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AD A 102643

BY THE COMPTROLLER GENERAL
Report To The Congress
OF THE UNITED STATES

**Improved Work Measurement Program
Would Increase DOD Productivity**

For years, DOD has tried to improve its depot managers' use of work measurement systems to distribute resources, reduce personnel requirements, and lower costs. However, GAO found that many of DOD's most serious work measurement problems continue to exist:

- The Office of the Secretary of Defense does not have a structured, dependable means to monitor service work measurement activities.
- Most of the work in DOD depots is still being measured with subjective or historical estimates.
- Continued work measurement understaffing threatens to further undermine the quality of the labor standards base.
- Lack of consistent depot management support and control is causing the work measurement system to lose its integrity and value.

If these systems are allowed to continue to deteriorate, efficiency will fall, budgets will rise, and less credible means of estimating costs will be used.

GAO makes several recommendations to strengthen the services' programs.

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14 GAO/PLRD-81-20
JUNE 8, 1981

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B-203049

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

This report discusses work measurement in DOD maintenance depots. It describes the progress being made by the services to improve their work measurement programs, the continued problems they are having in carrying out these programs, and ways to improve overall depot effectiveness through better work measurement.

Our last DOD-wide review of this subject was in 1976; since then, we have touched on specific service work measurement programs in several other reports. This review, a followup to our past recommendations, refocuses attention on needed improvements in DOD's work measurement programs.

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

Milton J. Fowler

Acting Comptroller General
of the United States

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COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

IMPROVED WORK MEASUREMENT
PROGRAM WOULD INCREASE
DOD PRODUCTIVITY

D I G E S T

For many years, the Department of Defense (DOD) has had programs aimed at improving, measuring, and evaluating its internal productivity. Because work measurement has proven to be an effective productivity-enhancing technique, it has always played a major role in these programs. In fact, where labor performance standards resulting from work measurement efforts have been used in concert with improved management, labor efficiency has increased 15 to 20 percent.

Some progress has been made in improving the services' work measurement programs, but many of DOD's most serious problems in this area have, for years, remained uncorrected. Recent initiatives have not solved or alleviated:

- Inadequate monitoring of the services' work measurement programs by the Office of the Secretary of Defense.
- Widespread use of nonengineered standards in DOD facilities.
- The services' inability to recruit and retain qualified work measurement personnel.
- Lack of consistent support by depot management for work measurement.

If these standards or their system of application are allowed to continue to deteriorate, efficiency will fall, budgets will rise, and less credible means of estimating costs will be used.

OFFICE OF THE SECRETARY OF DEFENSE

The Office of the Secretary of Defense (OSD) is the focal point for developing systematic ways of applying work measurement and the associated policy guidance. Although the Office has recognized the importance of this role, it still needs a reporting system to monitor the services' progress in implementing work measurement. (See pp. 4 to 6.)

AIR FORCE

In recent years, the Air Force Logistics Command has been emphasizing the accuracy of its labor standards through a 2-year labor standards improvement program and a subsequent consultant evaluation. However, the emphasis on accuracy apparently has been at the expense of improving coverage. The command has made no improvement during the last 5 years, and, during the latest period for which data is available--March to May 1980--coverage actually declined in four of the five air logistics centers. (See p. 13.)

Other problems include recruiting and retaining planner/technicians and other duties limiting the amount of time planner/technicians can spend on work measurement.

In addition, more specific guidance as to which workload to cover with standards and more control over local work measurement programs by the Air Force Logistics Command would improve program quality. (See pp. 15 to 20.)

ARMY

Although the Army has corrected some deficiencies, it still has three main problems in the work measurement area:

--Low coverage by engineered standards--from a low of 7 percent in one depot to a high of only 30 percent in another. (See p. 22.)

--A 20-percent decline in staffing of the work measurement function. (See p. 24.)

--System integrity. (See p. 25.)

NAVY

A Navy instruction requires that 80 percent of the naval air rework facilities' workload be covered by engineered standards. However, this goal seems to be beyond the repair facilities' reach. In fact, the trend is toward less coverage. Since 1977 facility-wide coverage has dropped 8 percent. GAO believes that the coverage has declined because the repair facility managers have not consistently emphasized work measurement. (See p. 33.)

One area, in particular, management should emphasize is accurate labor charges. At present, the repair facilities are having difficulty obtaining accurate labor charges because of workers' recording too many direct staff-hours as nonstandard time. (See p. 36.)

Other problems include:

- A lack of qualified personnel.
- Low quality of the standards. Because of this, naval aviation repair facility reports may be overstating actual workload coverage. (See pp. 34 and 35.)

RECOMMENDATIONS

In the interests of improving work measurement data accuracy and quality and ensuring that maintenance depot management adequately emphasizes the activity, GAO recommends that the Secretary of Defense:

- Require the services to report periodically on the status of their work measurement programs. Particularly, service reports should address progress toward achieving predetermined goals for workload coverage by engineered standards, trends in staffing the work measurement function, and work measurement contributions to increasing depot productivity.
- Become more involved in each service's work measurement program to provide timely advice and act as a conduit for information exchange among the services. (See p. 11.)

To improve the quality of work measurement in Air Force air logistics centers, the Secretary of Defense should direct the Secretary of the Air Force to:

- Develop a reporting mechanism by which the Air Force Logistics Command can monitor work measurement program results in the air logistics centers.
- Provide sustained emphasis on improving all aspects of work measurement with particular focus on upgrading estimates to engineered

standards and providing clear guidance for applying work measurement principles.

--Develop and implement solutions for the Air Force's recruiting and retention problems at each air logistics center, such as special pay rates for affected groups, until the reality and value of pending blue-collar pay reform is known.

--Redefine the duties of the planner/technician so that more time is spent on work measurement tasks.

--Require that air logistics center commanders improve their work measurement systems by submitting engineered standards coverage goals that are closer to the 80-percent goal suggested by a private consultant. (See p. 20.)

To improve the quality of work measurement in Army maintenance depots, the Secretary of Defense should direct the Secretary of the Army to act on the recommendations regarding work measurement GAO has made in the past and with which the Army has agreed. Specifically, the Army should:

--Increase its workload coverage with engineered standards and rely less on historical averages for estimating labor requirements.

--Fully implement an effective work measurement system, including improving work methods, labor standards, and staffing and monitoring system implementation.

--Place a high priority on carrying out its plans to improve the staffing of its work measurement functions. (See p. 30.)

To improve the quality of work measurement in naval air rework facilities, the Secretary of Defense should direct the Secretary of the Navy to:

--Require all rework facility commanders to set goals for improving their work measurement programs, particularly regarding covering

workload with engineered standards and maintaining the quality of these standards.

--Emphasize to new facility commanders the importance of the Navy's performance standards program and the need for the commanders to support it.

--Review relative staffing among support functions within each repair facility so that resources can be redistributed to avoid losses in facility effectiveness because of insufficient work measurement personnel.

--More accurately communicate to shop labor and management the need for accurate labor-hour reporting so that the advantages of accurate work measurement data are more fully realized. (See pp. 37 and 38.)

DOD COMMENTS AND GAO EVALUATION

In a February 24, 1981, letter, GAO asked the Secretary of Defense to comment on a draft of this report. In a meeting on March 27, 1981, DOD generally agreed with the facts as presented in the draft. GAO has included DOD's comments where appropriate.

DOD did not share GAO's concern that the services' existing policy guidance regarding proper application of work measurement principles needed updating. On the basis of further discussions with service work measurement program officials, GAO tends to agree with DOD that new guidance is not urgently needed. Accordingly, GAO has deleted its proposal that such guidance be issued.

DOD also voiced concern about GAO's proposal for stronger OSD oversight and involvement in work measurement. OSD believes that it should be a policymaking body and should let the services run and implement their own programs.

The work measurement program has suffered from a lack of interest and strong oversight. GAO's 1976 report pointed out these shortfalls; this followup shows degradations in program quality since then. GAO believes this is a critical point that the Secretary of Defense needs to address. If the Secretary wants the services to properly implement an effective productivity program, then OSD needs to have a stronger

role in the implementation and monitoring. A low-key approach has not been fully effective, and stronger leadership is needed. Therefore, GAO believes that its recommendations should be adopted by DOD.

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DIGEST

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NAVY WORK MEASUREMENT PROGRAM QUALITY
FALTERING DUE TO UNDERSTAFFING

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Navy has been working toward a
viable work measurement program
Coverage of workload by engineered
standards should be higher than
current level

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Understaffed work measurement
teams weaken standards and system
NARF top management needs to
strengthen its commitment to and
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ABBREVIATIONS

AFLC	Air Force Logistics Command
DESCOM	Depot Systems Command
DOD	Department of Defense
GAO	General Accounting Office
GS	general schedule
NALC	Naval Aviation Logistics Center
NARF	naval air rework facility
OSD	Office of the Secretary of Defense

CHAPTER 1

INTRODUCTION

Keeping Department of Defense (DOD) military aircraft, vehicles, weapons, and support equipment--valued at \$140 billion--up to date and combat ready will cost a projected \$9 billion in fiscal year 1981 and will require 167,000 personnel just at the depot level, generally about one-third of DOD's total maintenance costs. Large personnel requirements and maintenance costs will always be necessary to maintain DOD combat readiness. It is important, therefore, that DOD strive constantly to make more accurate personnel determinations and realize savings wherever possible.

Using a work measurement system, a valuable management tool, can save time, reduce personnel requirements, and lower costs because job activities are designed so that they use a minimum amount of resources. Two elements essential for a work measurement system are accurate labor standards and an effective management information system.

LABOR STANDARDS ACCURACY

Accuracy in a work measurement system depends on the use of engineered labor standards. Conceptually, labor standards provide workers with goals against which to measure their own productivity. They also give management criteria with which to evaluate current operations and a basis from which to estimate the cost of future work. A labor standard is the time needed (plus appropriate allowances) for a normally skilled operator following a prescribed method, working at a normal pace, to complete a defined task with acceptable quality. An engineered standard is established using a recognized technique, such as time study, work sampling, standard data, or a recognized predetermined time system, to derive at least 80 percent of the total time associated with the labor effort covered by the standard. Before the appropriate measurement technique is applied, a methods analysis is normally completed so that inefficiency is not built into the standard. Nonengineered standards do not meet the above criteria and are usually determined by estimates or are based on historical data.

The Office of the Secretary of Defense (OSD) and the services recognize that labor standards developed from work measurement are viable means of improving labor productivity at DOD's industrial activities, especially in DOD maintenance depots staffed primarily by civilians.

Specific requirements for using established engineered standards include:

- Having reasonable goals for achieving coverage of all direct labor by engineered standards.

- Building an accuracy of at least 25 percent, with a confidence level of 90 percent, into the standards.
- Developing personal, fatigue, and unavoidable delay allowances as part of the standard.
- Reviewing standards for accuracy when changes are made in the manufacturing process.
- Submitting periodic reports on labor performance and variance analysis on an exception basis.
- Providing internal audit of the system.

Therefore, if engineered standards cover a depot's workload, the system using these standards as input data should enjoy a certain measure of credibility. However, a high degree of non-engineered standards means that system accuracy cannot be guaranteed and managers tend to lose confidence in the labor standards as management tools. In other words, the benefits of a work measurement system will not accrue in an environment dominated by estimated labor time values based on historical data.

MANAGEMENT INFORMATION SYSTEM

The second essential element is a management information system which, among other things, tells managers--from shop foremen to depot commanders--how much time a job actually took and how much it actually cost. When labor standards are incorporated into such a system in a DOD industrial activity, the general requirements are

- a work measurement plan and supporting procedures;
- a clear designation of the organization and personnel responsible for carrying out the system;
- a plan to establish and maintain engineered labor standards of known accuracy and sufficient detail to allow daily variance analysis;
- a plan of continued improved work methods in connection with the established labor standards; and
- a defined plan for using labor standards as an input to budgeting, estimating, production planning, and direct labor performance evaluation.

If these requirements are met, the work measurement system's integrity will remain high, the system's data will be credible, and the system will be a useful management tool.

OBJECTIVES, SCOPE, AND METHODOLOGY

Our objectives were to

- determine and assess DOD's progress in improving the depot maintenance work measurement program,
- identify work measurement data and its application still needing improvement, and
- assess the adequacy of DOD management's commitment to and emphasis on work measurement.

Productivity principals (officials in OSD and the services) design the services' productivity programs. A large part of this design involves work measurement. We discussed with productivity principals past and current management emphasis on work measurement and what improvements were most needed in the services' programs.

The services' logistics commands carry out and evaluate the work measurement programs in the services' maintenance activities. Therefore, we did much of our work regarding the current status of work measurement programs at the logistics command level.

Because a large portion of the services' actual work measurement occurs in the maintenance depots, it was there that we evaluated and tested the current quality and use of DOD work measurement. Because of the geographic breadth of military activities, we conducted our audit work at two maintenance depots in each service.

In evaluating work measurement, we used two basic quantitative measures--workload coverage by engineered standards and trends in staffing depot work measurement functions. These measures are endorsed by the services and by various expert internal and external review groups. In displaying and reporting the measures, we used summary data collected by the depot personnel and maintained by logistics command personnel who monitor the work measurement program.

We tested each service's work measurement system by documenting its operation and discussing the system with employees at many locations throughout the DOD depot maintenance complex. (See app. I for a complete listing.)

CHAPTER 2

MANY PROBLEMS PERSIST IN MANAGING AND APPLYING WORK MEASUREMENT IN DOD DEPOTS

In 1976 1/ we recommended that the Secretary of Defense ensure stronger leadership, direction, and control over the services' work measurement programs. One way to do this, we said, would be through better communications mechanisms with the services. Since then, we have recommended in many reports 2/ that the services provide greater support to, and improve the staffing of, their work measurement programs. We have also recommended that the services make more use of valid labor standards instead of historical estimates. Even though the services have made some progress, many of DOD's most serious work measurement problems persist.

Recent DOD initiatives either have not helped or not addressed many problems. Some examples follow:

- A structured, dependable means for OSD to monitor service work measurement activities does not exist.
- Most depot work is still being measured with subjective or historical estimates, and there is little emphasis on using more efficient methods or increasing depot productivity.
- Continued work measurement understaffing threatens to further undermine the quality of the labor standards base.
- Lack of consistent depot management support and control is causing work measurement data to be applied improperly and the system to lose its integrity and value.

NEW REPORTING REQUIREMENT NEEDED SO OSD CAN MONITOR WORK MEASURE- MENT USE AND ENSURE CONTINUED PRODUCTIVITY GAINS

Because of demonstrated advantages of an effective work measurement program, OSD should do more to follow through and ensure adequate work measurement implementation within the services. In particular, a reporting system with which OSD can monitor the services' progress in implementing work measurement is still needed. OSD's updated work measurement policy guidance containing requirements for a reporting system

1/"Improvements Needed in Defense's Efforts To Use Work Measurement" (LCD-76-401, Aug. 31, 1976).

2/See app. II.

has been over 2 years in the making. This guidance is now in draft form; however, OSD personnel are not certain the reporting requirements will remain intact.

Work measurement is the basis for productivity gains

For many years, DOD has had programs aimed at improving, measuring, and evaluating its internal productivity. Because work measurement has proven to be an effective productivity-enhancing technique, it always played a major role in these programs. Where labor performance standards resulting from work measurement efforts have been used in concert with improved management, labor efficiency has increased 15 to 20 percent. Using labor performance standards has, in some cases, resulted in productivity improvements as high as 30 percent.

Lack of services' reporting contributes to OSD's spotty control of work measurement

OSD does not have an ongoing reporting system for the services' work measurement program, primarily because in 1975, when the work measurement instruction, DOD Instruction 5010.34, was issued, OSD's policy was to stay abreast of service programs in ways other than formal reporting. As a result, OSD is not in the best position to provide policy guidance to the services on how to change or improve their work measurement programs.

An illustration of OSD's need for information and the services not providing it follows. In 1978 OSD issued instructions to the services for preparing program objective memorandums. The instructions directed the services to establish productivity goals for planning, programing, and budgeting, and emphasized, among several other actions, work methods improvement programs. The services were to support these goals with action plans stating the resources used, savings made, and plans for using these savings. However, the services did not respond with goals as requested. Instead, they argued that they could not develop the information required in the necessary detail. OSD claimed the services did not have the detailed data because they had not complied with the DOD instruction requiring them to maintain the data. Although knowing the services could not comply, OSD did not confront them with it until this specific request for information in 1978. This frustrating exercise illustrates the difficulty OSD faces when gathering information without having a structured reporting system within which the services can routinely report.

According to the DOD productivity principal, OSD believes that reports from the services are not the best means of reviewing a program. OSD's philosophy has been to rely on feedback from service internal auditors and on direct reviews of service implementing instructions to judge work measurement program

effectiveness. OSD could not provide specific instances of where reliance on these sources paid off; moreover, these sources seem to provide uncertain feedback on program effectiveness and should not be counted on to satisfy OSD's information needs. According to this oversight philosophy, after a service develops a program's implementing instruction, it assumes responsibility for the program and is not bound to report back to OSD on its progress. We believe that this procedure prevents OSD from having a clear understanding of the services' work measurement efforts and lessens OSD's ability to provide effective guidance.

Reporting requirement tied to uncertain
issuance of OSD work measurement
instruction

OSD officials acknowledge that they have not provided the services with recent, formal guidance on using work measurement data. These officials believe that the current guidance is adequate and that the need for a new work measurement instruction is not urgent. However, under the current instruction, service reporting requirements do not exist.

Although the services are not required to report to OSD on the status of their work measurement programs, OSD officials say reporting could be useful. In fact, reporting requirements are contained in the latest draft revisions to DOD Instruction 5010.34, which addresses work measurement. However, revisions to this instruction have been 2 years in the making, and their approval does not, even now, seem imminent. In addition, it is not certain that when the new work measurement instruction is issued it will contain reporting instructions. According to the services, delays in OSD's updating the work measurement instruction have no negative effects on their programs, but delays in needed guidance have no positive effects, either.

WORK MEASUREMENT APPLICATION
NOT CONSISTENT

For work measurement data to benefit an organization, the data must be accurate and available, it must be combined with other information, and management must learn to depend and act on the results. These events are not independent; raw data quality affects information system integrity; which in turn influences management's tendency to use the data. If work measurement data does not play a role in decisionmaking, then the function will receive less management support, eventually resulting in lower data quality and system integrity. Clearly, then, the first priority in applying work measurement data should be to emphasize developing accurate labor standards. In DOD maintenance depots, work measurement data accuracy can be assessed by determining (1) the amount of repair workload covered by the engineered standards and (2) the quality level of the engineered standards base.

Engineered standards coverage and quality can and should be greatly improved in all three services' maintenance depots. We found that the services' ability to improve their work measurement programs depends on their ability to recruit and retain qualified people for the program. The services' ability to maintain effective programs depends on the initial commitment and sustained support from depot management.

Department of the Air Force

For 4 years, the Air Force has been evaluating and changing its depot maintenance work measurement program. Independent review groups have provided objective assessments of the program as well as recommendations for improvement. Work measurement program management has reacted positively by implementing several of those recommendations. Because results have been seen primarily as one-time improvements to the existing engineered labor standards base, future management attention should focus on developing a sustained and well-rounded improvement program.

In evaluating the Air Force's work measurement program, each review group identified deficiencies. One such group, the Air Force Depot Maintenance Management Systems Assessment Group, said labor standards quality was such that reported labor efficiencies did not provide an accurate or realistic measure of performance. As a result of the group's identifying several labor standards deficiencies, the Air Force decided to upgrade the quality of the depot maintenance labor standards and to strengthen the work measurement function through a labor standards improvement program.

The Air Force implemented its labor standards improvement program in October 1977. At the program's conclusion, the Air Force had realized a net capability increase of 885,170 standard hours--about 2.6 percent of the Air Force Logistics Command's (AFLC's) 34 million standard hours annually of maintenance operations.

The Air Force, apparently still not satisfied with the status of its work measurement program, hired a private consultant to

- evaluate the adequacy and effectiveness of the labor standards improvement program,
- determine the validity of the engineered standards improved under the program, and
- assess the AFLC production engineering/planning program.

Upon completion of its evaluation, the consultant made numerous substantive recommendations, and the Air Force has now revised its work measurement regulations on the basis of those recommendations.

Some specific conclusions we reached regarding work measurement in Air Force air logistics centers are listed below and are discussed more fully in chapter 3.

- Except for improvements in the accuracy of the existing engineered standards, the quality of the air logistics centers' work measurement programs has changed little since 1977.
- The guidance in Air Force regulations about work measurement standards is too subjective and open ended.
- Many of the problems identified in prior assessments as causes for low-quality work measurement are still present today. For example, (1) industrial engineering planner/technicians are still involved in too many other tasks, and therefore, are not spending enough time on work measurement, and (2) recruiting and retaining qualified industrial engineering technicians, are still problems.
- Inadequate reporting by air logistics center work measurement programs to AFLC could also cause inconsistent program quality.

Department of the Army

The Army plans to improve maintenance productivity by more effectively applying work measurement. For example, the Army's Depot Systems Command (DESCOM) plans to (1) carry out a formal productivity improvement program, (2) establish productivity improvement divisions in each depot, and (3) increase the number of staff in the depots' Methods and Standards Branches. However, as shown by the following historical facts, the current emphasis needs top managers' support to reverse the past trend of deemphasizing work measurement:

- Workload coverage by engineered standards has stagnated since 1977.
- Methods and standards personnel resources have decreased as a percentage of direct labor.
- The Development and Readiness Command and Army headquarters seemingly have offered only token support for work measurement.

Some specific conclusions we reached regarding work measurement in Army depots are listed below and are discussed more fully in chapter 4.

- In the past 5 years, Army depots have reduced the number of methods and standards personnel by about 20 percent.

- The accuracy of the Army's work measurement data is low because most of the standards are nonengineered.
- Work measurement data lacks integrity because of system implementation problems.
- Standards are being established and validated by unqualified personnel because of a lack of trained work measurement personnel.
- The Army's nonengineered standards have not been adequately documented.
- Several questionable work measurement practices at the Tobyhanna Army Depot, Tobyhanna, Pennsylvania, tend to inflate the depot's labor standard base.

Department of the Navy

The Naval Aviation Logistics Center (NALC) has been the primary catalyst in causing work measurement to be a more useful managerial tool in the Navy. We reported in 1975 that naval maintenance depots' work measurement programs were not adequate to make realistic workload and cost estimates or to control cost growth. This situation has improved significantly because of NALC's persistent review, support, and reinforcement of the application of work measurement concepts and principles.

NALC is supporting work measurement in the naval air rework facilities (NARFs) through a program of goals, review, and follow-up. For example, NALC has set

- an 80-percent engineered standards goal with a 65-percent minimum for all NARFs,
- labor standards reduction goals for each NARF, and
- a 5-percent maximum goal for time charged as nonstandard work.

In addition, NALC encourages the use of its internally developed system of elemental standard data and a data interchange system among NARFs as two ways to reduce the time analysts spend in setting standards.

Several problems still needing management's attention are listed below and are discussed more fully in chapter 5.

- The Navy's 80-percent goal for engineered standards coverage seems to be beyond the NARFs' reach. In fact, the recent trend is toward less coverage.

- The inconsistent quality of NARF standards means that the Navy may be overstating its coverage.
- NALC is not providing NARFs with criteria for selecting work to be covered by engineered standards.
- NARF managers are not strongly emphasizing work measurement activities, and they need to do more to ensure the accuracy of labor charges.
- The Navy, like the other services, is not able to retain qualified work measurement analysts.
- In some instances, the Navy has not been updating its labor standards correctly.

CONCLUSIONS

For work measurement to be a useful management tool for enhancing productivity and lowering costs, OSD must exert stronger leadership. While OSD should be the focal point for developing systematic ways of applying work measurement and the associated policy guidance, it is not taking an aggressive enough attitude in that role. Without a formal feedback mechanism and periodic testing, OSD cannot assure that its policies are being carried out effectively. Moreover, until service reporting requirements are incorporated into the DOD work measurement instruction, that assurance will continue to be absent.

RECOMMENDATIONS

In the interests of improving work measurement data accuracy and quality and ensuring that maintenance depot managers adequately emphasize the activity, we recommend that the Secretary of Defense:

- Require the services to report periodically on the status of their work measurement programs. Particularly, service reports should address progress toward achieving predetermined goals for workload coverage by engineered standards, trends in staffing the work measurement function, and work measurement contributions to increasing depot productivity.
- Become more involved in each service's work measurement program to provide timely advice and act as a conduit for information exchange among the services.

DOD COMMENTS AND OUR EVALUATION

In a February 24, 1981, letter, we asked the Secretary of Defense to comment on a draft of this report. In a meeting on March 27, 1981, DOD generally agreed with the facts as presented in the draft. We have included DOD's comments where appropriate.

DOD did not share our concern that the services' existing policy guidance regarding proper application of work measurement principles needed updating. On the basis of further discussions with service work measurement program officials, we tend to agree with DOD that new guidance is not urgently needed. Accordingly, we have deleted our proposal that such guidance be issued.

DOD also voiced concern about our proposal for stronger OSD oversight and involvement in work measurement. OSD believes that it should be a policymaking body and should let the services run and implement their own programs.

The work measurement program has suffered from a lack of interest and strong oversight. Our 1976 report pointed out these shortfalls; this followup shows degradations in program quality since then. We believe this is a critical point that the Secretary of Defense needs to address. If the Secretary wants the services to properly implement an effective productivity program, then the OSD level needs to have a stronger role in the implementation and monitoring. A low-key approach has not been fully effective, and stronger leadership is needed. Therefore, we believe the recommendations in this chapter as well as in the succeeding chapters should be adopted by DOD.

CHAPTER 3

ENGINEERED STANDARDS ACCURACY HAS IMPROVED, BUT MANY OTHER IMPROVEMENTS NEEDED IN AIR FORCE

WORK MEASUREMENT PROGRAM

Recent Air Force assessments of its work measurement program have pointed out that the Air Force program lacks quality because the accuracy of the labor standards is too low. To remedy this, the Air Force improved the accuracy of the existing engineered standards base, which now covers only about 35 percent of the workload. However, in doing so, the Air Force neglected many of the problems that contributed to its low overall engineered standards coverage, even though the potential for improvement has been recognized by private consultants and by AFLC top management. What remains is for management to provide sustained support for balanced improvement efforts by adequately staffing and monitoring them and giving them appropriate guidance.

HIGHER COVERAGE WITH ENGINEERED STANDARDS WOULD IMPROVE QUALITY OF LABOR STANDARDS PROGRAM

Recent assessments of AFLC's work measurement program found that coverage of maintenance workload by engineered standards is too low. Individual air logistics center goals for coverage are also too low and are far below their potential. Firmer guidance to and control of the local work measurement programs by AFLC headquarters would improve program quality.

Coverage has stagnated, goals are too low,
but potential for improvement exists

In August 1977 a comprehensive and definitive Air Force study, "Assessment of Present and Planned Depot Maintenance Management Systems," stated that "Labor standards, properly used, are the key to improving depot maintenance management effectiveness." The study, commonly known as the Buckingham report, identified the following program deficiencies:

- Failure to maintain and upgrade the standards properly.
- Reductions in the time available for standards setting by work measurement technicians.
- Extensive reliance on estimated standards.
- Excessive use of occurrence factors to compute labor standards elements for jobs which have wide fluctuations in work content.

--Placement of the work measurement function within the maintenance operating division.

The report concluded that

"* * * the present quality of the labor standards provided by the ALC [air logistics center] work measurement program is such that reported work center labor efficiencies do not provide an accurate or realistic measurement of performance."

The report also said that the quality of a standards program depends on the percentage of workload covered by engineered standards. At the time, coverage of workload in AFLC air logistics centers ranged from 13 to 44 percent. According to the report's criteria, the Air Force has changed little since 1977--the following table shows that the current range of coverage is 17.8 to 36.3 percent.

Coverage of Programed Workload With Engineered Standards
(Average coverage for Mar., Apr., and May 1980)

<u>Air logistics center</u>	<u>3-month programed workload</u>	<u>Earned hours covered by engineered standards</u>	<u>FY 1980 coverage percentage goal</u>	<u>Actual coverage percentage (3-mo. average)</u>
Sacramento, Calif.	1,306,062	312,537	26.9	17.8
Warner Robins, Ga.	1,437,393	459,484	20.0	27.4
San Antonio, Tex.	1,599,380	677,338	41.0	36.3
Ogden, Utah	1,315,369	556,545	37.0	32.3
Oklahoma City, Okla.	1,706,632	605,884	35.0	31.2

To bolster the coverage, AFLC recently required the air logistics centers to submit engineered standards coverage goals. As the table shows, however, even if the goals--20 to 41 percent--are achieved, coverage will change only slightly.

As shown in the table, from 17.8 to 36.3 percent of AFLC's work is covered by engineered standards. This means that from 63.7 to 82.2 percent of work at the various centers is covered by nonengineered standards which cannot be audited because no documentation for them is required; they are developed through "empirical judgment," according to their definition in AFLC Regulation 66-4. No accuracy requirement is imposed on the standards, and no methods work is done to assure even a minimum efficiency. Under

these conditions, performance measurement is meaningless because actual, current performance is being compared against average historical performance and, in the absence of any drastic changes from period to period, expected efficiency will always be around 100 percent. With such high proportions of estimated standards, it is not surprising that the Buckingham report attributed the attainment of 85 to 95 percent efficiencies to, in part, "loose" standards.

What coverage is possible in a repair environment? Where is the point of diminishing return? We cannot answer these questions definitively, but, to provide an approximate answer, we analyzed programed workload at the Warner Robins and Oklahoma City Air Logistics Centers. We found 551,631 and 678,812 standard hours at Warner Robins and Oklahoma City, respectively, that satisfy AFLC criteria in use until recently (100 units and 2,000 hours) for developing engineered standards but were covered with nonengineered standards. Upgrading these to engineered standards at Warner Robins and Oklahoma City would mean increases of 10.3 and 13.3 percent, respectively, in the engineered standards coverage. Thus, the potential exists for broadening coverage on the basis of the coverage goals submitted to AFLC, but what seems to be missing is a willingness on management's part to place emphasis on this portion of the labor standards program.

Need for a shift in emphasis toward
increasing engineered standards coverage

Since the Buckingham report criticized AFLC's work measurement program, AFLC has been emphasizing the accuracy of its labor standards through the 2-year labor standards improvement program and the subsequent consultant evaluation. However, the emphasis on accuracy apparently has been at the expense of improvement in coverage. AFLC has made no improvement during the last 5 years, and, during the last period for which we have data--March to May 1980--coverage actually declined in four of the five air logistics centers.

Also, coverage varies widely among maintenance divisions in the depots. For example, coverage in the aircraft divisions by engineered standards is almost zero, even though the same equipment returns for repair year after year. Depot work measurement officials said that, according to AFLC Regulation 66-4, repair order quantities for aircraft overhaul have not been large enough to economically justify engineered standards. The Air Force productivity principal, however, feels that more efficient work measurement techniques would allow standards to be developed without using too many people. A revision to AFLC Regulation 66-4 lifts the order quantity criteria and allows more discretion in choosing workload to cover with accurate standards. Therefore, coverage of aircraft overhaul workload could increase if appropriate management emphasis is present.

To encourage the depots to use fewer estimates and more engineered standards, AFLC management needs to consciously shift its emphasis in that direction. The consultant which evaluated the labor standards improvement program said that overall coverage should be 80 percent and offered many detailed recommendations for reaching that level. These recommendations should be considered as AFLC begins to emphasize coverage.

AFLC management should provide firmer guidance for increasing standards coverage

Recently revised AFLC Regulation 66-4 states that coverage by engineered standards is the primary goal for a viable work measurement program. It directs the air logistics centers to develop and submit coverage goals to AFLC for review and approval. To assist the centers in determining how much workload should be covered, the regulation provides this guidance:

"* * * standards will be engineered beginning with the high volume, high [standard hour] workloads working progressively downward in volume and [hours] until a point of diminishing return on the investment in work measurement resources has been reached." ^{1/}

The centers' response to this open-ended guidance was to submit goals that are less than half of the 80-percent goal that was recommended by a private consultant hired by the Air Force. The Warner Robins and Sacramento centers had especially low goals of 20 and 26.9 percent, respectively. In fact, Maintenance Directorate officials at Warner Robins believe the "point of diminishing returns" to be an annual volume of 10,000 standard hours. If this figure became the criteria for engineered standards coverage at Warner Robins, only 43 of about 5,500 line items in the Warner Robins programed exchangeable workload would have engineered standards. Furthermore, coverage would subsequently drop to less than 15 percent of the total programed workload.

AFLC officials responsible for monitoring and evaluating the centers' work measurement programs do not receive periodic summary reports from the centers on their coverage attainment. Without current reporting, efficient monitoring becomes difficult and air logistics centers' adherence to the new regulation is uncertain. Work measurement program quality could continue to degrade without AFLC knowing or being able to judge the rationality of coverage goals of 20 percent, or possibly less, submitted by the centers.

^{1/}The Army and Navy have quantitatively determined that point; the Air Force has not.

LACK OF ADEQUATE STAFFING AND CONSISTENT
OVERSIGHT RESPONSIBLE FOR LOW QUALITY OF
WORK MEASUREMENT PROGRAM

Many of the causes the Buckingham report identified for low-quality work measurement are present today. We found that planner/technicians are involved in too many other tasks, and therefore, are not spending enough time on work measurement. Also, recruiting and retaining qualified technicians remain problems because of

- a pay disparity between blue-collar (wage grade) and white-collar (general schedule, or GS) personnel in the Directorate of Maintenance and
- a job classification disparity between the Directorates of Maintenance and Material Management.

Until these problems are solved, sustained improvement to the work measurement system will not occur.

Multiple responsibilities limit
the amount of time planner/technicians
spend on work measurement

The Engineering/Planning Branches at each center are responsible for establishing and maintaining labor standards. However, according to a 1979 labor standard study, planner/technicians spend only about 28 percent of their time on this work. Instead, they spend most of their time on such tasks as

- long-range workload preplanning and workload negotiations,
- short-range preplanning and modifications,
- review of material standards,
- facilities/equipment design,
- system design, and
- consulting.

The cause of this seems to be the merging of the industrial engineering and planning functions in 1971. Since then, the following organizational trends have developed:

- Planning has become the first priority in engineering/planning organizations.
- Most resources within engineering/planning have been channeled into the planning function.
- Setting and maintaining standards have become secondary to the planning function, even though the standards program

is the basis for planning and forms the pricing structure for each center.

Pay differential between wage grade and GS personnel impairs the recruitment and retention of qualified analysts

The most qualified candidates for planner/technician positions are wage grade employees who have several years of shop experience. Because they know how the work should be done, they can accurately and expeditiously evaluate labor standards. Unfortunately, the significant pay disparity between wage grade and GS personnel makes planner/technician positions unattractive. For example, if typical wage grade employees became planner/technicians, their total salary loss over a 5-year period would be about \$13,177. They could expect to earn about \$3,740 less per year than if they had remained in the shop. A salary difference of this size could act as a major barrier to recruiting qualified personnel.

All levels of Air Force management have recognized pay disparity as a major problem in recruiting and retaining planner/technicians. Although Warner Robins officials proposed a solution involving special pay rates, AFLC rejected it as being too expensive. Also, AFLC doubted whether Warner Robins' proposal complied with Federal personnel regulations, and this doubt mitigated AFLC's approval of the special pay rate solution. AFLC's response to Warner Robins was that the solution should come through proposed legislative action as part of the Federal Pay Comparability Reform Act of 1981, instead of specific pay increases for small groups.

According to the Air Force, the act would offer a potential, specific solution to the pay disparity problem. It calls for revising within-grade pay ranges and night-shift differentials for wage grade employees, thereby making their salaries lower. Over a period of time, the pay disparity between wage grade and GS employees would decrease somewhat and the planner/technician positions might once again attract the most qualified applicants.

Responding to the Congress in other contexts, we have endorsed the act's blue-collar pay reforms. However, because similar acts have been submitted to the Congress in the past, its enactment into law is not certain. Also, because its precise impact on the relationship between blue-collar pay and white-collar pay cannot be predicted, it may not be a viable solution to the pay disparity problem.

Job classification disparity between two Directorates contributes significantly to the loss of qualified planner/technicians

GS-9 is the journeyman level for planner/technicians within the Directorate of Maintenance in the air logistics centers. In contrast, the journeyman level for technician positions within

the Directorate of Material Management--which requires about the same level of skill--is GS-11. Because of this difference, when they become eligible, planner/technicians in the Directorate of Maintenance apply for similar positions in the Directorate of Material Management, the former serving as a training base for the latter.

These pay disparity and job classification problems seem to be worsening and are not amenable to quick solutions. For example, during the first 8 months of calendar year 1979, the Engineering/Planning Branches at one center lost 31 planner/technicians. In addition, 56 planner/technicians requested reassignments to the Directorate of Material Management. The problem became so serious that the Deputy Director of Maintenance at Warner Robins put a freeze on all assignments outside the Maintenance Directorate. Although short-term action is necessary, long-term solutions to these problems need to be found.

IMPROVED LABOR STANDARDS HAVE SIGNIFICANT
IMPACT ON AIR LOGISTICS CENTER EFFICIENCY
AND CAPABILITY

When nonengineered standards are upgraded from historical estimates to engineered standards, the allowed time usually decreases by 15 to 25 percent. Assuming little change in work content, a similar, though smaller, improvement will occur through the periodic maintenance of existing engineered standards, as was shown during the recent 2-year labor standards improvement program. The emphasis during this program was to improve existing engineered standards; however, we believe more benefits could be realized by converting estimates to engineered standards.

The Buckingham report suggested that, to remedy the deficiencies in AFLC's work measurement program, AFLC should reemphasize the need for reliable standards. In response, the labor standards improvement program was established on October 1, 1977, with a primary objective of validating engineered labor standards. The program officially ended September 30, 1979, at which time the Air Force hired a private consultant to audit the labor standards, evaluate the improvement program, and assess the AFLC production engineering/planning program.

The consultant's quantitative evaluation of the labor standards improvement program was in terms of the increased direct product standard hours of capability that the air logistics centers have to repair equipment. In summarizing his evaluation, the consultant said:

"A net capability increase of 885,170 DPSH [direct product standard hours] is the result of reviewing and updating labor standards across the Command. This capability change reflects modification not only to operations covered by engineered standards but also of operations covered by nonengineered

standards. The increased capabilities permit AFLC to undertake additional work or new workloads to the extent of the increase without increasing direct labor costs. These improved conditions reflect a positive benefit of reviewing and upgrading estimated standards to engineered standards. However, it should be understood that net capability increases also depend on the workloads actually materializing upon which improvements were based."

The consultant's results are shown in the table below.

<u>Labor Standards Improvement Program</u>			
<u>Impact Net Capability Change (note a)</u>			
<u>Air logistics center</u>	<u>Standard hours covered</u> (millions)	<u>Change in standard hours</u>	<u>Percent of validated hours</u>
Metrology and Calibration, Ohio	1.0	-141,904	14
San Antonio, Tex.	1.1	-131,191	12
Sacramento, Calif.	1.7	-282,802	17
Oklahoma City, Okla.	1.1	-108,333	10
Warner Robins, Ga.	0.8	-40,256	5
Ogden, Utah	<u>0.7</u>	<u>-180,684</u>	26
Total	<u>6.4</u>	<u>-885,170</u>	14

a/The figures in this chart are effective as of the time the consultant audited each center. Therefore, the time frames are not consistent and no attempt should be made to compare the data of one center with those of another.

Although the labor standards improvement program focused mainly on validating engineered standards, a great deal was also done to upgrade nonengineered standards--an activity which we believe offers a bigger payoff. For example, at Warner Robins, when 78 estimates were upgraded to engineered standards, 479,746 standard hours were lowered to 363,289 hours--a 24.3-percent change. In contrast, the validation of 94 engineered standards

produced a decline from 625,649 standard hours to 605,930 hours--or only a 3.2-percent change. Thus, a far greater return is realized for upgrading estimates to engineered standards than for validating existing standards.

CONCLUSIONS

Beginning in 1977, a great deal of evaluation, focused improvements, and change characterized AFLC's work measurement program. But the most important determinant of program quality--workload coverage by engineered standards--did not improve at all. Moreover, AFLC has no routine reporting system for monitoring coverage trends. Although the labor standards improvement program improved the accuracy of a portion of the existing standards base, many of the causes for the original low coverage and inaccurate standards still exist. Until pay and job classification problems are solved so that adequate staffing exists, and until a sufficient number of qualified technicians can focus on work measurement and not on a host of other duties, sustained improvement will not occur. In addition, future emphasis on work measurement improvements will have a higher payoff if the Air Force focuses on converting estimated standards to engineered standards and provides clearer guidance on which portions of workload to cover with engineered standards.

RECOMMENDATIONS

To improve the quality of work measurement in Air Force air logistics centers, we recommend that the Secretary of Defense direct the Secretary of the Air Force to:

- Provide sustained emphasis on improving all aspects of work measurement with particular focus on upgrading estimates to engineered standards and providing clear guidance for applying work measurement principles.
- Develop a reporting mechanism by which AFLC can monitor work measurement program results in the air logistics centers.
- Redefine the duties of the planner/technician so that more time can be spent on work measurement tasks.
- Require that Air Force air logistics center commanders improve their work measurement systems by submitting engineered standards coverage goals that are closer to the 80-percent goal suggested by the consultant.
- Develop and implement specific solutions for the Air Force's recruiting and retention problems at each air logistics center, such as special pay rates for affected groups, until the reality and value of pending blue-collar pay reform is known.

CHAPTER 4

MUCH IMPROVEMENT POSSIBLE IN ARMY

DEPOT WORK MEASUREMENT PROGRAM

Recognizing the merits of work measurement, the Comptroller of the Army, in 1978, said:

"In the operation and management of an organization, it is fundamental that standards be established to measure the efficiency and effectiveness of the organization. * * *. Armed with reliable standards, a manager can operate with a greater degree of confidence in today's environment of constrained resources. The ability to know where resource adjustments can be made without having to resort to an undisciplined and arbitrary approach is an achievable objective of the Methods and Standards effort."

This kind of recognition by Army management of the need for an aggressive work measurement program implies a commitment for such a program. However, we found that, although improvements are planned, the Army's work measurement activities are plagued with low-quality data, decreasing number of personnel, and system implementation problems. We believe that many improvements in the work measurement system are possible and that effective management use of the system will be enhanced if the Army takes less of an "undisciplined and arbitrary approach."

ARMY IS PLANNING IMPROVEMENTS

We recently reported on the Army's inability to maintain a viable work measurement program in its combat vehicle depots and noted major inadequacies at the depot level. ^{1/} The Army has acknowledged most of these inadequacies and, through its formal productivity improvement program, has initiated several actions to:

- Improve cost data validity. During 1981 the DESCOM Comptroller plans to validate new labor standards as they occur and update existing standards on a time-phased plan.
- Improve program discipline. DESCOM plans to (1) emphasize the need for developing and documenting efficient work methods, (2) request a relaxation of the accuracy criteria now in effect for establishing engineered standards, thereby permitting more standards to be developed per

^{1/}"Significant Savings Possible Through More Efficient Depot Maintenance on Army Combat Vehicles" (LCD-80-82, Aug. 7, 1980).

analyst in a given time period, and (3) investigate and promote the use of more efficient techniques for developing engineered standards.

--Improve program integrity. DESCOM plans to take a more active role in the depot methods and standards program reviews. It also plans to modify its workload pricing system by developing an auditable management factor which will adjust engineered standards to depot bid standards.

--Improve its staffing. DESCOM has moved all its depots' Methods Branches and three Standards Branches from the depots' comptrollers to the Directorates of Maintenance. If the other depots' Standards Branches follow, this reorganization should increase total methods and standards staffing from 182 to 263 during fiscal year 1982.

We are encouraged by DESCOM's attention and management's efforts and commend the Army for the strong support given to this area.

COVERAGE BY ENGINEERED
STANDARDS SHOULD BE HIGHER
THAN CURRENT LEVEL

The Army has recognized that the depot maintenance system needs to increase its use of engineered standards. Thus, in January 1980, DESCOM determined that a potential of 45 percent of its maintenance operations could be covered by engineered standards by the end of fiscal year 1980. The minimum potential coverage was 35 percent. However, these potentials were only estimates and were established to encourage depots to increase coverage. This is necessary because the majority of work measurement standards in use at depots are nonengineered and, therefore, are based on historical performance and incorporate past inefficiencies.

Large variance in use of engineered
standards at Army depots

Engineered standards coverage varies among depots. At the end of the third quarter of fiscal year 1980, the coverage for the Army's nine depot maintenance activities ranged from a low of 7 percent to a high of only 30 percent. Only two of the nine depots had achieved their planned coverage levels for engineered standards; not one had exceeded its planned coverage level. Further, only two depots anticipated meeting the DESCOM minimum potential of 35 percent. The following table shows each depot's planned and actual engineered standards coverage at the end of the third quarter of fiscal year 1980.

Maintenance Engineered Standards
Coverage Level

<u>Depot</u>	<u>Planned</u>	<u>Reported actual</u>	<u>Percent of planned</u>
	(percent)		
Tooele, Utah	45	28	62
Anniston, Ala.	36	30	83
Red River, Tex.	30	26	87
Sacramento, Calif.	30	23	77
Tobyhanna, Pa.	26	22	85
Corpus Christi, Tex.	23	23	100
Letterkenny, Pa.	20	7	35
Sierra, Nev.	14	14	100
New Cumberland, Md.	11	10	91

Potential for engineered standards coverage is double current planned level

What is the true potential for coverage in the Army? And how can that potential be approached?

To answer the first question, we analyzed a listing of Tobyhanna's projected fiscal year 1981 workload to determine how much of it could be covered economically with engineered standards. We found that about 54 percent could. This is more than twice the planned and actual coverage levels of 26 percent and 22 percent, respectively, for Tobyhanna.

We used as a basis for our analysis a model developed in 1979 by the Tobyhanna Methods and Standards Branch entitled "Economic Breakeven Point of Setting Engineered Standards." The model assumes that:

- An average of 6 hours of analyst time is needed to produce 1 standard hour.
- The labor rate for time study analysts is \$9.61 an hour.
- A 15-percent productivity savings accrues by using an engineered standard over a nonengineered standard.
- The average maintenance labor rate is \$10.77 an hour.

The model determined that 36 units are the minimum quantity per maintenance job for the savings to cover the cost of establishing the standard.

The projected workload analyzed represents about 60 percent of the depot's total annual workload, with the other 40 percent coming from carryover from the previous year and additional work not currently planned. The distribution of order quantities of

the remaining 40 percent may not be identical to the one we studied; however, we feel our conclusion that 54 percent of Tobyhanna's workload could be covered by engineered standards is close to being accurate. In fact, Tobyhanna analysts made a similar study for a time period earlier in the year and found 47 percent of the workload susceptible to engineered standards. Tobyhanna officials noted that this percentage is subject to variation because planned workload does not always materialize and the depot has little control over this variable.

The answer to the second question, how to achieve more accurate standards through higher coverage, is discussed below.

INSUFFICIENT METHODS AND STANDARDS PERSONNEL TO CONDUCT WORK MEASUREMENT PROGRAM

The primary reason for the low coverage is that in recent years, despite avowed high-level support for work measurement, the Army depots have been reducing the number of methods and standards personnel. For example, in the past 5 years, the number of work measurement personnel for all functional areas in maintenance depots has decreased by about 29 positions, or about 20 percent, as the following table shows.

<u>FY</u>	<u>No. of methods and standards personnel authorized</u>
1975	144
1976	136
1977	132
1978	121
1979	115

Furthermore, the ratio of assigned methods and standards personnel to direct labor personnel susceptible to engineered performance standards is declining and is another measure of the Army's lack of commitment.

<u>FY</u>	<u>Ratio of technicians to personnel covered by engineered standards</u> (note a)
1977	1:158
1978	1:153
1979	1:184
1980	1:190

a/GAO computed.

At the Tobyhanna and Letterkenny depots in Pennsylvania, we found the same situation--a decline in the number of authorized spaces. At Tobyhanna, in an 8-year period, staffing declined from 22 to 8; at Letterkenny, the decline was not as severe but was still substantial--a reduction of 5 positions in less than 2 years. Applying the staffing criteria in Development and Readiness Command Regulation 5-9, we determined that the two depots included in our review were understaffed by a total of 14 work measurement positions for maintenance functions alone. Overall, therefore, the depots' inability to cover their workload with engineered standards is somewhat explained by the decreasing resources devoted to the program.

This lack of resources and apparent lack of commitment is also evident at Army headquarters. For example, the Army Comptroller's Office has only two spaces for work measurement (one was recently vacated and one is filled), and the Army's Development and Readiness Command has only one. Also, the the charter for the Army's newly created Productivity Technical Committee, described to us by the Army productivity principal as an example of the Comptroller's commitment to work measurement, was allowed to expire. The Committee, formed in June 1979, was to meet at least quarterly and was to coordinate the development of work performance standards. Although it met only once during its year-long charter, it met again in September 1980, and Army officials say it will continue to function and meet annually.

Although DESCOM's newly initiated programs should be able to increase emphasis on work measurement, they must have more continuous interest and support than does the Productivity Technical Committee. Furthermore, the Army must give methods and standards more personnel if the program is to be the keystone for improving productivity.

SYSTEM IMPLEMENTATION PROBLEMS COMPROMISE INTEGRITY

A work measurement system exists in the Army and, in fact, Army regulations describe how the system can be used to increase productivity. However, because the intent and spirit of the regulations are not fully carried out, the data is not as useful to management as it could be. Furthermore, several system inconsistencies tend to inflate the labor standards base. Only specific management recognition of these problems followed by appropriate action can improve the overall standards accuracy.

Work measurement data could be a more
valuable management tool at Tobyhanna

Development and Readiness Command Regulation 5-9 prescribes three distinct strategies by which a methods and standards program should increase a maintenance depot's productivity. According to this regulation, productivity can be improved by

- developing performance standards against which actual performance can be measured;
- increasing efficiency and economy through improving work methods and conditions; and
- using current and historical work measurement data for determining resource requirements, developing budgets, and scheduling and controlling workload.

We tested the use of each of these strategies at Tobyhanna and to a lesser extent at Letterkenny. We generally found that, where the data was reliable, management used it and benefited from it; however, in several instances, work measurement data was not used where it should have been.

Strategy 1:
Developing performance standards
against which actual performance
can be measured

On a daily basis, the Maintenance Directorate's Production Planning and Control Division and the various repair shops divisions are the most typical performance variance analysts. The Production Planning and Control Division Chief told us that the performance effectiveness $1/$ measure is very meaningful to shop supervisors and division chiefs. We learned through discussions with many shop supervisors and production control schedulers that they used the measure as a management-by-exception tool-- cases of unexplained low performance were followed up to determine the cause of low output relative to input.

The biggest problem in using the measure for short-term variance analysis is that the nonengineered standards generally do not break the work down into fine enough detail so that meaningful performance values are produced weekly or even monthly. In other words, if the standard time to produce one unit of output is more than 40 hours (1 week), then at the end of that week the performance effectiveness will be zero, although much productive effort will have been expended.

Another problem is a lack of documentation about how nonengineered standards were developed. Although Army regulations require each nonengineered standard to include a description of the work performed and record of the computation used to determine the standard, we found Tobyhanna's documentation of nonengineered

$$\frac{1}{\text{Performance effectiveness}} = \frac{[(\text{units of output}) \times (\text{standard hours/unit})]}{(\text{direct labor hours to produce the output})} = \frac{\text{earned hours}}{\text{actual hours}}$$

standard development to be inadequate. For example, in most cases reviewed, the standard time was a single number representing the time to completely overhaul an item. In the case of one 2,000-hour standard, a division was made between disassembly (999 hours) and overhaul (999 hours). In addition, the documentation contained few instances of work method description or how the time standard was computed. Even for work new to the depot, "similar to" references can be made in the time standards documentation. Without this documentation, nonengineered standards cannot be validated.

Having the ability to validate standards is important because of recent changes in the organization of work measurement personnel. All Methods and three Standards Branches in the depots have moved from the Comptroller to the Maintenance Directorates, with the location of remaining standards to be decided later. But the Comptroller will retain the standards validation responsibility, a task which cannot be fulfilled given the current documentation practices.

Strategy 2:
Increasing efficiency and economy
through improving work methods
and conditions

Nonengineered standards cover most of the workload in Army repair depots. However, their documentation does not adequately describe the work method to be used, and methods analysis normally is not a part of their development. Therefore, as long as nonengineered standards dominate the system, compliance with this part of the regulation will be difficult and productivity increases from methods improvements associated with setting standards should not be expected.

Although methods analysis is clearly not a part of developing most Army maintenance labor standards, we wanted to know what role work measurement data plays in specific methods and procedures studies. To answer this, we looked at a major, ongoing methods study that was reviewing the process flow and operating procedures for electronic communication shelters and vans at Tobyhanna. The study proposed to change the material flow and maintenance procedures to

- reduce material movement and damage,
- optimize scheduling,
- centralize operations,
- provide versatility, and
- avoid unnecessary construction costs.

However, savings in labor costs are conspicuously omitted from this list of advantages. We learned that savings were anticipated but could not be estimated by the methods analysis people. The labor standards branch said that it could provide complete estimates of labor savings, but that it had not been asked to do so. Thus, work measurement data was not playing a role in this methods study, and the decision to accept or reject the proposal would be made on incomplete information.

Strategy 3:

Using current and historical work measurement data for determining resource requirements, developing budgets, and scheduling and controlling workload

The depots were adhering to this part of the regulation in most measurable aspects. The data being used is not as accurate or as reliable as it could be, but the mechanisms for using it are in place. According to depot officials, examples of using work measurement data in this context include:

- Making repair or reprocurment decisions on the basis of cost to repair.
- Shop supervisors' depending on labor standards to guide their daily scheduling of work flow and work assignment process. Our on-the-floor observations confirm this occurs to varying degrees, depending on the supervisor's management style.
- Using standards as a foundation for bidding on reimbursable work.
- 1977 labor standards, with adjustments for inflation, forming the basis for negotiating fixed-price orders.
- DESCOM's workloading of depots by staff-hours for all industrial fund work.

Several problems contribute to inflation of labor standards base

Our review of work measurement in the Army was not to provide an exhaustive list of the system's deficiencies; rather, it was to focus on the use of the data and what factors encouraged or inhibited data use. System integrity and the accuracy with which all system parts add up are the key to determining the system's credibility as a management tool. The system's credibility was low, but with adequate emphasis and commitment, changes could take place that would improve data accuracy, system integrity, and ultimately, system credibility and use.

Labor standards inflation probably explains most of the system's low credibility. The labor standards base at Tobyhanna is inflated because of several unrelated local practices and local implementation of Army policies. These include:

- Nonengineered standards being developed primarily by the Maintenance Directorate with little advice and only perfunctory approval by the Methods and Standards Branch. Although Army regulations prohibit maintenance personnel from unilaterally setting their own labor standards, too few industrial engineering personnel make this practice unavoidable, according to Tobyhanna officials.
- A 2-percent limit placed by the Army's Development and Readiness Command on the amount of delay time that can be charged to a depot's overhead account. This encourages charging some delays as productive time so that the 2-percent total is not exceeded. The result is that, because of a one-time delay, the historical standard data base for the work is increased permanently, thus incorporating more excess time into the standard than is needed.
- A representative sample of 82 work measurement performance rating factors averaged 113 percent, 13 percent above the expected average if experienced workers performing at a normal all-day pace are measured. The sample was drawn from documentation in Tobyhanna's Standards Branch. These factors are used by industrial engineering technicians to develop an engineered labor standard from time-studied work measurement data. Although we recognize the possibility of an entire work force performing for some period of time above its normal level or that, as the Army contends, time studies might tend to be made on the better workers, we do not believe this explains the 13-percent differential between expected and rated performance of the Tobyhanna maintenance personnel. The effect of overstating the performance rating factor is a corresponding overstatement of the standard to which the factor is applied.

The net effect of these problems is a tendency to inflate the labor standards. The solution lies in management recognizing the problems and more effectively monitoring and controlling the system.

CONCLUSIONS

The Army plans to change its depot maintenance work measurement program. Whether the changes are effective and will improve the program depends on Army management support for the program, thus reversing a trend toward less support for work measurement.

Coverage of depot workload with engineered standards can and should be higher than the current level. Increasing coverage,

however, requires higher staffing levels than the Army historically has assigned to the work measurement function.

The Army's work measurement program is to improve productivity. Achieving this goal depends primarily on depot workload being covered by sufficient engineered standards. However, coverage is so low in Army depots that productivity based on work measurement is doubtful.

Specific problems in the current depot work measurement system show a need for closer management oversight. Also, the problems we found all tend to inflate the work measurement system. The ultimate effect is that the system has lost some of its credibility, and therefore, is not used as much as it should be.

RECOMMENDATIONS

We recommend that, to improve the quality of work measurement in Army maintenance depots, the Secretary of Defense direct the Secretary of the Army to act on the recommendations regarding work measurement we have made in the past 1/ and with which the Army has agreed. Specifically, the Army should:

- Increase its workload coverage with engineered standards and rely less on historical average for estimating labor requirements.
- Fully implement an effective work measurement system, including improving work methods, labor standards, and staffing and monitoring implementation.
- Place a high priority on carrying out its plans to improve the staffing of its work measurement functions.

1/"Significant Savings Possible Through More Effective Depot Maintenance of Army Combat Vehicles" (LCD-80-82, Aug. 7, 1980).

CHAPTER 5

NAVY WORK MEASUREMENT PROGRAM QUALITY

FALTERING DUE TO UNDERSTAFFING

For several reasons, the 65 to 80 percent goals for using engineered standards that the Navy has set have been beyond the NARFs' reach. In fact, coverage has declined over the last 5 years. The primary reason is the inconsistent emphasis NARF managers have put on work measurement, but other reasons include a lack of qualified personnel and low-quality standards. In addition, the structured work measurement program designed by NALC has not been emphasized uniformly among NARFs and it has not been implemented adequately in the two NARFs we visited. As a result, work measurement data has lost some of its credibility and value, and the integrity of other depot systems using the data has been lessened.

NAVY HAS BEEN WORKING TOWARD A VIABLE WORK MEASUREMENT PROGRAM

Since we reported in 1975 that NARFs' work measurement program lacked quality and quantity, NALC has been working to improve it. The program's primary direction is still toward increasing engineered standards coverage, coupled with emphasizing the performance standards program as the foundation for negotiating workloads and distributing resources.

Emphasis on increasing engineered standards coverage

NALC Instruction 5220.7 requires that NARFs cover productive direct labor with at least 65-percent engineered performance standards. The ultimate goal is 80 percent. Coverage by the NARFs as a group has not reached the minimum requirement, but coverages by several NARFs have fluctuated around it. Comparing NALC's coverage requirement with that of the two other services, the Navy is far ahead because, according to Navy officials, its standards program is more efficient and effective than those in the other two services. They explain this by showing that:

- NARFs develop engineered performance standards quicker than the Army and Air Force because NARFs' primary work measurement tool is elemental standard data.
- NARFs coordinate the development of standards through data interchange among facilities.

However, as discussed later, NARF standards quality needs improvement; therefore, the Navy's high coverage levels relative to the other services may be less credible in light of the quality problems.

NALC has set up a sound work measurement system

NALC has established a structured, goal-oriented work measurement program for NARFs. The NARFs' performance standards program includes:

- Reporting and review requirements to monitor and emphasize the use of work measurement.
- An 80-percent engineered standards goal.
- Review of engineered standards for validity every 3 years.
- Documentation to support engineered standards.
- A ratio of 1 work measurement analyst for each 100 employees to be measured by standards.
- Goals for reducing workload standards.
- Use of work measurement data for budgeting, planning, staffing, workloading, assessing, and controlling labor effectiveness and cost estimating.
- Initial and refresher training for analysts.

To monitor these goals, NALC annually reviews each NARF's program through an onsite audit and requires quarterly reports showing each NARF's staffing, standards coverage, time spent on various work measurement tasks, and savings realized.

Strong work measurement program pays off

The effects of a good performance standards program on increased capabilities were illustrated by the NALC in summarizing its annual audits. It compared the repair of like weapon systems at different facilities to illustrate a correlation between low standards coverage and quality and the resulting magnitude of the standards. (See chart below.)

Aircraft	FY	Average workload standard hours		Percent difference
		Alameda NARF	Jacksonville NARF	
P-3B	1978	8,148	7,051	13
	1979	9,119	7,482	18
P-3C	1978	7,269	6,228	14
	1979	7,222	6,559	9

The Jacksonville NARF's program quality was relatively high with average coverage for the 2 years at 66.5 percent and a quality level determined by NALC of 91.5 percent. On the other hand,

the Alameda NARF had an average coverage of 50 percent and a quality level of 60.5 percent. Jacksonville had an average of 14 percent lower workload norms than Alameda over the 2-year period for the two aircraft.

NALC expects NARFs to have a viable work measurement program. Coverage goals are set, and yearly audits are made. The focus on workload standards enhances the work measurement program's visibility, and continuous emphasis should encourage improvements in the program.

COVERAGE OF WORKLOAD BY ENGINEERED STANDARDS SHOULD BE HIGHER THAN CURRENT LEVEL

The Navy instruction requires that, as an ultimate goal, 80 percent of NARFs' workload be covered by engineered standards. Nevertheless, none of the NARFs have reached that goal and, as the following chart shows, the trend is toward less coverage.

<u>NARF</u>	<u>Coverage with engineered standards</u>					<u>Third quarter of FY 1980</u>
	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	
Alameda, Calif.	49	53	54	50	50	39
Cherry Point, N.C.	72	72	74	72	67	63
Jacksonville, Fla.	57	56	65	68	63	63
Norfolk, Va.	67	59	49	45	54	65
North Island, Calif.	73	74	73	70	54	47
Pensacola, Fla.	48	55	50	46	45	43
Average	61	62	61	59	56	53

After remaining relatively stable for 3 years, the NARF-wide coverage percentage dropped eight points after 1977. The important exception is Norfolk, where coverage increased from 49 to 65 percent during the 1977-80 period.

Among the factors accounting for the low coverage trend are the lack of criteria for selecting work to be covered by the standards, the standards' low quality, the lack of standards' updating, and, most important, a shortage of qualified work measurement analysts.

Work selection criteria needed

Criteria are essential for selecting work to be covered by engineered standards, and NALC should be providing NARFs with these criteria. In the absence of NALC's assistance, NARFs themselves have been selecting work to be covered. NARF officials have made their choices by considering the work's repetitiveness, its volume, and the time needed to establish the standard. To ensure consistency in this decision process, NALC should provide guidelines for NARFs to follow.

Standards' quality is too low

Poor quality may be leading to overstating the Navy's coverage. The NALC work measurement instruction prescribes establishing engineered standards; detailed documentation should back up these standards so Navy officials can review the standards, continuing applicability every 3 years. But according to annual NALC audits, the quality of NARF standards is too low. Because of this, NARF reports may be overstating actual workload coverage. Also, because some standards are not updated correctly, these standards, too, may be of poor quality and may overstate the coverage.

Yearly NALC audits find NARF standards of lower quality than regulations prescribe. Reasons for poor quality standards are the lack of supporting documentation and poor workmanship in completing a task. NALC's fiscal year 1980 audit of the Alameda NARF showed a quality level of 51 percent. NALC cited this level as unacceptable. The other 49 percent of standards found unacceptable lacked supporting documentation or showed poor workmanship. The fiscal year 1979 audit of Norfolk NARF's quality level revealed only a 66-percent quality level, although this was an increase over its 1978 level of 54 percent.

Lack of standards' updating affects quality

We found instances in which updating was not correctly carried out. For example, the Norfolk NARF standard for repairing an A-6 aircraft's ASN-31 inertial navigation platform was updated in July 1978, but the "occurrence factor" ^{1/} was not changed. We were told that the occurrence factor was not updated in this case because Norfolk could discontinue working on the platform at any time. The Navy was then expecting funding of replacement ASN-92 platforms. However, repair of the older model was still occurring at Norfolk as of August 1980 and the factor should have been updated to reflect most recent repair experience.

The 50 to 60 percent coverage with engineered standards at Navy NARFs is significantly greater than coverage in the Army and Air Force. However, the credibility of that coverage may be affected, in light of quality levels of 50 to 60 percent.

NALC now has a means of updating standards

Some incentive now exists for updating standards. Computer assistance is giving a boost to reviewing, revising, or replacing outmoded standards. In 1977 NALC started a computer program for printing out monthly those engineered standards approaching 3

^{1/}An occurrence factor is an historically derived number indicating the normal frequency with which a specific operation is carried out during the repair of a component.

years old. Work measurement analysts then review these standards for their currency and update them if necessary. If the standards become 40 months old without having been updated, they are automatically downgraded to nonengineered standards.

With this program, NALC created an incentive for keeping engineered standards current and keeping up coverage. The incentive appears to be effective because our review showed infrequent updates until recently.

UNDERSTAFFED WORK MEASUREMENT TEAMS WEAKEN STANDARDS AND SYSTEM

A shortage of qualified analysts is a major cause of NARFs' low coverages and poor-quality engineered standards. Not enough analysts are available to develop and maintain standards and NARFs attribute this to turnover, inadequate recruiting, and personnel ceilings.

Loss of experienced analysts through turnover is the cause NARFs cite almost universally as responsible for low coverage and poor quality of standards. We were told that analysts are returning to the shops or are moving into management slots because of the money and greater advancement potential. During our 3 months at the Norfolk NARF, 8 analysts left the work measurement organization; from January 1979 to March 1980, 19 analysts left Alameda. Twelve of the Alameda group cited promotion, more pay, or greater opportunity as reasons for moving on.

Low recruiting and personnel ceilings also contribute to the problem of retaining qualified analysts. For example, officials blamed pay inversion for causing recruiting difficulties. Pay inversion occurs when shop workers are paid under the wage board (blue-collar) system at more salary than analysts are paid under the GS (white-collar) system. As a result, wage board journeymen in the production jobs no longer apply for analyst trainee positions. In fact, lack of qualified applicants for the GS-7 entry level forced the entry level down to GS-4/5.

Personnel ceilings, too, affect the number of analysts retained. Management of some NARFs impose these as hiring limits. The Alameda NARF, for instance, has a ceiling of 49 analysts, but needs 69. We were told that Alameda cannot recruit enough people to even meet the ceiling.

NARF TOP MANAGEMENT NEEDS TO STRENGTHEN ITS COMMITMENT TO AND OVERSIGHT OF THE WORK MEASUREMENT SYSTEM

Management backing is the key to a sound work measurement system. However, management at some NARFs is not strongly emphasizing work measurement activities. Also, implementation of work measurement at individual NARFs is inconsistent.

NARF management support and staffing
affect work measurement coverage

The degree of management support for engineered standards affects the level of standards' coverage. Norfolk NARF officials have explicitly emphasized the use of standards. Two years ago, the commanding officer at Norfolk set 20 facility goals as part of his command management program. One goal was to increase coverage by engineered standards. During his tenure, his support, along with his commitment to staffing work measurement, helped coverage increase from 48 to 68 percent. At the Alameda NARF, however, there has been no such command emphasis, and between 1971 and 1980 coverage dropped from 66 percent to 39 percent.

Management should emphasize the
recording of accurate labor charges

NARF management should do more to ensure the accuracy of labor charges. NARFs are having difficulty in obtaining accurate labor charges because we are recording direct staff-hours as nonstandard time.

NARF management has no way of controlling the accuracy of shop workers' staff-hour charges. Production workers use transactors--remote computer terminals--to transmit data into the management information system. Workers insert their identification cards into the transactor, along with shop cards accompanying the unit to be repaired. These cards tell the system how much time is being charged to repair a unit and when the repair is complete. We were told that shop supervisors are responsible for assuring accurate reporting. Apparently, supervisors are not doing this.

All NARFs have had problems because workers have recorded direct staff-hours as nonstandard hours--a catch-all for incorrectly reported labor charges. Improper data coding, lack of a labor standard against which to charge time, and invalid transactions contribute to actual staff-hours spent being recorded as nonstandard time. NALC has acknowledged that charging too many nonstandard hours

- tends to discredit an entire work measurement program,
- negates any actual savings realized by using engineered standards,
- causes loss of earned hours that would have been used to develop summary (workload) standards, and
- negates the accuracy of reported shop performance indexes and makes variance analysis less meaningful.

NALC officials stated that nonstandard direct labor hours should be no more than 5 percent of NARF direct labor staff-hours. But, as of the second quarter of fiscal year 1980, the Alameda NARF had 21.4 percent nonstandard hours and the Norfolk NARF had 10.7 percent. Norfolk had also sustained a 10-percent level 2 years before, despite emphasis by NALC management to lower this level.

Norfolk had no evidence of management insistence on use of accurate labor charges. Many managers there told us they felt workers manipulated labor charges to show the best performance possible. For example, a work measurement supervisor knew of instances when time studies--which were made to set standards--revealed that the labor for which a worker charged his time differed from that which the supervisor observed. Another supervisor admitted charging his workers' time to jobs having excess standard time when the workers had overrun the standards on their assigned jobs. We do not know the extent of these abuses, but additional scrutiny of these activities seems necessary.

CONCLUSIONS

Despite NALC's improved system for providing goals and monitoring NARF's work measurement achievements, increases in coverage have not occurred and improvements in quality are badly needed. As more NARF decisions on workloading, staffing, budgeting, and costing are based on work measurement data, the need for more accuracy is essential.

For the Navy to reach its program goals, reinforced emphasis from NALC on sound work measurement practices and consistent NARF top management support are needed. Specifically, problems of retaining and recruiting qualified analysts are hurting the work measurement program's success. Inexperienced analysts are likely to work less efficiently and produce lower quality work than those at the journeyman level. In addition, to make valid comparisons of actual and standard production times, input data from the shop floor to the work measurement system needs to be more accurate.

RECOMMENDATIONS

We recommend that the Secretary of Defense direct the Secretary of the Navy to:

- Require all NARF commanders to set goals for improving their work measurement programs, particularly regarding covering workload with engineered standards and maintaining the quality of these standards.
- Emphasize to new NARF commanders the importance of the Navy's performance standards program and the need for the commanders to support it.

--Review relative staffing among support functions within each NARF so that resources can be redistributed to avoid losses in NARF effectiveness because of insufficient work measurement personnel.

--More accurately communicate to shop labor and management the need for accurate labor-hour reporting so that the advantages of accurate work measurement data are more fully realized.

DOD LOCATIONS GAO VISITED

Office of the Secretary of Defense:
Assistant Secretary (Manpower, Reserve Affairs and
Logistics)
Assistant Secretary (Comptroller)

Army:
Headquarters, Department of the Army,
Washington, D.C.
Development and Readiness Command, Alexandria, Va.
Depot Systems Command, Chambersburg, Pa.
Tobyhanna Army Depot, Tobyhanna, Pa.

Air Force:
Headquarters, Department of the Air Force,
Washington, D.C.
Air Force Logistics Command, Wright-Patterson Air
Force Base, Ohio.
Oklahoma City Air Logistics Center,
Tinker Air Force Base, Oklahoma City, Okla.
Warner Robins Air Logistics Center,
Warner Robins Air Force Base, Ga.

Navy:
Headquarters, Department of the Navy,
Washington, D.C.
Naval Material Command, Arlington, Va.
Naval Air Systems Command, Arlington, Va.
Naval Aviation Logistics Center,
Patuxent River, Md.
Naval Air Rework Facility, Norfolk, Va.
Naval Air Rework Facility, Alameda, Calif.

GAO REPORTS ON DOD PRODUCTIVITY AND WORK MEASUREMENT

"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 Materiel Area, San Antonio, Texas" (B-158896, Apr. 11, 1974)

"Ways 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)

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

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"If Army Helicopter Maintenance is to Be Ready for Wartime, It Must Be Made Efficient and Effective in Peacetime" (LCD-79-407, May 10, 1979)

"Productivity Measurement in the Defense Logistics Agency Must Be Supported, Improved, and Used" (FGMSD-80-41, Apr. 18, 1980)

"Military Standard on Work Measurement--A Way to Control Cost and Increase Productivity" (PSAD-80-46, June 3, 1980)

"Significant Savings Possible Through More Efficient Depot Maintenance of Army Combat Vehicles" (LCD-80-82, Aug. 7, 1980)

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