable.

The Defense directive establishing work measurement efforts gives the Assistant Secretary of Defense (Installations and Logistics) the responsibility for establishing overall implementation policies. Therefore GAO believes the Secretary's office is well within its prerogatives in recommending that the services aline the work measurement activities to insure their independence.

Defense said it had been monitoring the development and use of labor standards at industrial locations since 1965.

GAO agrees. However, the data in the reports Defense used as a basis for its monitoring was inconsistent and inaccurate, which precluded Defense from making meaningful evaluation of the services' progress. Moreover, in 1975 Defense eliminated the requirements for the services to report their progress. Therefore it is difficult to see how Defense, without a monitoring-reporting system, can determine whether satisfactory progress was made.

CHAPTER 1

INTRODUCTION

In recent years, because of rising personnel costs and reduced staff levels, the Department of Defense (DOD) has been coming under increasing pressure to improve the productivity of its personnel resources. The Senate Armed Services Committee, in its May 19, 1975, report (94-146) accompanying S. 920, recommended to the Secretary of Defense that, to improve the productivity of DOD's civilian employees, overall workload indicators be developed for each staff category.

GAO noted in previous reports that DOD had a work measurement system to provide managers with workload and productivity information. This system, known as the Defense Integrated Management Engineering System (DIMES), was established in December 1965.

Because of the recognized importance of work measurement to improving DOD's productivity, GAO reviewed this system to see how effective it was in contributing to DOD's productivity efforts.

DESCRIPTION OF WORK MEASUREMENT

Work measurement is the term generally used to describe the body of knowledge and techniques used to design job activities so they require a minimum amount of resources and, when appropriate, establish labor standards which are useful to management in forecasting staff requirements, formulating budget estimates, measuring and controlling efficiency and performance, and comparing actual with expected accomplishments.

Work measurement embraces two major, but independent, activities--job design and standards development. Normally job design is completed before standards are developed. To do otherwise would build gross inefficiences of an existing job into the standards developed. However, judgment must be used in selecting the appropriate jobs. For example, it would not be economical to spend money to optimally design jobs which are infrequently done. Therefore, as a general rule, the job design effort is reserved for jobs which are frequently done and which consume a large proportion of resources. Such jobs are often referred to as "high burner" jobs.

Depending on the job and its frequency, a number of techniques are available for economically establishing a standard (such as time study, work sampling, predetermined time standards, and mathematical modeling). Qualified work measurement technicians or industrial engineers select the appropriate technique.

Labor standards by themselves normally do not provide savings. They are expensive to develop and to maintain and therefore must be justified in light of management's intended use. Most frequently, however, large savings are generated from job design; therefore labor standards are usually coupled with job design to provide the offsetting savings.

In developing a work measurement system, adequate provisions must be made to insure that the data the system's reports are based on is accurate. To be effective, work measurement systems must be integrated with the production-reporting systems (to get the count of units produced) and the cost-accounting systems (to get the actual hours used to produce the units). There are other ramifications, such as measuring the amount and cost of materials and energy used, but unit counts and corresponding actual hours are the primary subsystems. These systems should work together to produce an integrated efficiency-reporting system. For example, a usual measure of how efficient an operation has been can be expressed in the equation:

$$\text{Efficiency} = \frac{\text{Standard hours}}{\text{Actual hours}}$$

Standard hours are developed by multiplying the standard time needed to produce a unit of production by the number of good units (total units less rework units equal good units) produced. These hours tell managment the number of hours which should have been used to produce these units of production. The standards come from the standards development system and the units produced come from the production-reporting system. Clearly both the integrity and the accuracy of these systems determine the validity of the standard hours.

Actual hours used to produce the units usually come from the cost-accounting system. It is equally important that these hours be accurate; otherwise the measure of efficiency itself can easily be rendered useless.

HISTORY OF WORK MEASUREMENT

Before 1949 the use of work measurement techniques by the Federal Government was prohibited. However, in

that year, President Truman signed Executive Order 10072 which allowed Federal funds to be used for making time studies. In 1950 the Bureau of the Budget (now the Office of Management and Budget) encouraged Federal agencies to use work measurement techniques by issuing Circulars A-11 and A-44. Revised Circular A-11, for example, states that "work measurement, unit costs, and productivity indexes should be used to the maximum extent practicable in justifying staffing requirements for measurable workload."

Efforts to use work measurement within some of the military services can be traced back to the early 1950s. For example, in 1951 the Navy's shipyards developed a work measurement system called the Production Planning and Control Program. However, not until 1965 was a coordinated DOD-wide effort made to use work measurement. In that year DOD established DIMES. DIMES was developed to improve DOD's use of manpower resources at its industrial-type activities. In 1970 DIMES was extended to nonindustrial activities and it became the principal work measurement system for all DOD's activities.

The most recent revision (1972) to DOD Directive 5010.15 listed the following objectives of DIMES.

--Improve labor productivity by applying management-engineering principles and techinques.

--Provide a common base of work measurement and productivity data which can be used in developing budget estimates and staffing requirements in work planning and control, in developing productivity performance indexes relating outputs to inputs, and in fulfilling other management purposes.

In fiscal year 1974, the last year data was readily available on the DIMES program, the Army, Navy, and Air Force devoted 4,483 staff-years to DIMES at a cost of about $58 million. Along with these costs, savings of about $121 million were reported.

In August 1975 DOD consolidated its work measurement system with its other efforts to enhance measurement and evaluate productivity. This new effort, DOD's Productivity Program, still included as one of its main concerns the use of labor standards (work measurement) in planning and controlling workload, balancing resources, and identifying

areas where labor resources were being used inefficiently. The thrust of work measurement was essentially the same as that delineated in the 1972 revision.

SCOPE OF AUDIT EFFORT

We worked primarily at the headquarters levels of each service and at several service commands. Also we reviewed pertinent instructions and guidance furnished to the field installations. We also reviewed the central direction and coordination furnished to the military services by the Assistant Secretary of Defense (Installations and Logistics). We obtained selective data from field installations and used factual data gathered in a number of our earlier reviews, including:

--"Industrial Management Review of the Naval Air Rework Facility, Alameda, California" (B-133014, July 3, 1973).

--"Industrial Management Review of the Army Aeronautical Depot Maintenance Center, Corpus Christi, Texas" (B-159896, Dec. 17, 1973).

--"An Industrial Management Review of the Maintenance Directorate San Antonio Air Material Area, San Antonio, Texas" (B-158896, Apr. 11, 1974).

--"Industrial Management Review of Puget Sound Naval Shipyard" (B-118733, Aug. 5, 1974).

--Letter to Commander, U.S. Army Armament Command, "Survey of Industrial Management Activities at Rock Island Arsenal, Rock Island, Illinois" (Dec. 13, 1974).

--"Way of Increasing Productivity in the Maintenance of Commercial-Type Vehicles" (LCD-75-421, June 24, 1975).

--"Productivity of Military Below-Depot Maintenance--Repairs Less Complex Than Provided at Depots--Can Be Improved" (LCD-75-422, July 29, 1975).

--"Improving Depot Maintenance of Combat and Tactical Vehicles" (LCD-75-424, Sept. 3, 1975).

--"Navy's Aircraft Overhaul Depots Could Become More Productive" (LCD-75-432, Dec. 23, 1975).

CHAPTER 2

IMPLEMENTING A WORK MEASUREMENT SYSTEM

In implementing a work measurement system, many factors have to be considered, such as the type of personnel to be covered; the organizational placement and control of the work measurement staff; the staffing assigned; and the development of accurate labor standards, production-reporting systems, and cost-accounting systems. Top management, once having decided upon these elements, should monitor their implementation, to determine whether it has a cohesive, effective work measurement system. A credible reporting system is one method for doing this.

The Assistant Secretary of Defense (Installations and Logistics), has had program responsibility for establishing the overall policies directing the services' implementation of work measurement. To monitor implementation of work measurement, each DOD component and agency was required to submit to the Office of the Secretary of Defense (OSD) an annual report summarizing its work measurement activities. Although the services submitted reports, the data they contained was inconsistent and inaccurate. Moreover, each service took a different approach to implementing work measurement. Because of these differences and the lack of OSD follow-up, aggressive approaches to improving productivity through work measurement and related activities are being hindered.

CREDIBILITY AND USEFULNESS

Implicit in the description of work measurement is the need for it to be credible and usable by management. To insure credibility, work measurement should logically be applied under consistent policy and practices, with suitable organizational placement, staffing, and direction and control of the program. Additionally there should be a reporting system which will allow appropriate levels of management to monitor the planned and actual progress of the program and which will help management determine the best possible program direction. To be useful to management, the job designs and standards must be integral parts of management's information system. We found enough inconsistencies in these elements for us to question both the credibility and the usefulness of work measurement in DOD.

MONITORING IMPLEMENTATION AND USE OF WORK MEASUREMENT

A credible reporting system is one mechanism that can be used for monitoring the implementation and use of a work

measurement system. By taking the reports generated from such a system and analyzing them, managers can identify:

--Areas where work measurement has been successful.

--The reasons for the success of a work measurement system.

--Areas where work measurement needs greater emphasis.

Our review showed that the reports the services submitted to OSD contained data that was inconsistent and inaccurate. OSD therefore could not make meaningful comparisons on the services' efforts to implement and use work measurement nor could it use the reports as inputs for providing useful direction.

In fiscal year 1974, as required by DOD Directive 5010.15, each of the military services submitted a report to OSD on its work measurement activities. According to the DOD directive, each of the services was to submit the same data. However, OSD did not precisely define what this data was to include. Therefore each service submitted its data according to their own interpretation. For example, OSD requested the services to report the total number of authorized personnel susceptible to coverage by either engineered or statistical standards. However, OSD did not precisely define what these standards were to include. The table below shows what each service reported.

	Population to which work measurement was applicable		
	Army	Navy (note a)	Air Force
Total actual military and civilian population (6/30/74) (note b)	1,101,752	1,045,414	914,915
Authorized population susceptible to coverage by either engineered or statistical standards	284,209	154,763	c/919,242
Percent of total population subject to work measurement (note b)	26%	15%	100%

a/Includes Marine Corps.

b/GAO-developed data.

c/Exceeds total population because authorized strength exceeds actual strength.

Because each service used a different criterion in compiling the above data, valid conclusion could not be made about each service's possible use of work measurement. The discussion below points out one of the major difference in the services' reports.

The Air Force, which was using engineering techniques to develop staffing standards (i.e., personnel requirements), believed that the personnel to be covered by these standards should be included in its reports. The Army and Navy did not share this belief and therefore did not include these personnel in their reports.

Even within a service, there was confusion as to what data to report to OSD. For example, in fiscal year 1974, the Navy reported the following data on its staffing of work measurement in its industrial activities.

Command	Number of personnel susceptible to coverage by either engineered or statistical standards	Number of full-time analysts	Ratio of analysts to coverage (note a)
Naval Air Systems	28,714	101	1:284
Naval Facilities Engineering	20,848	1	1:20,848
Naval Ordnance Systems	18,258	48	1:380
Naval Ship Systems	45,557	45	1:1012
Naval Supply Systems	13,122	37	1:354
Total Naval Material Command	126,499	232	1:545
Marine Corps	28,264	43	1:657
Total	154,763	275	1:563

a/GAO-computed data.

The extreme fluctuation of the ratios, from 1:20,848 to 1:284, indicated some extraordinary differences in the Navy's perception of work measurement and suggested that OSD should inquire into the Navy's work measurement effectiveness. However, it was not until we cited this data in our proposed report that the Navy told OSD that some of the above figures were incorrect, even though some of these same levels of staffing had been continually reported for previous years. OSD told us that the Naval Ship Systems Command and Naval Facility

Engineering Command had included in their reports only their personnel engaged in developing standards. Their reports had failed to include the 88 and 25 personnel, respectively, engaged in job-design activities, such as work simplification, method studies, and equipment layout. Furthermore DOD told us that there were eight personnel developing standards at the Naval Facilities Engineering Command, rather than the one person originally reported. The table below shows this revised data.

Revised Navy Work Measurement Staffing Ratios in Fiscal Year 1974

Command	Number of personnel susceptible to coverage by either engineered or statistical standards	Number of full-time analysts	Ratio of analysts to coverage (note a)
Naval Air Systems	28,714	101	1:284
Naval Facilities Engineering	20,848	33	1:632
Naval Ordnance Systems	18,258	48	1:380
Naval Ship Systems	45,557	133	1:343
Naval Supply Systems	13,122	37	1:354
Total Naval Material Command	126,499	352	1:545
Marine Corps	28,264	43	1:657
Total	154,763	395	1:392

a/GAO-computed data.

Although the revised data showed a more even-handed application of work measurement, the fact that the original data had been erroneously reported for a number of years suggests that the adequacy of OSD's means for monitoring this reporting system was questionable.

Although there were many deficiencies in DOD's reporting system, they could have been corrected to give DOD a credible means of monitoring the services planned and actual progress. Moreover, the services' work measurement reports could have aided DOD in determining the best program direction. However, in consolidating work measurement with DOD's other productivity efforts, the reporting requirement on progress in implementing work measurement was not improved so as to insure better credibility but was completely rescinded.

Therefore since August 1975 DOD has had no formal system for collecting data on the services' implementation and use of work measurement. In view of the 4,483 staff-years spent and the $121 million reported saved through work measurement in fiscal year 1974, we believe the effort should be closely monitored to insure that it is properly implemented and used. Work measurement appears to be one area where DOD can get a considerable return on its investment, and with the ever-shrinking DOD dollar, this area deserves increased top-level attention and monitoring.

APPLICATION OF WORK MEASUREMENT

DOD and each of the services recognize that labor standards developed from work measurement are viable means of improving labor productivity at DOD's industrial activities staffed primarily by civilians. These activities are most often referred to as depot-level operations. However, for other locations engaged in similar activities and staffed primarily by military personnel, work measurement is not used to develop labor standards.

DOD's depot-level activities can be characterized as places where end-items, such as airplanes, tanks, and ships, are repaired to an almost new condition. In accordance with OSD and the services beliefs, most of DOD's work measurement staff resources on these operations have been expanded. In fiscal year 1974 the services reported the following staff-years devoted to work measurement activities at these industrial activities.

	Work measurement staff-years at civilian industrial activities	Total service work measurement staff-years	Percent of work measurement activities directed toward civilian industrial activities
Army(Army Materiel Development and Readiness Command)	332	597	56
Navy (Naval Material Command)	352	481	73
Air Force (Air Force Logistics Command)	2,440	3,405	72

The services also have many other industrial activities which are staffed by military personnel and which repair

pieces of equipment from such end-items such as airplanes, tanks, and ships. For example, the Navy has over 20,000 servicemen repairing ships' equipment. These personnel differ from their civilian counterparts in that they repair end-items only to the extent that the end-items are brought up to an operational, not a like-new, status. These activities are most often referred to as below-depot-level operations. Although DOD and the services agree that work measurement is a viable means of improving labor productivity at its depot-level operation, there is no such agreement for its below-depot-level operations.

The Air Force, at its below-depot-level activities, has used work measurement techniques to develop staffing standards, which, as previously mentioned, are used to develop personnel requirements. Generally managers do not use these standards to measure labor's performance because they do not show incremental levels of performance. For example, a staffing standard would show how many vehicles one mechanic should be able to maintain, not the time necessary to repair the carburetor or brakes.

The Navy and the Army have made little effort to use work measurement to develop either labor standards or staffing standards at their below-depot levels of operations. For example, it was not until fiscal year 1974 that the Navy started using work measurement techniques to develop staffing standards for its shore activities, of which below-depot-level operations are one. As in the case of the Air Force, these standards are generally not used to measure performance.

In contrast to the services' apparent beliefs that the development of standards for below-depot-level repair activity would be of limited value, our report on the productivity of below-depot maintenance operations 1/ identified a number of jobs and tasks for which it was appropriate to develop labor standards. We had work measurement technicians develop labor standards for the J-57 engine repair. The following table shows the relationship between the standard hours we developed for the teardown and buildup of the J-57 (P-10) engine and the actual time it took the Alameda Naval Air Station to do these tasks for the period July 1973 to April 1974.

1/"Productivity of Military Below-Depot Maintenance--Repairs Less Complex Than Provided at Depots--Can Be Improved" (LCD-75-422, July 29, 1975).

	Actual time reported (hours)	Standard time developed (hours)	Percent above standard
Teardown and buildup of J-57 engines	7,864	1,561	404

Had management been able to attain these standards, it could have done well over three times the work actually done.

In view of the congressional and DOD concern for limiting defense-support costs, we believe if greater efforts were put forth to develop labor standards at activities, such as the one above, DOD resource managers would be better able to identify those areas where

--more work could be done,

--personnel could be transferred to higher priority work, and

--personnel reductions could be made.

MANAGEMENT'S LACK OF COMMITMENT TO WORK MEASUREMENT

The Army Management Engineering Training Agency, in a study of work measurement systems in use at 11 Federal agencies, found that a contributing factor to the success of a work measurement program was the support given to it by top management. Two key measures can be used to identify top management's commitment to the use of work measurement.

--Progress in covering its respective employees with standards.

--The number of work measurement technicians assigned to the program.

As previously mentioned, both OSD and the services recognize that the development of labor standards at their industrial activities staffed primarily by civilians is cost beneficial. Therefore we expect the services would have had great success in this area in covering their employees with standards. The table below shows each service's progress.

Work Measurement Coverage at Industrial Activities Manned Primarily by Civilian Personnel for Fiscal Year 1974

	Air Force Logistics Command	Army Materiel Development and Readiness Command	Naval Material Command
Authorized personnel susceptible to coverage by engineered or statistical standards	52,088	66,549	126,499
Authorized personnel covered by engineered or statistical standards	50,905	46,463	52,546
Percent of authorized personnel covered by engineered or statistical standard of those susceptible to standards	98%	70%	42%

Although there is no magic number or goal for the percent of standards coverage, it is clear that, for the same functional areas (depots), the Army and Navy have not made comparable progress in covering these areas. By itself this lack of progress may not be important. However, when the lack of progress is coupled with the staffing shown below, it is clear that the services are not uniformally emphasizing this cost-beneficial area. In fact, judging from the staffing reductions, the Army and Navy are decreasing their emphases.

Changes in Work Measurement Staffing at Industrial Activities Manned Primarily by Civilian Personnel

	Air force Logistics Command	Army Materiel Development and Readiness Command	Naval Material Command
Work measurement staffing for fiscal year 1973	2,160	403	471
Work measurement staffing for fiscal year 1974	2,440	332	352
Increase or decrease (-)	13%	-18%	-25%

Although OSD could not be expected to develop an overall work measurement staffing criterion for all of DOD--because of the number and variety of jobs done--some of the services individual commands had established work measurement staffing criteria for their respective areas. Following is the Navy's most recent guide on staffing work measurement activities at naval shipyards.

> "The manning for a work measurement system should be sufficient to establish standards for new workloads and continuously refine existing standards to account for methods improvements, process changes, etc. Experience had indicated that to carry on the routine work of an industrial engineering organization of similar responsibilities in an organization of similar size with a similar job lot type workload to that of the naval shipyards, one industrial engineering technician is required for approximately each 100 production employees. Staffing requirements may change depending upon the necessity to review existing standards and the changing conditions requiring the setting of new standards. Relatively unchanging workloads will require fewer technicians than will the more variable workloads."

Our review showed that in fiscal year 1974 the Naval Ship Systems Command was far below this requirement. Only 45 personnel were developing standards for the command's 45,557 personnel to be covered by standards, or a staffing ratio of less than 1 work measurement technician for each 1,000 personnel to be covered by standards. Even if this command added the 88 work measurement technicians who were doing job-design work to the 45 who were developing standards, the staffing ratio still would be less than 1 work measurement technician for each 343 personnel to be covered by standards. During the same time frame that these staffing levels were low, Navy officials testified before the Congress that they were "not getting a full day's work for a full day's pay" from naval shipyard personnel. Navy officials estimated that the productivity rate of these personnel was only 50 to 70 percent.

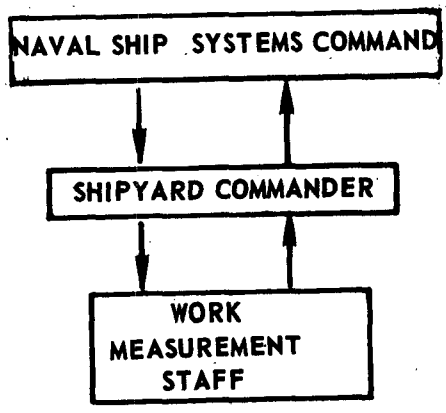
We believe that, since DOD has made a firm commitment to improve labor productivity, it should be focusing more attention on its work measurement programs. DOD needs to assure itself not only that adequate personnel resources have been provided to meet established goals of standards coverage but also that suitable organizations have been created to insure that standards are developed which represent the most efficient and economical way of doing jobs.

ORGANIZATIONAL PLACEMENT AND CONTROL FOR WORK MEASUREMENT STAFF

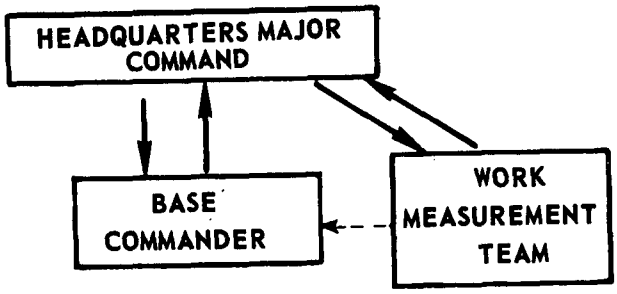
Organizational placement of the work measurement activity in both OSD and the services is equally important to its credibility. Ideally the placement should be where strong, dynamic leadership and the broad applications of work measurement across functional lines can be best facilitated. Moreover, those personnel actually doing the work measurement should be placed so they are sufficiently insulated from the pressures generated by those to whom work measurement is being applied.

DIRECTION AND CONTROL

The direction and control of standards developed and maintained most directly determine the standards' credibility and potential usefulness to management. Within the Army, Navy, and Air Force, the control of work measurement staffs at industrial locations staffed primarily by civilians has been decentralized. As a result, the monitoring of a work measurement staff, its integrity, and the credibility of its products are the responsibility of each local activity or installation commander. The diagram below shows the organizational placement of a work measurement staff at a typical Navy shipyard.



In contrast to the above organizational structure, some of the services have employed a different organizational structure for their work measurement teams assigned to non-industrial locations. For example, within the Air Force the work measurement teams assigned to military bases and certain other locations do not report to the base or the activity commander to which they are assigned but rather to the headquarters of the major command. This organizational structure is depicted by the following diagram.



The Air Force believes, and we agree, that, by using this approach, work measurement teams will be beyond the influence of those they are developing standards on and less prone to arbitrary personnel reductions.

The adequacy of control over work measurement and its products--standards--is shown in the credibility of the standards themselves and their associated reporting systems. At a number of DOD's industrial activities, we reviewed a sample of the engineered standard in use. Supposedly, these are the most accurate type of standards that can be developed. Our reviews showed that the standards in our samples were overstated by at least 27 percent. In other words, the standards were allowing more time to accomplish the task or job than was necessary.

The most common error we found was in the occurrence rate--the number of times a work step or element of a standard is done. For example, at one Army depot, we noted that one standard allowed 17.9 minutes to check and test a small metal tube used to distribute fluids on a helicopter. The standard was made up of the following work elements: Getting tube to work area, walking to tester, testing pressure, walking to degreaser, degreasing the tube, returning to workbench, completing paperwork, and disposing of the tested tube. The standard provided that each element would occur each time the tube was checked and tested, or a 100-percent occurrence rate for each one of the elements.

Our examination of work measurement documentation showed that tubes were processed through the work elements in batches of 10 tubes each; that is, the workmen carried 10 tubes to the tester, pressure-tested 10 tubes at a time, carried 10 tubes to the degreaser, and so on. Therefore the work elements occur only once for each batch of 10 tubes, or a 10-percent occurrence rate for each tube. Changing the element occurrence rates in this standard to 10 percent would reduce the standard performance time from 17.9 minutes to 8.6 minutes for each tube, or a 51.9-percent reduction in standard time.

PRODUCTION-REPORTING SYSTEMS

To relate the standard time allowed for a unit of production to the total production of a specified time, a measure called standard hours has been developed. Standard hours is computed by multiplying the number of complete units (or tasks) by the standard time for each unit (or task). For example, if the standard time for overhauling a carburetor on a jeep is 2 hours and a mechanic has overhauled 10 of them, he then has "done" 20 standard hours of work. The 20 hours tells management the amount of time that should have been used to overhaul the 10 carburetors.

The quotient of standard hours to actual hours used is the rate of efficiency--a measure of how well management was able to keep employees productively occupied. Referring once more to our example of the carburetors on the jeep, if the mechanic had overhauled the 10 carburetors in 40 hours, he would have been only 50 percent efficient (20 standard hours÷40 actual hours). Depending on the work situation, this low efficiency should signal to management that a problem existed.

By the above example it can be seen how important it is to have accurate production counts. If production is reported greater than it acutally is, efficiency will be reported higher than it actually is.

At tests done at several Naval Air Rework Facilities, we reviewed the controls exerted over the production-reporting system. We found many instances where production was reported greater than it actually was. For example, at one facility we noted nine instances in which units were reported completed but where shop personnel had only just started to work on the units. As a result of this error, shop personnel received full credit for the 491 standard hours associated with these unit of production before the work was done. We believe the erroneous reporting would have been apparent to supervisory personnel at this location if the management information system had been programed to measure performance on a job-by-job basis rather than in total for the shop.

Another problem we noted during our work concerned those items which were returned to shops for additional repairs because of their failure to pass quality control or component testing. Work done on this basis normally should not qualify for additional standard hours. However, we found many instances in which shops doing such work received credit for additional standard hours. For example, during a test we made at the Norfolk Air Rework Facility,

we found that 58 percent of work sent back for additional repairs during 1 month received credit for additional standard hours. Thus the shops that did this work received credit for additional standard hours on work that already had been assigned standard hours.

COORDINATION BETWEEN PRODUCTION-REPORTING SYSTEMS AND COST-ACCOUNTING SYSTEMS

Besides having valid labor standards and accurate production counts, management must also insure that the units reported as completed in the production-reporting system are compatible with the hours reported worked in the cost-accounting system. If this is not done, labor's performance will be computed incorrectly. Reports of the Air Force's audit agency have shown that Air Force depots have had a problem in coordinating their production-reporting systems with their cost-accounting systems. For example, one report stated that:

> "The direct standard hours accumulated in the production reporting system was not compatible with the actual hours accumulated in the cost accounting system. This incompatibility was caused by the varying production count cutoff dates * * *. For example, at one section the official production count cutoff date was January 30, 1974; however, the last day counted was January 22, 1974. Thus, 2,614 units produced in January were counted in February's totals."

CONCLUSIONS

Although clear-cut criteria for effectively implementing work measurement in DOD are illusive, our work to date indicates that DOD's current method of implementation, monitoring, and review is not adequate to insure that the process of work measurement and its associated outputs--standards--are credible as a resource allocation tool.

The differences among the services concerning work measurement applications, the lack of even generic cost-benefit guidance, and the continuing patterns of standards which do not accurately depict the work being done point to an absence of strong and effective leadership at the OSD level.

We believe an effective work measurement program in OSD would provide not only a sound basis for determining the minimum essential manpower required to accomplish specified missions but also a credible means for determining its

efficient and effective manpower utilization. Consequently, it seems logical for OSD to identify those areas having the greatest potential benefit for work measurement applications and direct implementation in those areas and to systematically control the implementation to insure the credibility of the outputs.

As OSD's work measurement program now stands, there is no continuing analysis to determine the areas where work measurement should be applied; there is no credible reporting mechanism to evaluate work measurement progress or costs; and there is, as yet, no means for determining whether OSD is obtaining the best return for the taxpayer-supported resources it is currently committing to work measurement.

RECOMMENDATIONS

We recommend that the Secretary of Defense insure strong leadership, direction, and control over work measurement activities within DOD so that scarce work measurement skills are applied to service areas having the greatest potential benefit. GAO further recommends that, in so doing, the Secretary of Defense:

--Establish a reporting system for periodically measuring and evaluating the contributions of work measurement to the DOD objective of obtaining best resource allocation.

--Monitor and review each service's actions with respect to the number of personnel assigned to work measurement, to insure that adequate attention is given to the program.

--Encourage the service secretaries to realine the functions of work measurement, to insure its maximum independence.

--Survey the services' activities, to identify those areas, such as below-depot maintenance operations, where it is cost beneficial to develop labor standards.

AGENCY COMMENTS AND OUR EVALUATION

DOD said that since 1965 it had been monitoring the development and use of labor standards at industrial locations. Moreover, it stated its primary efforts had been on the use of labor standards at industrial-type activities. We agree that the services have submitted reports to OSD on their implementation of work measurement. However, as we pointed

out on pages 5 through 8 the data in these reports was inconsistent and inaccurate and therefore precluded DOD from making any meaningful comparisons of the services' implementation. Furthermore, since August 1975 DOD has not had even these limited reports to monitor the services' implementation of work measurement. We agree that the services have emphasized the use of work measurement in placing primary effort on the use of labor standards at industrial-type activities. However, there were vast differences in the services' emphases. For example, on page 12 we pointed out that, although the Air Force had covered 98 percent of its susceptible depot-level personnel with standards, the Army and Navy have covered only 70 and 42 percent, respectively.

DOD said that labor standards had the greatest impact at industrial activities and that DOD's long-standing policy was to use them in all areas where they would be cost beneficial. Our previous work showed that there were many jobs at industrial-type activities that were not covered by labor standards. However, neither DOD nor the services had developed any clear-cut, cost-benefit criteria to help identify those jobs suitable for coverage. We therefore believe, because of the savings that can accrue to the Government, OSD should take the initiative in identifying those specific industrial activities where it is cost beneficial to develop labor standards. OSD is establishing standard time data for the military services to use in developing labor standards. We believe that a natural outgrowth of this work would be identifying those areas where using labor standards would be cost beneficial.

DOD did not concur with our recommendation that the services realine the function of work measurement. It based its nonconcurrence on the fact that functional and organizational alinements were service prerogatives. However, according to the DOD directive establishing DIMES, the Assistant Secretary of Defense (Installations and Logistics) was given the responsibility for establishing the overall policies to implement and operate DIMES. Furthermore, each DOD component was given the responsibility for implementing a work measurement program in accordance with these policies. Since, as we pointed out on page 14, many people who develop and maintain standards must work for the same people these standards cover, we believe OSD is well within its prerogative to recommend to the service secretaries that they realine the functions of work measurement to insure its independence.

DOD concurred, in principle, with our recommendation that a reporting system be established to monitor the services' implementation of work measurement. However, it did

not identify specific actions it would take. We believe, in the light of the 4,483 staff-years spent and the $121 million reported saved through work measurement, DOD should be aggressively monitoring the services' implementation of work measurement. Without such monitoring DOD has no way of assuring itself that its limited work measurement skills are being used most effectively.

CHAPTER 3

USE OF STANDARDS

The successful use of a work measurement system depends on the accurate development of labor standards at successive levels of management. This stepping-stone approach, or accumulation of standards through greater levels of aggregation, is necessary because managers at different levels of management have different information requirements. For example, a shop supervisor in charge of overhauling rotor blades on a jet engine would need more detailed information than a manager planning the overhaul of a fleet of jet aircraft.

Most OSD literature explaining work measurement refers to three kinds of standards--detail, intermediate, and summary--which should be developed for the different levels of management and appropriately integrated into their management information systems.

DETAIL STANDARDS

Detail standards are standards developed for managers at the lowest operating level of an activity. Most often this level is referred to as the work-center level. Managers at this level use these standards to aline their staff with their workload. They can also use these standards to identify areas where labor is being used inefficiently. An example of a detail labor standard would be the amount of time required to overhaul the rotor blades on a jet engine.

As stated earlier we found many of the standards developed at this level to be inaccurate. These standards were found to allow more time than was necessary to complete these jobs. Consequently, managers could not use these standards to identify situations when labor resources exceeded their workload or when labor resources were performing inefficiently. For example, at one Army depot, our studies showed that standards were used to assign 14,573 standard hours to 47,300 units of production. Using these standard hours as its base, management determined that its labor resources had performed at a level of 112 percent of standard. However, we reviewed these standards and found 11 of them to be overstated on the average by about 27.6 percent. Thus, using our standards as a base, we determined that labor was attaining only 81, not 112, percent of standard. If management had been using our standards, it would have seen that its labor resources were performing below standard.

INTERMEDIATE STANDARDS

Intermediate standards are developed for managers who are responsible for the production planning and control of many similar work centers. These standards are developed on the basis of the standards developed at the operating work-center level. For example, the intermediate standard developed for a jet engine would be derived from the detail standards developed for the components of that engine, such as fuel control, rotor blades, and fuel nozzles.

The intermediate standards which were being used in the work measurement systems we reviewed had not been developed from detail standards but from historical data. Agency officials' reasons for using standards based on this data were that not enough detail standards had been developed and that those developed were not of a high enough quality.

Use of past performance data assumes that the practices followed in the past were efficient. This is not always true. For example, in our recent report on the operations of two Naval Air Rework Facilities, 1/ we noted that both facilities had established work measurement systems. However, neither system had been sufficiently developed to allow its detail labor standards to be summarized into intermediate standards. As a result, managers were relying on historical data, with all its recurring inefficiencies, in their workload planning. The effect of using these standards for workload planning can be seen in a report published in May 1974 by one of the rework facilities. This report stated that, through the use of industrial engineering techniques, the historically allotted time for repairing 112 components was reduced by about 27 percent. Thus the managers in the past who were basing their workload planning on these historical standards were understating their capacity for repairing these components.

SUMMARY STANDARDS

Summary standards are developed for that level of management which is concerned with relating total mission requirements to needed resources. For example, the manager responsible for overhauling a fleet of jet aircraft would use a summary standard. This standard would be based upon the intermediate standards developed for the different components of an aircraft, such as the engine and landing gear.

1/"Navy's Aircraft Overhaul Depots Could Become More Productive" (LCD-75-432, Dec. 23, 1975).

Managers at this level, by taking their summary standards and applying them to their workload forecasts, can determine the number of staff-years needed to accomplish their organizations' mission. Furthermore, by converting staff-years to dollars, this data can also be used for budget development.

We observed the same weaknesses in the development of intermediate standards and of summary standards. In those work measurement systems we reviewed, a sufficient number of labor standards was not developed or those developed were not of a high enough quality to permit the development of summary standards. As a result managers were basing their staff requirements on nonengineered data. The effect of using this data in determining staff requirements was discussed in our recent report on the maintenance of commercial-type vehicles. 1/ That report pointed out that in Northern California the Army, Navy, and Air Force had installations which maintained basically the same type of commercial vehicles. However, the staffing ratio of vehicles to maintenance employees at those installations varied from 25.6:1 to 46.5:1. Our review showed that none of those installations determined its staffing requirements through labor standards. Consequently, as evidenced by the different staffing ratios in use, management at those activities had no sound basis for determining the size of the work force needed to accomplish its mission most efficiently. Thus, although one activity might be overstaffed, another activity could be understaffed.

CONCLUSIONS

DOD's work measurement systems have been plagued by inaccurate and insufficient numbers of detail labor standards. As a result many of the intermediate and summary standards DOD uses have been based not on detail standards but on historical data. Such standards do not always represent the most efficient and economical means of doing a job. Consequently, many times DOD resource managers have not had standards which would identify situations where labor resources exceeded planned workload or where labor resources were performing inefficiently.

We suggested that the Secretary of Defense emphasize the need to develop labor standards which represent the most efficient and economical way to do a job so that managers at all levels can use them in their day-to-day decisionmaking.

1/"Ways of Increasing Productivity in the Maintenance of Commercial-Type Vehicles" (LCD-75-421, June 24, 1975).

AGENCY COMMENTS AND OUR EVALUATION

DOD concurred with our suggestion. It said that DOD Instruction 5010.34 required each DOD component to insure that its procedures provide for periodically and systematically reviewing all major jobs, functions, and operations and for establishing and using appropriate types and levels of labor standards. We believe that, if the services conscientiously carry out the provisions of this instruction, work measurement and its associated products--labor standards--will greatly enhance DOD's productivity program.

APPENDIX I

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

INSTALLATIONS AND LOGISTICS

2 APR 1976

Mr. F. J. Shafer
Director
Logistics and Communications
Division
U.S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Shafer:

We appreciate the opportunity to comment on GAO Draft Report, dated January 1976, "Improvements Needed in DoD's Efforts to Use Work Measurement," Code 947142 (OSD Case #4278).

Attached are comments resulting from reviews of the draft report by my office, the military departments and the Defense Supply Agency. The findings and recommendations contained in the report will be given full consideration in DoD's continuing efforts to reduce operating and support costs and increase productivity of its work force.

Sincerely,

FRANK A SHRONTZ
Assistant Secretary of Defense
(Installations and Logistics)

Attachment
as stated

DEPARTMENT OF DEFENSE POSITION
On
GAO Draft Report, dated January 1976
(Code 947142 - OSD Case #4278)

"Improvements Needed in DoD's Effort to Use Work Measurement"

I. Summary of GAO Draft Report

The report (1) defines work measurement as a generally used term to describe the body of knowledge and techniques used to design job activities so they require a minimum amount of resources; and when appropriate establish job standards which are useful to management in forecasting manpower requirements, formulating budget estimates, measuring and controlling efficiency and performance, and comparing actual to expected performance and (2) states that in order to be effective a work measurement system must be integrated with an agency's production reporting and cost accounting systems.

It highlights characteristic work measurement deficiencies noted by GAO reviews of the Defense Integrated Management Engineering System (DIMES) conducted since 1970. The most recent audit effort was performed primarily at the headquarters levels of each military service and at several service commands.

GAO concludes that (1) top management support and central direction on use of work measurement is lacking (2) a common definition does not prevail among the three military services as to where work measurement is applicable, (3) each service and commands within the services have placed different emphasis on the use and staffing for work measurement, and (4) adequate provisions have not been made to assure the accuracy of labor standards and production reporting.

II. Defense Comments on Report Facts and Conclusions

DoD is in basic agreement with the facts and conclusions cited in the report. We offer the following comments for consideration prior to publication of a final report.

Page 4 (last line). The word "registered" in front of "industrial engineers" should be deleted. Professional registration is not a civil service prerequisite for classification of individuals as either industrial engineers or technicians.

Page 5. The equation which reads, "efficiency equals standard hours divided by actual payroll hours" is not considered the usual measure of efficiency. Labor efficiency is most commonly measured by relating job/task standard hours to actual hours worked rather than to actual payroll hours. Actual payroll hours contain non-available hours, such as authorized leave.

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Page 10. The figures reported for authorized population subject to work measurement for the three services do not reflect comparable data.

The Air Force figure represents all personnel, the Navy figure represents only those personnel at industrial type activities in the Naval Material Command, and the Army figure represents personnel assigned to non-tactical units. Therefore, we do not feel that these figures are an indication of the varying impact of each service's unique policies governing the application of work measurement.

Each service utilizes work measurement techniques in establishing manpower staffing standards and includes the total population in the universe. Likewise, each service employs detailed labor performance standards in workload planning and control at industrial type operations. Valid comparisons of the impact of each service's policies can only be made by comparing comparable universes and comparable type standards, i.e., manpower staffing standards, detailed labor standards, etc.

[See GAO note 1, p. 30.]

The statement that "the Navy has not fully implemented this program even in these commands as indicated by the extremely high ratios between work management analysts and covered employees in some of the commands" is not a factual statement. For example, the number of full time-analysts involved in work measurement at the Naval Ship Systems Command was 133, (not 45 as shown in the staffing ratio table) which would give a ratio of analyst to coverage of 1 : 343 in lieu of 1 : 1000 as shown. The 45 full-time analysts shown in the table represent only those full-time analysts directly involved in the development and maintenance of labor standards. During FY 1974 approximately 88 full-time analysts were involved directly in work simplification, method studies and equipment layout work -- very important elements of an effective work measurement system.

[See GAO note 1, p. 30.]

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[See GAO note 1, p. 30.]

During FY 1974, the Naval Facility Systems Command had eight full-time analysts working on the development and maintenance of various types of labor standards. In addition, the Command had another 25 analysts throughout the Command working in the area of work simplification and methods studies. This changes the ratio from 1:21000 to 1:632.

[See GAO note 1, p. 30.]

Pages 16 and 17. The statement, "as a result, the monitoring of a work measurement staff, its integrity, and the credibility of its products are the responsibility of each local activity or installation commander" is a misleading statement as it applies to the Army and Navy. The Army has a centrally directed methods and standards program under cognizance of the Army Comptroller and each System Command in the Navy centrally plans and directs its respective work measurement system and monitors/evaluates local programs and progress.

[See GAO note 1, p. 30.]

III. Defense Comments on Report Recommendations

DoD agrees that the effectiveness of the military services' work measurement efforts can be improved. However, the cost impact of obtaining an increase in effectiveness must be carefully weighed in relation to the true benefits which will be achieved. Our reactions to the draft report recommendations contained on page 24 follow:

Recommendation #1 -"Secretary of Defense monitor and review the actions taken by each service with respect to the number of personnel assigned to work measurement to assure that adequate attention is given to the program. Emphasis should be placed on those activities that have a high percentage of 'high-burner' type jobs."

Comment - The Office of the Assistant Secretary of Defense (Installations and Logistics) has been monitoring service programs on the development and use of labor performance standards since 1965. Since that time DoD has placed primary emphasis on the use of labor performance standards at industrial-type activities. These are the activities which have a high percentage of jobs susceptible to cost effective use of labor performance standards --- "high-burner" type jobs. Responsibility for use of work measurement techniques in establishing manpower staffing standards is assigned to the Assistant Secretary of Defense (Manpower and Reserve Affairs). In this regard, the ASD(M&RA) has issued policy guidance for FY 1977 which places increased emphasis on the processes and techniques employed by the Services when determining defense manpower needs. In addition, the guidance stresses that the quantity and quality (grade and skill) of authorized manpower spaces are to be based on workload and engineered on statistical standards to the maximum extent possible.

Recommendation #2 - "Secretary of Defense establish procedures to help the military services identify those areas where labor standards will have the greatest impact."

Comment - The Office of the Secretary of Defense establishes basic policies and general operating guidelines for DoD Components to follow, but normally does not establish detailed procedures for use by the military services in implementing DoD policy guidance. Additionally, it has been a long-standing DoD policy that labor performance standards have the greatest impact at industrial type activities and that they should be utilized in all areas where determined cost beneficial.

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Recommendation #3 - "Secretary of Defense consider directing the service secretaries to realign the functions of work measurement to assure its independence."

Comment - Do not concur. Functional and organizational alignments are service prerogatives.

[See GAO note 1, p. 30.]

The following comments pertain to the recommendations set forth on page 30:

Recommendation #1 - "Secretary of Defense emphasize the need to develop labor standards which represent the most efficient and economical manner in which to perform a job, so that managers at all levels of management can use them in their day-to-day decision making."

Comment - Concur. DoD Instruction 5010.34, dated August 4, 1975 requires that each DoD Component insure that its procedures provide for periodic and systematic reviews of all major jobs, functions and operations and the establishment and use of appropriate types and levels of labor performance standards throughout its department/agency.

Recommendation #2 - "Secretary of Defense establish a means to periodically measure and evaluate the contributions of work measurement to DoD objectives of obtaining optimum resource utilization."

Comment - Concur. DoD will continue to periodically evaluate benefits obtained from resources devoted to work measurement.

GAO note 1: Deleted comments pertain to matters which were presented in the draft report but are not included in the final report.

GAO note 2: Page references in this appendix refer to the draft report and may not agree with the page numbers in this final report.

PRINCIPAL OFFICIALS OF THE DEPARTMENT OF DEFENSE AND THE DEPARTMENTS OF THE ARMY, NAVY, AND AIR FORCE RESPONSIBLE FOR THE ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
DEPARTMENT OF DEFENSE		
SECRETARY OF DEFENSE:		
Donald H. Rumsfeld	Nov. 1975	Present
James R. Schlesinger	July 1973	Nov. 1975
William P. Clements, Jr. (acting)	Apr. 1973	July 1973
Elliot L. Richardson	Jan. 1973	Apr. 1973
DEPUTY SECRETARY OF DEFENSE:		
William P. Clements, Jr.	Jan. 1973	Present
Kenneth Rush	Feb. 1972	Jan. 1973
ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS):		
Frank A. Shrontz	Feb. 1976	Present
John J. Bennett (acting)	Apr. 1975	Feb. 1976
Arthur I. Mendolia	June 1973	Mar. 1975
Hugh McCullough (acting)	Jan. 1973	June 1973
DEPARTMENT OF THE ARMY		
SECRETARY OF THE ARMY:		
Martin R. Hoffman	Aug. 1975	Present
Howard H. Callaway	July 1973	July 1975
Robert F. Froehlke	Jan. 1971	Apr. 1973
UNDER SECRETARY OF THE ARMY:		
Herman R. Staudt	Oct. 1973	Present
Vacant	June 1973	Oct. 1973
Kenneth F. Belieu	Aug. 1971	June 1973

APPENDIX II

DEPARTMENT OF THE ARMY (continued)

	Tenure of office	
	From	To
ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS AND LOGISTICS):		
Harold L. Brownman	Oct. 1974	Present
Edwin Greiner	Aug. 1974	Sept. 1974
Edwin Greiner (acting)	May 1974	Aug. 1974
Vincent P. Huggard (acting)	Apr. 1973	Apr. 1974
Dudley C. Mecum	Oct. 1971	Apr. 1973

DEPARTMENT OF THE NAVY

SECRETARY OF THE NAVY:		
J. William Middendorf	June 1974	Present
J. William Middendorf (acting)	Apr. 1974	June 1974
John W. Warner (acting)	May 1972	Apr. 1974
UNDER SECRETARY OF THE NAVY:		
David S. Potter	Aug. 1974	Present
Vacant	June 1974	Aug. 1974
J. William Middendorf	June 1973	June 1974
Frank Sanders	May 1972	June 1973
CHIEF OF NAVAL OPERATIONS:		
Admiral James C. Holloway III	June 1974	Present
Admiral Elmo R. Zumwalt, Jr.	July 1970	June 1974

DEPARTMENT OF THE AIR FORCE

SECRETARY OF THE AIR FORCE:		
Thos. C. Reed	Jan. 1976	Present
James W. Plummer (acting)	Nov. 1975	Jan. 1976
John L. McLucas	July 1973	Nov. 1975
Vacant	June 1973	July 1973
Dr. Robert C. Seamans, Jr.	Feb. 1969	May 1973
UNDER SECRETARY OF THE AIR FORCE:		
James W. Plummer	Dec. 1973	Present
Vacant	July 1973	Dec. 1973
John L. McLucas	Mar. 1969	July 1973

DEPARTMENT OF THE AIR FORCE (continued)

	Tenure of office	
	From	To
ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS AND LOGISTICS):		
J. Gordon Knapp	Mar. 1976	Present
Richard J. Keegan (acting)	Feb. 1976	Mar. 1976
Frank A. Shrontz	Oct. 1973	Feb. 1976
Richard J. Keegan (acting)	Aug. 1973	Oct. 1973
Lewis E. Turner (acting)	Oct. 1972	Aug. 1973