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A Central Manager Is Needed to Coordinate the Military Diagnostic and Calibration Program. LCD-77-427; B-160682. May 31, 1977. 12 pp. + 2 appendices (4 pp.).

Report to Secretary, Department of Defense; by Robert G. Rothwell (for Fred J. Shafer, Director, Logistics and Communications Div.).

Issue Area: Facilities and Material Management: Consolidating or Sharing Supply and Maintenance Systems (701).
Contact: Logistics and Communications Div.
Budget Function: National Defense: Department of Defense - Military (except procurement & contracts) (051).
Organization Concerned: Department of Transportation; Energy Research and Development Administration; National Aeronautics and Space Administration; Office of Management and Budget.
Congressional Relevance: House Committee on Armed Services; Senate Committee on Armed Services.

The creation of a single, central manager with authority over the entire calibration program within the Department of Defense (DOD) would be a major improvement in the management of calibration resources within the Department. Findings/Conclusions: The military services use precision measuring and test equipment valued at over $1.8 billion to design, construct, operate, and maintain their facility, equipment, and research programs. The military services operate more than 700 calibration facilities worldwide; employ about 9,000 civilian and military technicians; and make over 3 million calibrations each year. The military facilities can be generally classified as metrology centers, primary laboratories, secondary laboratories, intermediate facilities, and user facilities. The DOD Joint Technical Coordinating Group for Metrology and Calibration established a subgroup in June 1975 to consolidate calibration services. Recommendations: A single manager should be created within DOD to cover all diagnostic tools, nondestructive tests, and diagnostic procedures common to more than one service. The consolidations of the three metrology and engineering centers, the four primary laboratories, and the many secondary, intermediate, and user facilities should be considered. The services should be directed to use the nearest calibration facility which can perform the service most effectively at the lowest transportation cost. (SC)

UNITED STATES
GENERAL ACCOUNTING OFFICE

A Central Manager Is Needed To Coordinate The Military Diagnostic And Calibration Program

Department of Defense

LCD-77-427

MAY 31, 1977

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

LOGISTICS AND COMMUNICATIONS
DIVISION

B-160682

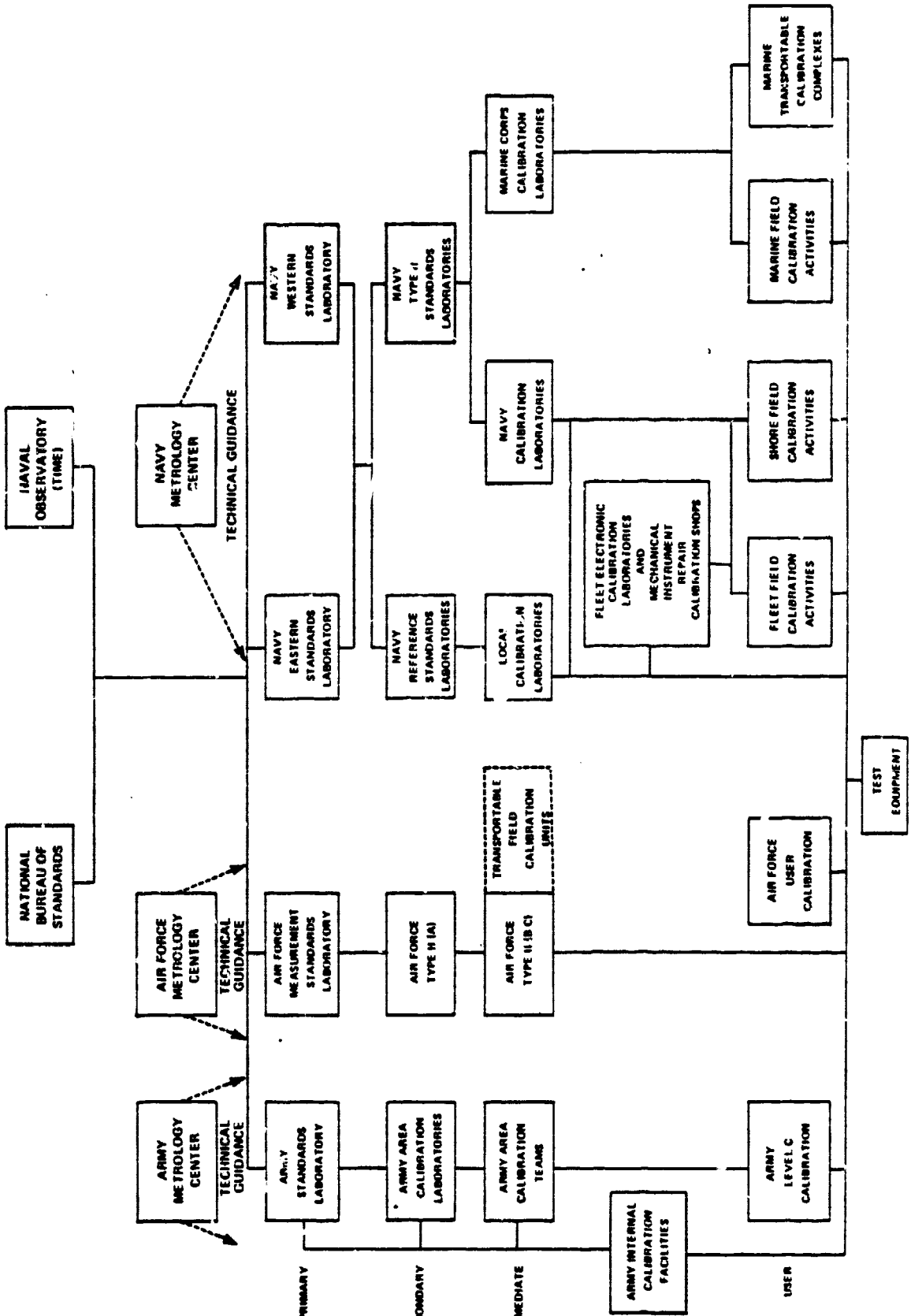
The Honorable
The Secretary of Defense

Dear Mr. Secretary:

The military services use precision measuring and test equipment valued at over $1.8 billion to design, construct, operate, and maintain their facility, equipment, and research programs. Such equipment ranges from simple scales to weigh packages to multifunctional test sets to measure the operational capability of major weapon systems.

Precision measuring equipment must be accurate, that is, calibrated to produce readings comparable to readings from devices whose accuracy is traceable to the national legal measurement standards. The National Bureau of Standards maintains these legal standards (such as the meter, kilogram, volt, and second) and develops methods for making measurements consistent with the standards.

The military services and Federal agencies have developed their own calibration systems, consisting of multilevel chains of calibration laboratories and other facilities. The military services operate more than 700 calibration facilities worldwide, employ about 9,000 civilian and military technicians, and make over 3 million calibrations each year. The military facilities can be generally classified as metrology centers, primary laboratories, secondary laboratories, intermediate facilities, and user facilities. (See the chart of calibration systems on the following page.) The National Aeronautics and Space Administration, the Federal Aviation Administration, the Coast Guard, and the Energy Research and Development Administration--four of the major nonmilitary users--all maintain their own calibration systems. These agencies use precision measuring and testing equipment valued at $0.9 billion and spend an estimated $42 million annually to operate their systems.


DEPARTMENT OF DEFENSE CALIBRATION SYSTEMS
NATIONAL BUREAU OF STANDARDS
NAVAL OBSERVATORY (TIME)
ARMY METROLOGY CENTER
AIR FORCE METROLOGY CENTER
NAVY METROLOGY CENTER
TECHNICAL GUIDANCE
TECHNICAL GUIDANCE
TECHNICAL GUIDANCE
ARMY STANDARDS LABORATORY
AIR FORCE MEASUREMENT STANDARDS LABORATORY
NAVY EASTERN STANDARDS LABORATORY
NAVY WESTERN STANDARDS LABORATORY
ARMY AREA CALIBRATION LABORATORIES
AIR FORCE TYPE II (A)
NAVY REFERENCE STANDARDS LABORATORIES
NAVY TYPE II STANDARDS LABORATORIES
ARMY AREA CALIBRATION TEAMS
TRANSPORTABLE FIELD CALIBRATION UNITS
AIR FORCE TYPE II (B C)
LOCAL CALIBRATION LABORATORIES
NAVY CALIBRATION LABORATORIES
MARINE CORPS CALIBRATION LABORATORIES
FLEET ELECTRONIC CALIBRATION LABORATORIES AND MECHANICAL INSTRUMENT REPAIR CALIBRATION SHOPS
FLEET FIELD CALIBRATION ACTIVITIES
SHORE FIELD CALIBRATION ACTIVITIES
MARINE FIELD CALIBRATION ACTIVITIES
MARINE TRANSPORTABLE CALIBRATION COMPLEXES
AIR FORCE USER CALIBRATION
TEST EQUIPMENT
ARMY INTERNAL CALIBRATION FACILITIES
ARMY LEVEL C CALIBRATION
PRIMARY
SECONDARY
INTERMEDIATE
USER

In the last 10 years, many studies and programs have been established to improve the coordination of Federal calibration systems and consolidate redundant resources. Most progress has been made since the Department of Defense (DOD) Joint Technical Coordinating Group for Metrology and Calibration established a subgroup in June 1975 to consolidate calibration services. The subgroup's efforts have been a major factor in the efficient use of calibration resources.

We believe that another major improvement in managing these resources would be produced by the creation of a single, central manager with authority over the entire calibration program, as recommended on page 10.

In June 1975 DOD responded to our draft report on the need for a single manager for military spectrometric oil analysis activities. 1/ The response indicated DOD did not advocate a single manager for oil analysis primarily because it was concerned that such action could cause a proliferation of single managers for each diagnostic tool.

GAO agreed with that concern and recommended that a single manager be created to cover all diagnostic tools, nondestructive tests, and diagnostic procedures common to more than one service.

This calibration services study confirms and reinforces that recommendation.

Apart from the single manager concept, we believe the subgroup can produce further coordination of calibration systems. We are, therefore, bringing to your attention the following areas which should be considered further in assessing the potential for calibration consolidations:

--The three metrology and engineering centers.

--The four primary laboratories.

--The many secondary, intermediate, and user facilities, including the Army's mobile teams.

1/"Single Manager Needed to Obtain Cost and Fuel Savings in Spectrometric Oil Analysis Program" (LCD-75-431, Aug. 27, 1975).

In addition, the facilities maintained by civil agencies and defense contractors should be considered part of the total U.S. calibration capability. Better coordination is necessary to be assured of maximized use of calibration capability throughout the Government.

BACKGROUND

According to Office of Management and Budget Circular A-76, Federal agencies are to rely on the private enterprise system to support their needs unless national interest dictates otherwise. Also, in January 1976 the Assistant Secretary of Defense said the military services should maximize the potential for interservicing and consolidating calibration facilities, both in DOD and other Federal agencies. In the past the military services and GAO 1/ have made several studies on the need to consolidate calibration capabilities.

In 1967 the Joint Technical Coordinating Group for Metrology and Calibration was established to coordinate the military services' metrology and calibration programs. The group has worked to promote standardization and uniformity among the services in such calibration matters as engineering, training, calibration procedures, and coordination of support provided by the National Bureau of Standards. Little attention was given to consolidating duplicative calibration facilities, however, until the Joint Technical Coordinating Group established a subgroup on consolidations in June 1975.

Calibration technician training is one area which has been standardized and consolidated. Since 1969 the Navy and Marine Corps have saved $200,000 annually by using Air Force training facilities at Lowry Air Force Base, Colorado. In January 1975, urged by the DOD coordinating group, the Army also consolidated its technician training at the Air Force base. The Army estimates this consolidation will save 26 military positions and reduce training costs by about $400,000 a year. Besides savings, consolidated training has helped standardize skill levels, calibration techniques, and terminology throughout the services and has produced better training equipment and facilities use.

1/"Opportunities To Consolidate Support Functions in the Pacific To Reduce Military Cost" (B-160683, May 11, 1972) and "Millions Could Be Saved Annually and Productivity Increased If Military Support Functions in the Pacific Were Consolidated" (LCD-75-217, Aug. 26, 1975).

In October 1975 the consolidation subgroup reported considerable duplication in Hawaii and recommended partial consolidation of calibration facilities and additional interservice support. Of 24 laboratories, mobile vans, and field activities in Hawaii, 9 were considered candidates for consolidation.

The subgroup also studied consolidating calibration facilities in Europe, but this study was incomplete by the end of our fieldwork. In addition, the subgroup identified 11 geographic areas in the continental United States and Pacific which have a high density of military calibration laboratories and offer potential savings through consolidation and interservicing. The first of these studies in the Sacramento-San Francisco Bay area began in June 1976. In December 1976, after we completed an initial review of the services' four primary laboratories, the subgroup requested and received tentative approval for a consolidation study of the laboratories. We were told the Sacramento-San Francisco study of lower level laboratories would probably be delayed pending completion of the primary laboratories study.

In addition to the subgroup's consolidations work, the individual military services have also tried to reduce duplicate resources. For example:

--Prior to 1969, the Army activities in Alaska were supported by mobile calibration teams from Tooele Army Depot, Utah. By negotiating a support agreement with the Air Force, the Army realized savings of over $100,000 a year in temporary duty and travel costs. Partly because of Tooele's resulting workload reduction, an Army study recommended elimination of the Tooele calibration facility. The facility was eliminated in August 1973 with a recurring annual savings of more than $1 million.

--In 1973 the Air Force studied the potential for consolidating its laboratories at March, Norton, and George Air Force Bases, all in southern California. The study showed consolidation would save $24,500 to $105,400 a year over a 10-year period. Though consolidation was delayed for some time, the March and Norton laboratories were being consolidated at the end of our fieldwork.

MILITARY METROLOGY CENTERS

The Air Force, Army, and Navy metrology centers carry out many support functions, such as

--specifying technician training requirements,

--developing calibration procedures,

--designing and developing calibration equipment and standards, and

--establishing calibration intervals criteria.

In fiscal year 1976, the services' three centers had over 400 employees and had operating costs of about $13 million.

As discussed earlier, the services have progressed in consolidating and standardizing their technician training. The metrology centers' other functions remain as potential consolidation candidates. For example, though the Joint Technical Coordinating Group has tried to standardize calibration procedures used by the three centers, only standardization of formats and an exchange of information have resulted. Thus, the centers continue to triple overhead costs for preparing separate procedures and using different standards and test equipment to make the same measurements.

The three centers also use different criteria in setting calibration intervals (the frequency at which equipment is to be calibrated). (See app. I.) As a result the services calibrate similar pieces of equipment at different intervals. The Joint Coordinating Group has studied the need for standardizing calibration intervals but does not have the authority to require using standard intervals.

PRIMARY STANDARDS LABORATORIES

The military services operate four primary standards laboratories, employing over 250 personnel and having facilities and equipment worth about $33 million. During fiscal year 1976 these laboratories did about 26,000 calibrations at a cost of over $7 million.

Although the laboratories' measurement capabilities are quite similar, interservice support during fiscal year 1976 was less than 5 percent at each laboratory. The laboratories have relatively stable workloads because they support secondary

standards laboratories' equipment periodically. The following table shows each laboratory's fiscal year 1976 workload and excess capacity as estimated by laboratory officials:

Primary laboratory	Number of shifts operated	Number of calibrations FY 1976	Estimated workload resources on 3 shifts	Excess resources available
Army	1	9,098	34,897	25,799
Air Force	1	8,735	81,870	73,135
Navy (western)	1	4,135	12,405	8,270
Navy (eastern)	1	4,208	29,456	25,248
Total		26,176	158,628	132,452

As can be seen, workload capacity far exceeds the workload requirement at each laboratory. Three of the four laboratories individually have sufficient capacities to support the combined workloads of all laboratories. Even though excess resources exist, the Navy has developed a $6.1 million proposal for constructing a new western standards laboratory and the Air Force has proposed a $273,000 expansion of its laboratory. Neither proposal considered the excess resources or the potential for interservicing workloads among existing laboratories.

Equipment sent long distances when interservice support is nearby

Because the primary standards laboratories provide very little interservice support, lower level facilities with similar calibration requirements often send their equipment long distances to their own service's laboratory. Compatible resources of the other services are often nearby:

Activity supported	Supporting laboratory	Distance in miles	Laboratory with comparable capability	Distance in miles
Navy Standards Laboratory (Type II), Norfolk, Va.	Navy Western Standards Laboratory, San Diego, Calif.	2,320	Army Standards Laboratory, Huntsville, Ala.	610
Navy Calibration Facility, Charleston Naval Shipyard, S.C.	Navy Western Standards Laboratory	2,160	Army Standards Laboratory	495
Edgewood Arsenal, Aberdeen Proving Ground, Md.	Army Standards Laboratory	675	Navy Eastern Standards Laboratory Washington, D.C.	112
Yuma Proving Ground, Ariz.	Army Standards Laboratory	1,620	Navy Western Standards Laboratory	160

Inefficient use of measurement equipment

Operation of separate but similar laboratories on a one-shift operation limits valuable facilities use and measurement equipment assigned to each laboratory. We selected 151 similar pieces of measurement equipment used by the laboratories and asked laboratory officials to estimate the number of hours the equipment was used. The following table shows their estimates of use compared with the total time available for use on a three-shift basis:

Laboratory	Number of units	Approximate dollar value (000 omitted)	Percent use on three shifts
Army	49	$169	11
Navy (eastern)	21	77	18
Navy (western)	22	82	13
Air Force	59	195	17
Total	151	$523	15 (average)

We found some items used as little as 1 to 2 hours during a 40-hour workweek.

Duplication in indirect labor

The four separate primary standards laboratories employ indirect labor personnel who perform similar functions. The following table shows the approximate number of such personnel employed during calendar year 1976 and the associated costs:

Type of indirect labor	Primary standards laboratories				Personnel costs
	Army	Air Force	Navy-west	Navy-east	
Supervision	4	10	2	3	$ 631,522
Administration	5	6	4	2	157,614
Engineering	1	6	2	2	290,288
Other (note a)	(b)	14	1	3	262,721
Total	10	36	9	10	$1,342,145

a/Includes such personnel as material handlers and production schedulers.

b/Not identified because the data did not provide clear personnel identification.

Consolidation of primary standards laboratories offers potential for reducing these costs. As previously noted three of the four primary standards laboratories have sufficient individual capacities to support the combined workloads. Air Force officials estimate at least 17 of the 65 positions could be eliminated if the entire primary calibration workload

was assumed by the Air Force. This would necessitate a two-shift operation and would yield about $385,000 in annual savings from reduced indirect labor costs.

SECONDARY, INTERMEDIATE, AND USER CALIBRATION FACILITIES

Many worldwide locations have a high density of lower level calibration laboratories and offer potential for savings through consolidation and interservicing. The Joint Coordinating Group has not evaluated some of these lower level facilities as consolidation candidates.

In the Sacramento-San Francisco Bay area, 13 calibration laboratories and field activities employ about 540 personnel and have facilities and equipment worth over $8.6 million. Three of these are Navy field calibration activities either at the same location or within 45 miles of other Navy calibration laboratories.

The Alameda Naval Air Station, for example, houses a field calibration activity at the same location as a Naval Air Rework Facility calibration laboratory. Our evaluation of the two facilities showed that the field activity's workload could be assumed by the rework facility's laboratory without additional storage, material handling, or production scheduling costs. If this were done, surplus equipment worth $92,115 could be released for use elsewhere and space vacated by the field activity, having an estimated replacement value of $25,761, could be put to other use. Also, personnel costs could be reduced over $25,000.

This situation is not unique to the San Francisco Bay area. A January 1975 Navy audit reported consolidating three lower level calibration facilities in southern California with other nearby Navy laboratories would produce recurring savings of $227,000 and release $401,000 in duplicative equipment and standards.

Further examples of lower level consolidation opportunities are presented in appendix II.

CONCLUSIONS

Each military service has established its own system and facilities to satisfy common calibration needs. DOD has recognized that many facilities are housed together or in close

proximity to each other and has had some success in reducing existing duplication. However, the services continue to maintain independent, substantial, and duplicative calibration staffs, equipment, and facilities. Aside from the subgroup's work, we found no serious attempts by the services to maximize calibration cross-servicing. As a result, our study showed DOD continues to underutilize its resources and incurs unnecessary costs for transportation, equipment, staff, and facilities.

In June 1975 DOD responded to our draft report on the need for a single manager for military spectrometric oil analysis activities. The responses indicated DOD did not advocate a single manager for oil analysis primarily because it was concerned that such action could cause a proliferation of single managers for each diagnostic tool.

GAO agreed with that concern and recommended that a single manager be created to cover all diagnostic tools, nondestructive tests, and diagnostic procedures common to more than one service.

This study of calibration services confirms and reinforces that recommendation.

We also believe centralized management of military diagnostic and calibration programs would improve coordination and standardization at substantially less cost. As a first step, the services' metrology centers and primary standards laboratories should be evaluated for consolidation. Such consolidations, along with central management, would then facilitate consolidation of lower level calibration facilities by geographic areas. In addition, lower level consolidation studies should include consideration of civil agencies' and defense contractors' facilities.

RECOMMENDATIONS

In view of (1) inadequate coordination and duplicate calibration resources discussed in this letter and (2) our prior recommendation for central oil analysis program management, we recommend that you establish a single, central manager for the entire diagnostic and calibration program. The staff for the single manager could be drawn from surplus staffs identified in the duplicate organizations.

In the meantime, and while the single manager concept is being considered, the subgroup's staff could be expanded to take more timely advantage of possible savings we have pointed out, and the services should be directed to use the calibration facility closest to it which can perform the service most effectively at the lowest transportation cost.

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

Copies of this letter are being sent to the Director, Office of Management and Budget; the Secretaries of the Army, Navy, and Air Force; the Chairmen, House and Senate Committees on Appropriations; the Chairman, House Committee on Government Operations; and the Chairman, Senate Committee on Governmental Affairs.

Sincerely yours,

R. B. Rothwell

for F. J. Shafer
Director

DIFFERENT CRITERIA USED TO ESTABLISH CALIBRATION INTERVALS AT METROLOGY CENTERS

Because the military services have established different criteria to evaluate calibration frequency intervals, they often calibrate similar equipment at different intervals. These are the methods used to establish the intervals:

--The Navy requires that at least 85 percent of the equipment be within the calibration tolerance limits at the end of the calibration interval. In conjunction with this policy, the Navy establishes and adjusts calibration intervals by evaluating equipment by both model number and serial number. This technique allows one calibration interval for the majority of similar equipment and variable calibration intervals for exception equipment having failure rates better or worse than the average similar item. An evaluation is also made to measure the costs and benefits from shortening intervals for exception equipment as opposed to procuring replacement items. The Navy Metrology Engineering Center has recommended modifying intervals based on an Army statistical model to allow for an 85-percent average over-the-period reliability for general purpose test equipment and 95 percent for special purpose test equipment.

--The Air Force separates equipment into classes by manufacturer and part number. Calibration intervals are then assigned by class of equipment. This analysis method, unlike the Navy's, is based on the assumption that all equipment within a specific class will exhibit the same reliability over a given period.

Data obtained from unscheduled equipment is excluded from the evaluation, since the analysis assumes that any malfunction is caused by damage instead of normal use. While the Air Force requires that at least 85 percent of the equipment be within the tolerance limits at the end of the calibration interval, some studies have been made to adjust intervals based on the Army statistical model.

--Army criteria for establishing calibration intervals were changed in early 1976. When the Army's calibration system was first established, intervals were set in multiples of 90 days to conform to the fiscal

quarter concept. Later, mathematical models were developed to predict calibration intervals for given levels of reliability, and the Army decided to follow the Air Force's and Navy's lead in establishing an 85-percent end-of-period reliability requirement. However, the Army has adopted a new statistical model and changed its policy to require 75-percent end-of-period reliability. Calibration intervals have been extended to 120-day multiples.

EXAMPLES OF DUPLICATION AT LOWER LEVEL FACILITIES

Lower level calibration facilities are frequently located with, or close to, other calibration laboratories and facilities. Some of these facilities are operating below capacity. In addition, mobile calibration teams often duplicate the resources of nearby fixed calibration facilities:

--At the Mare Island Naval Shipyard, a field calibration activity has been established at the Combat Systems Technical Schools Command a tenant of the shipyard. Four calibration facilities within the shipyard's organization have estimated surplus capacities of 50 to 300 percent on a three-shift basis. Although some support is provided to the command, greater savings could be gained by consolidating the field activity into the shipyard's calibration facilities. A shipyard official estimated incurring no additional costs for storage, workload scheduling, or shipping and receiving. Space vacated by the field activity, with an estimated replacement value of $11,200, could be used for other purposes; and equipment assigned to the activity worth $19,500 could be reassigned.

--The Navy operates a field calibration activity at the Naval Air Station, North Island, San Diego, California. The Navy's Western Standards Laboratory and a Naval Air Rework Facility calibration laboratory are also at the air station. Although a Navy audit group recommended consolidating the field calibration activity with the rework facility calibration laboratory, the air station submitted plans for modernizing the field activity at a cost of $155,000.

--The Sacramento Army Depot operates seven mobile calibration teams to support about 25 Army, Army Reserve, National Guard, and other military locations in California, Oregon, Idaho, Nevada, and Arizona. Travis Air Force Base, about 50 miles from the Sacramento Depot, operates two mobile teams to support Air Force activities in California and Oregon. In addition, mobile teams operate nine mobile vans from the Alameda Naval Air Rework Facility to provide onsite support throughout central California.

APPENDIX II

These mobile teams' routes often overlap and some activities supported are close to another service's fixed calibration facilities. For example, one Army team from the Sacramento Army Depot supports the Navajo Army Depot, Arizona National Guard, and an Army Reserve unit in Arizona. Luke Air Force Base, within 160 miles of these activities, has a calibration laboratory which can support all three activities at an estimated annual savings of about $8,150. Also, the Presidio of San Francisco, Oakland Army Base, and a Marine Corps Reserve training center at Alameda, California, are supported by another Sacramento Army Depot mobile team. The calibration laboratories and mobile vans at the nearby Alameda Naval Air Rework Facility can support these activities at annual savings of about $28,700.