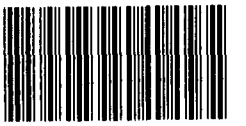
148569

GAO

United States
General Accounting Office

National Security and
International Affairs Division

B-252463



February 25, 1993

The Honorable Vic Fazio
House of Representatives

The Department of Defense (DOD) is evaluating depot maintenance operations to determine how best to lower the overall cost of these functions while retaining essential operating capability. As you requested, we developed information on work load, productivity, quality, capacity and financial indicators at the Air Force's five Air Logistics Centers (ALC).

BACKGROUND

Depot maintenance is the repair of materiel requiring a major overhaul or the complete rebuilding of parts, assemblies, and end items. It includes manufacturing, modification, modernization, repair, testing and reclamation. The maintenance depots provide stocks of serviceable equipment by using a combination of special skills, equipment, and repair facilities that are not available at lower levels.

The Air Force has five major depot repair centers, each of which is an integral part of one of the five Air Logistics Centers. These include Ogden ALC, Hill Air Force Base, Utah; Oklahoma City ALC, Tinker Air Force Base, Oklahoma; Sacramento ALC, McClellan Air Force Base, California; San Antonio ALC, Kelly Air Force Base, Texas; and Warner Robins ALC, Robins Air Force Base, Georgia.[1] The ALC depots repair aircraft, missiles, engines, and communications-electronics equipment. The work varies in technical complexity, scope of work packages, and the types and skills of work required. Table 1 provides a brief overview of the five Air Logistics Centers and the type of repair work they

[1]The Air Force has two other depot maintenance activities, the Aerospace Guidance and Metrology Center, Newark Air Force Base, Ohio and the Aerospace Maintenance and Regeneration Center, Davis-Monthan Air Force Base, Arizona.

do. Appendix III provides additional details about repair work load assignments at each activity.

Table 1: Overview of Air Force Maintenance Depots

Air Logistics Center	Number of facilities	1992 Replacement Cost ($m) Facility/ Equipment	Type of work
Ogden	346[a]	$ 352/$408	Strategic missiles, aircraft, air munitions, photo/ reconnaissance, landing gear
Oklahoma City	51	1,100/396	Aircraft, engines, oxygen equipment
Sacramento	128	634/565	Space/ground communications-electronics, aircraft, hydraulics, instruments
San Antonio	66	424/685	Aircraft, engines, nuclear equipment
Warner Robins	79	225/850	Aircraft, avionics, propellers, life support systems

a Includes 45 buildings from Little Mountain and Utah Test Range

Source: U.S. Air Force.

RESULTS IN BRIEF

Because the ALCs have different missions, work loads, and facilities, Air Force officials believe comparisons of performance indicators are of limited value. Additionally, despite previous DOD and GAO studies recommending the development of comparable and reliable cost accounting,

performance measurement reporting, and capacity measurement, universally accepted standardized procedures have not yet been developed.

Recognizing the shortcomings in the collection of depot-level maintenance data and the need for more realistic and effective performance indicators, in 1990 DOD began to develop the Depot Maintenance Performance Measurement System. This system is intended to provide an improved set of performance indicators for depot-level maintenance activities. However, DOD does not yet have an approved system in place.

With these cautions in mind, this report presents performance indicators in five categories--work load, productivity, quality, capacity, and financial. Appendices I and II provide the results of our work.

-- The work load indicators we gathered were the quantity of items repaired and the number of direct labor hours expended to do the work. Of the two, using direct labor hours expended provides a better indication of work load size, because it takes into consideration the fact that not all repairs require the same amount of work.

-- DOD has had difficulty developing consistent and reliable data about the productivity of the ALCs' work forces or the productivity improvements that the work forces have achieved.

-- Air Force officials believe that while measures of quality are useful to individual shop managers, they are not particularly useful at the ALC or Headquarters Air Force Materiel Command level. They noted that data gathered on customers' complaints about quality of depot repair work is not a valid indicator of quality differentials among the centers.

-- Information regarding depot capacity shows that the Air Force depot maintenance system has large amounts of excess capacity. This problem is not unique to the Air Force. Appendix I includes a summary of ongoing DOD initiatives to address this situation.

-- Financial information presented in this report includes financial operating costs, the average cost of a direct labor hour, indirect costs as a percent of total costs, the cost per direct product standard hour, and year-end work load carryover.

We are continuing to review DOD efforts to downsize and improve the Department's management of depot maintenance systems and operations and will report our findings in this area to the Congress.

- - - -

SCOPE AND METHODOLOGY

We obtained data on the five categories of management indicators from the Office of the Secretary of Defense; Office of the Joint Chiefs of Staff; Headquarters, U.S. Air Force; Headquarters, Air Force Materiel Command; and the five ALCs. We did not verify the data or question the methodology used to compile it. Because of the 2-week period available to conduct our work, we did not determine the reasons for, or the significance of, changes or trends in data. On the basis of discussions with DOD officials and our review of documentation, we judgmentally selected work load, productivity, quality, capacity, and financial indicators on which to report. We conducted our work during February.

Because of the short time available to complete our work, we did not obtain written agency comments. However, officials from the Office of the Secretary of Defense and the Air Force reviewed a draft of the report for accuracy. They cautioned about comparing ALCs based on existing data, and noted that ongoing or planned efforts should result in the development of improved performance indicators for depot maintenance managers.

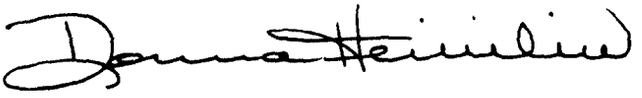
- - - -

We are sending copies of this letter to the Secretaries of Defense and Air Force, Commander of the Air Force Materiel Command, and interested congressional committees. Copies will be made available to others upon request.

This letter was prepared under the direction of Julia Denman, Project Director, who may be reached on (202) 275-8412 if you or your staff have any questions.

Other major contributors were Karl Gustafson, Larry Junek, Enemencio Sanchez, and Eddie Uyekawa.

Sincerely yours,



Donna Heivilin
Director
Defense Management and NASA Issues

INFORMATION ON AIR FORCE DEPOT MAINTENANCE OPERATIONS

Most equipment purchased and operated by the Department of Defense (DOD) requires maintenance throughout its useful life. The required maintenance may be as simple as a routine oil change or as complicated as extensive modifications to upgrade and extend the life of fielded systems. The most complex work involving overhauls; the complete rebuilding of parts, assemblies, or subassemblies for weapon systems and their components; and other jobs beyond the technical ability of individual military units is the responsibility of the military services' depot maintenance system.

For DOD aviation depot maintenance, the Navy has six depots, the Army has one, and the Air Force has five. The Air Force's depot capacity is an estimated 40 million direct labor hours (based on a single shift operation of 8 hours per day, 5 days a week) of a total DOD aviation capacity of 63 million direct labor hours.

The Air Force Materiel Command (AFMC) controls Air Force depot maintenance programs and facilities. AFMC's allocation of depot maintenance work load to individual Air Logistics Centers is influenced by its technology repair center and integrated weapon systems management concepts. Implemented in 1973, the technology repair center concept was intended to consolidate responsibility for the depot-level maintenance of reparable items along technological lines. For example, under this concept, the Ogden ALC is the technology repair center for missile components, landing gears, and photographic equipment, while Warner Robins ALC is responsible for airborne electronics, life support equipment, and propellers.

Under the integrated weapon systems management concept, one ALC coordinates the overall logistical support for a weapon system. For example, Sacramento ALC coordinates overall logistical support of the F-111 aircraft even though several ALCs may have a role in repairing various F-111 components. In most instances, the system manager of a weapon system also does major overhauls of the system.

In fiscal year 1992, the Air Force depot maintenance work load was valued at about $4.5 billion, of which about $3.3 billion was done in Air Force depot facilities and $1.2 billion was contracted out. About $241 million of the contracted work load was done through

"interservicing,"[1] with the remainder contracted to commercial firms.

Table I.1 shows the Air Force's projected depot maintenance program budget for 1993 through 1997. The contract dollars include work load to be accomplished through interservicing.

Table I.1. Projected Air Force Depot Maintenance Budget for Fiscal Years 1993-97

Dollars in millions (then year)

	Fiscal year				
	1993	1994	1995	1996	1997
Inhouse	$2,791.3	$2,801.4	$2,820.5	$2,732.4	$2,751.6
Contract	1,134.1	1,017.7	909.1	970.5	986.3
Total	$3,925.4	$3,819.1	$3,729.6	$3,702.9	$3,737.9

Source: Table 1-2, Defense Depot Maintenance Council Corporate Business Plan (fiscal years 1992-97).

According to AFMC, peacetime depot maintenance requirements for Air Force systems and equipment have declined for reasons such as the increased reliability and maintainability in many of the recently fielded systems and reductions in DOD's force structure and budget. While not yet well-defined or quantified, depot maintenance requirements for wartime and contingency operations have also declined. While the existence of excess capability and capacity has been widely discussed, limitations in the availability of good baseline data have inhibited the Department's ability to quantify the excesses, realign work load, and reduce excess capacity. In August 1992, the DOD Office of the Inspector General reported that the maintenance depots' capacity and utilization data was not accurate or complete and was therefore unreliable to base decisions on.

EXCESS CAPACITY IN DOD'S DEPOT SYSTEM

Since the early 1960s, the military services, the Office of the Secretary of Defense, the General Accounting Office, and various other agencies and commissions have undertaken numerous management

[1]Interservicing involves transferring work on comparable systems to the depot of another service to take advantage of economies of scale and to avoid the cost of maintaining dual capabilities in both services.

initiatives, studies, and audits that have resulted in recommendations for improving depot maintenance effectiveness and economies of operation. These include standardizing cost accounting and reporting systems, increasing interservicing and competition, and modernizing and centralizing depot maintenance operations in varying degrees.

Although DOD believes these efforts have resulted in improvements, excess capacity, unnecessary duplication, and inefficiencies still exist. Because changing world conditions have significantly reduced the projected future need for depot maintenance capability and capacity to support wartime requirements, there has been a renewed emphasis on the need to achieve greater economy of operations.

In September 1992, the Chairman of the Joint Chiefs of Staff chartered a special group, consisting of retired senior officers from each service and a senior representative from industry, to study the depot maintenance system and identify the best way to scale down excess capacity and reduce costs without degrading the ability to meet current or future peacetime and wartime needs. The group reached the following conclusions:

-- DOD has not substantially reduced excess capacity and has 25 to 50 percent more depot capacity than will be needed in the future.

-- Unnecessary duplication exists throughout the individual service depots, especially when viewed across service boundaries.

-- Closure of a significant number of the 29 military depots is necessary to reduce excess capacity and substantially reduce long-term costs.

-- DOD can most effectively close depots through its overall effort to close or consolidate excess military bases and facilities, a process overseen by the Base Realignment and Closure Commission.

However, the Air Force has chosen to downsize each of the ALC depots without closing depot facilities. Actions undertaken to reduce capacity include closing buildings, reducing space used in its maintenance facilities, and mothballing equipment.

Table I.2 shows depot repair capacity utilization indices at each ALC, reflecting planned capacity reductions from 1993 through 1997. The capacity index is the amount of repair work expressed in direct labor hours that a facility can effectively produce annually on a single shift, 40 hour per week basis.

Table I.2: Capacity Utilization Index

Direct labor hours in thousands

Air Logistics Center	Fiscal year				
	1993	1994	1995	1996	1997
Ogden	7,947	7,713	7,196	7,168	7,168
Oklahoma City	8,064	8,042	7,862	7,729	7,729
Sacramento	6,819	7,250	7,250	7,248	7,248
San Antonio	8,935	8,935	8,935	8,935	8,935
Warner Robins	7,693	7,486	7,486	7,486	7,486
Total	39,458	39,426	38,729	38,566	38,566

Source: Defense Depot Maintenance Council Corporate Business Plan, (fiscal years 1992-97).

However, DOD officials believe capacity indices are not reliable because the guidance used by the services to calculate capacity is subject to service interpretation and can be used to support a range of capacity. Moreover, officials from the Office of the Joint Chiefs of Staff told us that there has been little permanent reduction in capacity that could not be revitalized.

Using the actual work load performed by the depots in 1987 as a baseline, we found that the centers performed approximately 20 percent less work in 1992 than in 1987 and are projecting approximately 30 percent less work by 1997 (see table I.3).

Table I.3: Comparison of Direct Labor Hours

Hours in thousands

Air Logistics Center	Work load by fiscal year			Differences in work load 1987 to 1992 and 1997			
	1987	1992	1997	1992	Percent	1997	Percent
Ogden	8,370	6,644	6,072	1,726	21	2,298	27
Oklahoma City	10,361	6,999	6,424	3,362	32	3,937	38
Sacramento	7,686	6,180	6,016	1,506	20	1,670	22
San Antonio	9,566	7,696	5,279	1,870	20	4,287	45
Warner Robins	7,752	7,148	6,142	604	8	1,610	21
Totals	43,735	34,667	29,933	9,068	21	13,802	32

Sources: Air Force Materiel Command (fiscal year 1987-92) and Defense Depot Maintenance Council Corporate Business Plan (fiscal years 1992-97).

Air Force Materiel Command officials noted that comparisons of capacity data during this period are difficult considering the ongoing disposal of facilities and turn-in of equipment. They acknowledged that while potential excess capacity exists, not all can be readily reconstituted.

On December 3, 1992, the Deputy Secretary of Defense directed the Secretaries of the military departments to prepare integrated proposals for submission to the 1993 Base Closure and Realignment Commission. On January 15, 1993, the Secretaries responded that over 14.6 million direct labor hours are excess to aviation depot requirements--3 million in rotary wing and 11.6 million in fixed wing--and that four aviation depot equivalents could be closed. The Chairman of the Joint Chiefs of Staff noted in a January 22, 1993, memorandum that this response did not fully address cross-service consolidation opportunities for fixed-wing aviation--the area with the greatest additional savings potential. The Chairman also noted the importance of focusing DOD's future depot maintenance resources upon the most cost-effective mix of facilities and eliminating not only excess capacity but also unnecessary duplication.

The Defense Base Closure and Realignment Act of 1990 (P.L. 101-510) established a new process for DOD base closure and realignment actions within the United States. The act established an independent Defense Base Closure and Realignment Commission and specified procedures that the President, DOD, GAO, and the Commission must follow, in order for bases to be closed or

realigned. We are continuing to review the depot maintenance excess capacity issue as well as the Commission's process regarding potential closure and realignments of depot activities. We will report our findings and conclusions to Congress in these areas at a later date.

OTHER DATA PROBLEMS IN AIR FORCE DEPOT SYSTEM

An essential factor in managing a large industrial operation such as depot maintenance lies in the accuracy, timeliness, and availability of required data generated by current financial and information systems. During the last 2 years, we and the DOD Inspector General have reported on the need for managers of the Air Force depot maintenance operations to have better data on repair costs. For example, in January 1991, the DOD Inspector General reported that the Air Force depot maintenance operation did not have reliable estimates of how long workers should take to accomplish their work.[2] In February 1991, we reported that these managers also lacked reliable data on how much it actually costs to do a repair job.[3] We attributed this problem to the facts that (1) depot operations accounting systems do not accumulate actual direct labor costs for individual jobs but rather estimate costs by allocating costs that are accumulated at the shop level, (2) the ALCs do not have effective controls to ensure material costs are charged to the right job, and (3) depot accounting systems do not allocate overhead costs properly. As a result, we recently pointed out that Air Force depot maintenance managers cannot effectively manage this critical activity.[4] In another recent report we noted that the financial systems that support F-15 repairs and modifications at the Warner Robins ALC do not contain accurate cost information, primarily because of internal control weaknesses.[5] Furthermore, without accurate and complete information, the F-15 manager cannot adequately manage costs; ensure that the prices set for the F-15 repair work are accurate; ensure that repairs are

---

[2]Management of Labor Standards for Airframes at Aeronautical Depots (Report No. 91-039, Jan. 31, 1991).

[3]Management letter to the AFMC Commander on the results of our audit of depot maintenance industrial fund financial statements (GAO/AFMD-91-33ML, Feb. 26, 1991).

[4]Air Force Depot Maintenance: Improved Pricing and Financial Management Practices Needed (GAO/AFMD-93-5, Nov. 17, 1992).

[5]Financial Systems: Weaknesses Impede Initiatives to Reduce Air Force Operations and Support Costs (GAO/NSIAD-93-70, Dec. 1, 1992).

charged to operations and maintenance funds and modifications are charged to aircraft procurement funds, as required; or ensure that the F-15 program supports the underlying premise of the revolving fund, which is to break even. Both the DOD Inspector General and our reports have identified corrective actions that, if taken, should improve the quality of depot maintenance data.

DOD EFFORT TO DEVELOP IMPROVED PERFORMANCE INDICATORS

In 1990, the Joint Policy Coordinating Group on Depot Maintenance established the Joint Performance Measurement Group to implement and maintain the Defense Depot Maintenance Performance Measurement System. This system is intended to provide an improved set of performance indicators for depot level maintenance activities. Developing and implementing this system has been slow, with no approved system yet in place.

Seven key areas of performance--effectiveness, efficiency, quality, capacity utilization, productivity, cost performance, and innovation--were identified in 1990, with each key area having one or more measurement indicators. DOD officials noted that while data was collected to develop these indicators, some depots did not have complete baseline data and the consistency of data collected has been questionable. Furthermore, when the services pointed out that excessive resource demands were required to support quarterly data collection efforts, submissions were reduced to twice a year.

In January 1993 the Joint Performance Measurement Group proposed eight new performance measures for the Depot Maintenance Performance Measurement System. The proposed new measures are: due date performance, net operating results, throughput, inventory, operating expense, return on investment, flow day reduction, and unit cost. The new measures attempt to integrate two management concepts--the theory of constraints and competitive edges--with DOD performance measurement requirements relating to the Chief Financial Officers Act of 1990. Features of the proposed system are shown in table I.4.

Table I.4: Features of Proposed Depot Maintenance Performance Measurement System

Competitive edges	Theory of constraints	DOD performance measurement requirements
Price	Throughput	Efficiency
Quality	Inventory	Effectiveness
Due date performance	Operating expense	Unit cost
Lead time		Quality
Flexibility		Schedule
Innovation		Timeliness
		Customer satisfaction

Source: Air Force Materiel Command.

According to Air Force Materiel Command officials, the Services and the Defense Logistics Agency intend to continue to process using the original measures (less capacity) during 1993 and at the same time initiate a pilot program using the new measures beginning with the third quarter of fiscal year 1993. This would provide a comparison of the two sets of indicators. According to Office of the Secretary of Defense officials, new performance indicators have not yet been approved for the Depot Maintenance Performance Measurement System.

Regardless of the nature of the performance measurement system implemented, the resulting output will only be as accurate and informative as the quality and consistency of the data that is input. We will continue to monitor DOD's progress in implementing this critical performance measurement system and in attempting to improve the data that is input to this system. We believe that without the feedback afforded by the collection and analysis of improved performance indicators, it will be difficult for the Department to successfully achieve the required efficiencies and economies needed to cost-effectively manage its depot maintenance operations.

ALC PERFORMANCE INDICATORS

Our discussion of performance indicators is divided into five categories--work load, productivity, quality, capacity, and financial. Despite previous DOD and GAO studies calling for the development of comparable and reliable cost accounting, performance measurement reporting, and capacity measurement, universally accepted standardized procedures have not yet been developed.

WORK LOAD

AFMC's Depot Maintenance Annual Report uses both the quantity of items repaired and the number of direct labor hours expended to show the amount of work the ALCs accomplished. Of the two methods, using direct labor hours expended provides a better indication of work load size because it takes into consideration the fact that not all repairs require the same amount of work. For example, a work package for a B-52 aircraft could require more than 40,000 hours, while a work package for an A-10 could require only 2,000 to 3,000 hours. Each of these activities would represent one repaired unit.

Table II.1 shows the total hours of direct labor expended annually on depot maintenance. Aircraft, engines and reparable items are the three largest work load categories, but work is also accomplished on such things as ground/space communications-electronics equipment and missiles.

Table II.1: Direct Production Hours

Hours in thousands

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Ogden	8,370	7,412	7,980	7,760	7,235	6,644
Oklahoma City	10,361	8,873	8,657	8,568	7,465	6,999
Sacramento	7,686	6,771	6,710	6,745	6,492	6,180
San Antonio	9,566	8,542	9,107	9,000	8,080	7,696
Warner Robins	7,752	7,037	7,837	8,051	6,738	7,148

Source: Military Bases: Information on Air Logistics Centers, GAO/NSIAD-90-287FS, Sept. 10, 1990 (fiscal years 1987-89); Air Force Logistics Command (AFLC) information digests (fiscal years 1990-91); and Air Logistics Centers (fiscal year 1992).

Table II.2 shows the number of aircraft on which maintenance work was completed. Aircraft maintenance work includes programmed depot maintenance, inspections, and modifications.

Table II.2: Aircraft Completed

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Ogden	340	256	291	317	277	365
Oklahoma City	191	148	126	126	115	94
Sacramento	243	224	222	226	220	202
San Antonio	81	64	62	45	39	32
Warner Robins	158	125	189	173	141	205

Source: Same as table II.1.

Table II.3 shows the actual hours of direct labor expended annually on aircraft depot maintenance at each ALC.

Table II.3: Direct Labor Hours Expended on Aircraft Work

Hours in thousands

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Ogden	3,209	2,805	3,268	3,153	2,847	2,595
Oklahoma City	3,022	2,770	2,669	2,946	2,514	2,491
Sacramento	2,522	2,326	2,241	2,041	1,739	1,844
San Antonio	1,984	1,807	1,980	2,138	1,839	1,932
Warner Robins	2,584	2,569	3,220	3,576	2,905	3,378

Source: Same as table II.1.

Table II.4 shows the number of engines repaired at the Oklahoma City and San Antonio ALCs. According to Air Force officials, this data should not be used to draw conclusions about the relative size of the two ALCs' work loads because it does not take into consideration the differences in types of engines repaired, the level of complexity, and the differing methodologies used to measure engine work completed. For example, San Antonio ALC

includes engines, modules, and gas turbine engines in its item count, and Oklahoma City ALC counts only complete engines. These two ALCs accounted for more than 99 percent of all Air Force aircraft engine repairs during this period.

Table II.4: Engine, Module, and Gas Turbine Repairs Completed

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Oklahoma City	1,250	1,093	1,249	1,124	1,066	1,053
San Antonio	6,697	5,575	5,029	4,796	4,263	4,521

Source: Same as table II.1.

Table II.5 shows the actual hours of direct labor expended annually on the depot maintenance of engines, engine modules, and gas turbines.

Table II.5: Direct Labor Hours Used to Maintain Engines, Modules, and Gas Turbines

Hours in thousands

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Oklahoma City	2,202	1,684	1,528	1,310	1,053	937
San Antonio	2,367	2,064	2,282	2,163	1,951	1,889

Source: Same as table II.1.

Table II.6 shows the number of reparable items on which work was completed. Reparable items are subsystems and components of weapon systems and equipment, such as avionics, life support equipment, and flight control instruments.

Table II.6: Reparable Items Completed

Items in thousands

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Ogden	165	128	119	123	109	86
Oklahoma City	276	212	195	165	150	147
Sacramento	184	150	155	144	139	127
San Antonio	257	167	133	133	154	114
Warner Robins	206	158	159	153	220	113

Source: Same as table II.1.

Table II.7 shows the actual hours of direct labor expended annually on the depot maintenance of reparable items.

Table II.7: Direct Labor Hours Expended on Reparable Work

Hours in thousands

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Ogden	3,332	2,741	2,728	2,736	2,630	2,154
Oklahoma City	4,692	3,959	4,042	3,805	3,313	2,909
Sacramento	3,289	2,711	2,726	2,761	2,760	2,227
San Antonio	4,232	3,852	4,041	4,018	3,753	3,409
Warner Robins	3,748	3,138	3,303	3,209	2,715	2,574

Source: Same as table II.1.

PRODUCTIVITY

DOD has had difficulty developing consistent and reliable data about the productivity of the ALCs' work forces or the productivity improvements that the work forces have achieved. As discussed below, three statistics that have been used as productivity measures are (1) direct labor efficiency, (2) output per paid man-day, and (3) annual productivity savings.

Table II.8 shows the ALCs' direct labor efficiency for fiscal years 1988 through 1992. This statistic is the ratio of production, measured in direct product standard hours, to the number of direct labor hours actually used to accomplish the work. A direct product standard hour is the time during which a specified amount of work of acceptable quality is or can be produced by qualified workers following the prescribed methods, working at a normal pace, and experiencing normal fatigue and delays.

Table II.8: Direct Labor Efficiency

Figures in percentages

Air Logistics Center	Fiscal year				
	1988	1989	1990	1991[a]	1992[b]
Ogden	93.9	92.8	91.1	90.3	90.4
Oklahoma City	95.2	95.7	92.2	95.7	91.9
Sacramento	93.1	97.4	90.6	93.9	94.3
San Antonio	95.7	94.8	90.9	93.5	92.3
Warner Robins	93.7	90.8	90.0	92.6	95.1

a According to Air Force officials, depot maintenance industrial fund personnel reductions cut end strength by almost 20 percent, causing extensive bumping of personnel into new positions, which affected labor efficiency rates at all centers in 1991.
b Air Force officials also noted that acceleration and displacement of work load to respond to priority requirements of Desert Shield/Desert Storm affected depot labor efficiency in 1991 and 1992.

Source: Same as table II.1.

Table II.9 shows the relationship between production, measured in direct product standard hours, and total payroll time (for both direct and labor overhead personnel), measured in paid staff-days. For example, an output per paid man-day value of 4 means that the work force accomplished 4 direct product standard hours of work for every 8 hours of payroll time. Because it takes into consideration not only the efficiency of the direct labor force but also the impact of overhead personnel, this statistic attempts to measure an ALC work force's overall productivity. However, Air Force Materiel Command officials stated that output per paid staff-day is no longer monitored closely because there were unintended results when this indicator was used as a key measure of productivity. For example, they noted when this indicator was emphasized by command leadership, some managers constrained important activities such as training in order to increase their production.

Table II.9: Output Per Paid Staff-Day

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Ogden	3.96	3.86	3.79	3.71	3.80	3.89
Oklahoma City	3.94	3.84	3.78	3.72	3.95	3.88
Sacramento	4.11	3.84	3.97	3.61	4.01	3.99
San Antonio	4.20	3.87	3.96	3.67	3.81	3.73
Warner Robins	4.05	3.90	3.94	3.80	4.04	4.15

Source: Military Bases: Information on Air Logistics Centers, GAO/NSIAD-90-287FS, Sept. 10, 1990 (fiscal years 1987-89); Air Force Materiel Command (AFMC) and Air Logistics Centers.

In June 1990, a Deputy Secretary of Defense memorandum noted that DOD had substantial opportunities to increase the efficiency and reduce the cost of depot maintenance operations and still continue to meet crucial maintenance missions. The Secretaries of the military departments were directed to prepare plans to reduce depot maintenance costs for the period fiscal year 1991 through fiscal year 1995 by internal streamlining and reducing the size of their maintenance depot infrastructure. This initiative became the Defense Management Report Directive (DMRD) 908, and was later expanded to include fiscal years 1996 and 1997. Table II.10 shows Air Force savings expected to result from the implementation of this initiative in the Air Force Materiel Command from fiscal year 1991 through 1997. According to Air Force Materiel Command officials, these projections could not be broken out to delineate potential savings by ALC. However, projected command-wide savings were broken out in the following areas: near-term strategy, interservicing, competition, and capacity utilization.

Near-term savings were to be achieved through personnel reductions, installation closures, and streamlining, and other savings were to be achieved through process improvements by transferring some Air Force work load to other service depots and by repairing equipment from other services in Air Force depots. Both types of transfers were expected to achieve economies-of-scale savings by spreading overhead costs over a larger work load base. Savings expected to result from increased competition were projected to total $943.3 million over the 7-year period and were to involve public-private competition, public-public competition, and manufacturing competition. Capacity utilization savings of $1.7 billion were to

be achieved through depot downsizing--divesting or mothballing unneeded facilities and equipment.

Table II.10: Estimated Productivity Savings

Dollars in millions

Type savings	Fiscal year				
	1991	1992	1993	1994	1995
Near-term	$44.2	$ 68.0	$105.0	$109.0	$109.0
Interservicing	0	1.7	11.6	13.0	13.5
Competition	14.1	68.8	110.5	176.6	241.7
Capacity utilization	0.1	10.8	8.4	1.2	3.2
Total	$58.4	$149.3	$235.5	$299.8	$367.4

Table II.10 (continued)

Type savings	Fiscal year		
	1996	1997	Total
Near-term	$112.7	$116.5	$ 664.4
Interservicing	14.6	15.6	70.0
Competition	162.0	169.6	943.3
Capacity utilization	3.4	3.5	30.6
Total	$292.7	$305.2	$1,708.3

Source: Defense Depot Maintenance Council Corporate Business Plan, (fiscal years 1992-1997).

Although projected DMRD 908 savings were not broken out by center, AFMC officials provided a breakout of actual savings by ALC. Table II.11 shows the $206.6 million reported as DMRD 908 depot maintenance savings during fiscal years 1991 and 1992.

Table II.11: Depot Maintenance Savings By ALC

Dollars in millions

Air Logistics Center	Fiscal year	
	1991	1992
Ogden	$13.1	$33.3
Oklahoma City	20.0	63.3
Sacramento	14.2	22.6
San Antonio	7.3	18.3
Warner Robins	4.5	10.0
Total	$59.1	$147.5

Source: Air Force Materiel Command.

QUALITY

Air Force Materiel Command officials noted that they do not routinely collect and analyze customer complaints to measure quality. However, over a 3-year period they collected information representing the total complaints for all aircraft, engines, and reparable work items repaired in Air Force depots against the total standard repair hours. As shown in table II.12, this data provides a rate (standard hours divided into total complaints). Command officials noted that product mix and differences in the number of end items produced are key factors influencing the outcome and cautioned that center-to-center comparisons are not recommended.

Table II.12: Rates of Customer Complaints About Quality

Air Logistics Center	Fiscal year		
	1989	1990	1991
Ogden	.00022	.00022	.00019
Oklahoma City	.00030	.00028	.00024
Sacramento	.00063	.00070	.00066
San Antonio	.00008	.00007	.00010
Warner Robins	.00040	.00035	.00022

Source: Air Force Materiel Command.

CAPACITY

Some capacity measures have already been provided in tables I.2 and I.3. The age and replacement cost of the ALCs' maintenance facilities and equipment, the amount of money spent on military construction and plant equipment, and the size of the depot maintenance work force are a few other statistics used to provide an indication of the ALCs' capacity for doing work. This information is summarized in tables II.13 through II.16.

Table II.13 shows the value and size of maintenance facilities, which include hangers, machine shops, and test facilities. Cost figures are estimated replacement costs.

Table II.13: Maintenance Facilities (fiscal year 1992)

Dollars in millions

Air Logistics Center	Buildings/Area (square feet in millions)	Average age of facilities (years)	Replacement Cost
Ogden	346/3.8	34	$352
Oklahoma City	51/5.1	36	1100
Sacramento	128/3.5	28	634
San Antonio	66/4.0	34	424
Warner Robins	79/2.9	29	225

Source: U.S. Air Force.

Table II.14 shows the average age and estimated replacement cost of the industrial plant equipment used in depot maintenance at the ALCs. Equipment includes such machinery as spot welders, drilling machines, lathes, grinders, and special test equipment.

Table II.14: Maintenance Equipment (fiscal year 1992)

Dollars in millions

Air Logistics Center	Average age of equipment (years)	Replacement Cost
Ogden	12	$408
Oklahoma City	11	396
Sacramento	13	565
San Antonio	13	685
Warner Robins	7	850

Source: U.S. Air Force.

Table II.15 shows the amount that the ALCs' depot maintenance activities have spent on military construction and plant equipment from fiscal year 1984 through 1993. These numbers include equipment purchased over that period by the industrial fund and through appropriations.

Table II.15: Military Construction and Plant Equipment Expenditures

Dollars in thousands

Air Logistics Center	Military construction	Plant equipment
Ogden	$ 73,200	$140,668
Oklahoma City	129,100	172,251
Sacramento	77,300	137,394
San Antonio	81,600	192,103
Warner Robins	51,400	159,530

Source: Depot Maintenance Consolidation Study, Appendix F - Depot Commodity Matrix.

Table II.16 shows the total number of people paid from the depot maintenance industrial fund during fiscal years 1988 through 1992. These are work years not authorizations. The work force includes mechanics, machinists, welders, and electricians as well as managers and administrative staff, and includes overtime.

Table II.16: Size of the Depot Maintenance Work Force

Work years in thousands

Air Logistics Center	Fiscal year				
	1988	1989	1990	1991	1992
Ogden					
Civilian	6,765	7,014	7,143	6,452	5,835
Military	177	171	166	92	124
Total	6,942	7,186	7,309	6,644	5,958
Oklahoma City					
Civilian	8,360	8,375	8,158	6,888	6,251
Military	96	87	82	73	77
Total	8,456	8,462	8,239	6,962	6,328
Sacramento					
Civilian	6,344	6,368	6,488	5,864	5,519
Military	122	150	137	71	87
Total	6,465	6,517	6,624	5,936	5,606
San Antonio					
Civilian	8,031	8,356	8,512	7,547	7,198
Military	47	49	57	56	66
Total	8,078	8,405	8,569	7,603	7,264
Warner Robins					
Civilian	6,406	6,888	7,264	6,402	6,357
Military	77	80	56	56	61
Total	6,484	6,968	7,330	6,458	6,418

Note: Numbers may not total due to rounding.

Source: Air Logistics Centers.

FINANCIAL INFORMATION

The creation of the Air Force Industrial Fund in 1969 resulted in efforts to operate Air Force depots in a businesslike manner. Since the establishment of the Defense Business Operations Fund in October 1991, DOD has placed additional emphasis on the need to operate the Air Force depots in a businesslike manner. According to DOD officials, the primary goal of the Fund is to encourage support organizations to provide quality goods and services at the lowest cost. This goal is intended to be accomplished, in part, by (1) identifying the full cost of providing goods and services to customers, (2) measuring performance on the basis of cost goals,

and (3) providing better information on the support organizations' operations to decisionmakers in DOD and the Congress.

Some of the financial indicators that are used to monitor the ALCs' depot maintenance operations are (1) their total revenues, expenses, and net operating results; (2) labor costs; (3) indirect costs as a percentage of total costs; (4) the cost per direct product standard hour of work produced; and (5) the carryover of work on hand at the end of the fiscal year. This data is summarized in tables II.17 through II.21.

Table II.17 shows total revenues from depot maintenance performed by ALC personnel and related cost of goods sold (COGS) for each Center during fiscal years 1988 through 1992. The ALCs have a financial objective to set their sales prices at a level that will allow them to recover their operating costs and operate on a break even basis over the long term. Sales rates for specific fiscal years can contain built-in profits or losses. According to AFMC officials, this is done to dissipate previous years' profit or loss so the fund will break even over the long-term.

Table II.17: Financial Operating Results (fiscal years 1988-92)

Dollars in millions

Air Logistics Center	Fiscal year				
	1988	1989	1990	1991	1992
Ogden					
Revenues	$348.9	$349.5	$381.1	$401.2	$417.4
Cost of goods sold	376.7	368.0	421.4	383.9	395.0
Net gain (loss)	($ 27.8)	($ 18.6)	($ 40.3)	($ 17.2)	$ 22.4
Oklahoma City					
Revenues	$531.7	$530.1	$488.5	$491.6	$533.8
Cost of goods sold	555.0	567.6	564.5	504.3	479.2
Net gain (loss)	($ 23.2)	($ 37.5)	($ 76.0)	($ 12.6)	$ 54.5
Sacramento					
Revenues	$368.4	$366.8	$380.6	$410.4	$478.8
Cost of goods sold	380.6	376.6	378.8	406.6	412.1
Net gain (loss)	($ 12.2)	($ 9.8)	$ 1.7	$ 3.9	$ 66.6
San Antonio					
Revenues	$449.2	$478.3	$501.5	$558.6	$512.9
Cost of goods sold	483.1	529.0	519.9	517.4	507.4
Net gain (loss)	($ 33.9)	($ 50.7)	($ 18.4)	$ 41.2	$ 5.6
Warner Robins					
Revenues	$378.8	$395.0	$440.1	$456.4	$474.8
Cost of goods sold	389.1	413.7	472.8	455.4	438.2
Net gain (loss)	($ 10.3)	($ 18.7)	($ 32.7)	$ 1.1	$ 36.6

Note: May not total due to rounding.

Source: Air Force Materiel Command.

Table II.18 shows the average cost of a direct labor hour for fiscal years 1987 through 1992. According to AFMC officials, hourly rates include wages, leave, retirement, life insurance, health and other benefits. These officials also noted that cost of labor is a function of work load mix, technology, skill requirements, and locality pay differentials.

Table II.18: Average Cost of a Direct Labor Hour

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Ogden	$16.27	$17.41	$17.22	$18.91	$20.41	$22.44
Oklahoma City	15.74	16.68	17.19	18.70	20.65	20.97
Sacramento	17.54	18.84	19.44	20.67	22.13	23.71
San Antonio	14.19	14.80	15.13	15.38	16.49	17.50
Warner Robins	17.65	18.22	18.08	19.29	21.59	20.77

Source: Air Force Materiel Command.

Table II.19 shows the ratio of indirect costs to total costs for fiscal years 1987 through 1992. According to DOD officials, the increasing percentage is largely a function of allocating fixed indirect costs over a declining work load.

Table II.19: Indirect Costs as a Percentage of Total Costs

Air Logistics Center	Fiscal year					
	1987	1988	1989	1990	1991	1992
Ogden	47.94	52.03	50.80	50.04	47.63	50.77
Oklahoma City	35.25	37.81	40.25	41.68	37.58	46.20
Sacramento	43.35	44.57	44.67	44.97	41.59	45.56
San Antonio	40.01	47.21	41.97	45.73	40.82	46.77
Warner Robins	41.99	45.83	44.21	44.26	43.16	48.89

Source: Air Force Materiel Command.

Table II.20 shows the relationship of total costs incurred to total direct product standard hours produced, with the costs segregated both by type (labor, material, and other) and level (direct, production overhead, and general and administrative overhead). Production overhead costs are those that apply to a specific organization, such as the labor costs associated with a shop supervisor, while general and administration overhead costs are those that apply to the depot as a whole, such as the labor costs associated with the security police force.

Table II.20: Cost Per Direct Product Standard Hours of Work Accomplished (fiscal year 1992)

Air Logistics Center	Ogden	Oklahoma City	Sacramento	San Antonio	Warner Robins
Direct	$31.55	$39.27	$37.64	$38.49	$33.38
Labor	(24.60)	(22.80)	(24.99)	(19.28)	(21.84)
Material	(6.34)	(16.32)	(11.38)	(19.13)	(11.34)
Other	(.61)	(.16)	(1.27)	(.08)	(.21)
Production overhead	$21.71	$22.40	$22.37	$26.14	$27.24
Labor	(13.49)	(13.07)	(13.54)	(14.49)	(12.77)
Material	(4.59)	(5.90)	(4.91)	(5.75)	(6.01)
Other	(3.64)	(3.42)	(3.91)	(5.90)	(8.46)
G & A[a] overhead	$10.81	$11.33	$ 9.13	$ 7.68	$ 4.70
Labor	(3.46)	(3.84)	(3.65)	(3.15)	(2.48)
Material	(.45)	(.25)	(.14)	(.24)	(.20)
Other	(6.90)	(7.23)	(5.34)	(4.30)	(2.02)
Total	$64.08	$72.99	$69.13	$72.32	$65.33
Labor	(41.55)	(39.71)	(42.18)	(36.92)	(37.09)
Material	(11.38)	(22.47)	(16.43)	(25.12)	(17.55)
Other	(11.15)	(10.81)	(10.52)	(10.28)	(10.69)

[a] General and administrative

Source: Air Logistics Centers.

Table II.21 shows the value of unfinished work that was carried over from one fiscal year to the next. Work that was deferred because of funding constraints is not included.

Table II.21: Year-end Carryover of Work (fiscal years 1988-92)

Dollars in millions

Air Logistics Center	Fiscal year				
	1988	1989	1990	1991[a]	1992[a]
Ogden	$77.7	$78.9	$93.8	$116.8	$168.5
Oklahoma City	66.3	62.9	79.8	129.4	162.6
Sacramento	86.9	120.3	161.4	199.6	292.6
San Antonio	72.8	95.0	93.6	157.6	205.4
Warner Robins	127.0	131.5	128.0	157.5	242.8

[a] Reflects the impact of Desert Shield/Desert Storm work load.

Source: Air Force Materiel Command.

ALC DEPOT MAINTENANCE REPAIR MISSIONS

OGDEN ALC

Ogden ALC is the source of repair for the C-130 and F-16 aircraft and large missiles (Minuteman, Peacekeeper). It is the technology repair center for weapons, air munitions, missile components, ram air turbines, landing gears, photographic equipment, training and simulation equipment, and instruments (all navigation except inertial systems; electrical/mechanical; and pressure, temperature, and humidity measuring). Interservice work load transfer decisions affecting Ogden ALC include the transfer of Navy C-130 aircraft to Ogden ALC in fiscal year 1993, Navy C-130 and F-14 landing gears to Ogden ALC in fiscal year 1992, Air Force F-4 aircraft to the Navy in fiscal year 1993, Air Force small arms to the Army in fiscal year 1992, Air Force Sidewinder missiles to the Army in fiscal year 1993, and Air Force Maverick missiles to the Army in fiscal year 1996. Ogden ALC's fiscal 1992 competition candidates were Minuteman III nuclear hardness, Minuteman III software, landing gear work loads, and F-16 APG-68 Radars. Work load competitions for fiscal year 1993 include F-16 Block 40 modifications, wheels, and the F-16 APG-66 radars.

OKLAHOMA CITY ALC

Oklahoma City ALC is the source of repair for the B-1B, B-2, B-52H, C-135, and E-3 aircraft. Also repaired there are the TF-30, TF-33, TF-41, J-57, F-103, F-107, F-108, F-110, F-112, and F-118 aircraft engines. Oklahoma City ALC is the technology repair center for hydraulics/pneudraulics (fluid-driven transmissions/constant speed drives, air driven accessories - except ram air turbines), oxygen components, and instruments (automatic flight control systems, engine). Interservice work load transfers affecting Oklahoma City ALC include the transfer of the J-79 engine work load to the Navy in fiscal year 1992, and transfer of all TF-30 engine and F-110 engine work loads from the Navy to Oklahoma City ALC in fiscal year 1993. The Air Force blade and vane work load will be consolidated at Oklahoma City ALC. The Oklahoma City ALC fiscal year 1992 competition candidates were the C-18 programmed depot maintenance and constant speed drives. Fiscal year 1993 repair work load competitions include the F-15, B-52, and the E-3 constant speed drive; the F-4C starter; air turbines and motors; the E-3 programmed depot maintenance; and the T-38 gyros.

SAN ANTONIO ALC

San Antonio ALC is the source of repair for the T-38, B-52H, C-5, and C-17 aircraft as well as gas turbine engine/auxiliary power units, T-56, TF-39, F-100, F-117, and F-119 aircraft engines. San Antonio also has the C-5 structural modification. It is the technology repair center for electronic support equipment, electro/mechanical support equipment, nuclear components, and instruments (engine). The work load at San Antonio ALC is decreasing due to force structure and weapon system reductions. Final resolution of B-52 work load assignments (proposed consolidation at Oklahoma City ALC) is pending final force structure decision. The interservice work load transfer affecting San Antonio ALC is the transfer of the gas turbine engine from the Army in fiscal year. San Antonio ALC's fiscal year 1992 competition candidates were the test equipment and generators and C-5 structural modification work loads. Fiscal year 1993 work load competitions include the T-56 engines and F-100 unified fuel control.

SACRAMENTO ALC

Sacramento ALC is the source of repair for the A-10, F-15, F-22, EF/F/FB-111, KC-135, and T-37. It is also the technology repair center for electric components, ground-electronics, hydraulics/pneudraulics (fluid-driven accessories except transmissions/constant speed drives), instruments (flight control), and shelters. Projected force structure and weapon systems drawdowns will affect work load. Sacramento ALC is not participating in the fiscal year 1992 or 1993 public private competition because it is competing in the public-public competition for the Sacramento Army Depot's work load.

WARNER ROBINS ALC

Warner Robins ALC is the source of repair for the C-130, C-141, and F-15 aircraft, and also has the C-141 structural modification. It is the technology repair center for airborne electronics, life support equipment, propellers, and instruments (gyroscopes except displacement). The Warner Robins ALC fiscal year 1992 competition candidate was the C-141 structural modification. Fiscal year 1993 candidates are the ALQ-131 II Reliability and Maintainability Pods, the APG Radar, the transponder Bundle, the ALQ-155, and the C-130 propellers.

(709003)