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Report to Bert Lance, Director, Office of Management and Budget; by William J. Anderson (for Victor L. Lowe, Director, General Government 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); General Government: General Property and Records Management (804).
Organization Concerned: Department of Defense; Department of Transportation; Energy Research and Development Administration; National Aeronautics and Space Administration; Federal Aviation Administration; Coast Guard.
Congressional Relevance: House Committee on Science and Technology; Senate Committee on Commerce.
Authority: OMB Circular A-76.

Federal agencies use precision measuring and test equipment worth over $2.7 billion, with the military services operating more than 700 calibration facilities, and four major nonmilitary agency users maintaining their own systems at an annual operating cost of about $42 million.
Findings/Conclusions: Agencies are reluctant to use other agencies' resources as required by the Office of Management and Budget (OMB). The National Aeronautics and Space Administration (NASA) has directed that each of its 10 centers establish their own calibration system, but no provision is made for central management control. Neither the Federal Aviation Administration (FAA) nor the Energy Research and Development Administration (ERDA) has a centralized calibration system. The Coast Guard has provided its district offices with instructions describing the essential features of a calibration system, but each district is responsible for devising its own system. The military services, although they continue to operate separate systems, have demonstrated that effective operation can be achieved with central direction. The overall Federal calibration program, which would prove easy to standardize, is poorly coordinated and sometimes duplicates activities. Recommendations: OMB should provide for central program direction and coordination of civil agencies' calibration systems and require closer coordination with the Department of Defense. (Author/HTW)

UNITED STATES
GENERAL ACCOUNTING OFFICE

Centralized Direction Needed For Calibration Program

Office of Management and Budget

LCD-77-426

JUNE 13, 1977

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

GENERAL GOVERNMENT
DIVISION

B-160682

The Honorable Bert Lance
Director, Office of
Management and Budget

Dear Mr. Lance:

Recently, we completed a study of Federal agencies' use of precision measuring and test equipment. Our study revealed potential improvements in the economy and efficiency of equipment management and use. This warrants attention from the Office of Management and Budget.

Federal agencies use precision measuring and test equipment worth over $2.7 billion to design, construct, operate, and maintain 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 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--also maintain their own calibration systems and, combined, annually spend about $42 million to operate their systems.

We recently evaluated the systems used by the military services and the four civil agencies to resolve their common precision equipment calibration needs.

Appendix I presents the results of our evaluation of military calibration systems. We concluded that, although the Department of Defense has made progress consolidating redundant calibration resources, calibration services will not be maximized until one central manager is given authority over the entire military diagnostic and calibration program.

This letter summarizes our observations on the civil agencies' calibration systems and recommends that you establish centralized direction and coordination with the Secretary of Defense. (See p. 8.) We believe that the intent of Office of Management and Budget Circular A-76 will be more effectively carried out if the military services' existing--and often underused--capabilities are considered in addressing civil agencies' calibration needs.

A PROFILE OF CIVIL CALIBRATION SYSTEMS

Office of Management and Budget Circular A-76 requires that Federal agencies place maximum reliance on the private sector for services needed to carry out agency programs. The circular also requires, when commercial resources will not suffice, that agencies rely on each other's existing resources before developing additional resources to meet their common requirements. We have found, however, that agencies are reluctant to use other agencies' resources and that, instead, they often duplicate others' resources and do not adequately coordinate their common needs.

National Aeronautics and Space Administration

The National Aeronautics and Space Administration has directed that each of its 10 research and space flight centers establish their own calibration system. No provision is made for central agencywide management control, coordination, or technical support of the separate center systems. This policy, as shown in the following two examples, has produced substantially different center systems.

--The Marshall Space Flight Center has a centralized calibration system which establishes calibration intervals, instrument recall, calibration certification, and documented accountability. The system gives direct access to national measurement standards and, where inhouse capabilities are limited, provides for aid from nearby Army calibration resources.

--The Ames Research Center does not have a centralized calibration system. Instead, five center organizations with calibration needs have separate policies and procedures. These organizations obtain their calibration support from several sources, including an onsite contractor, a small inhouse laboratory, original equipment manufacturers, a Navy organization nearby, and nearby commercial sources. Inventories of equipment requiring calibration are generally incomplete, and required calibration intervals are, at best, disorganized and not always followed. Not all organizations maintain equipment recall systems to indicate when calibration is needed, and those that do have not enforced these systems.

Federal Aviation Administration

The Federal Aviation Administration does not have an agencywide calibration system. Separate formal and informal systems, however, do exist within the administration. For example:

--The Flight Standards Service, a major organization component, has developed a formal calibration activity which assigns central responsibility, provides for a multilevel capability approach with accuracy traceable to the national standards, specifies calibration time intervals, and certifies completed calibration actions.

--The Airways Facility Service, another major component, has no formal system. Its field activities are encouraged to calibrate their own equipment, if feasible. Otherwise, calibration services are obtained from the agency's maintenance depot or from commercial

and military sources. We visited several field activities and found that, although nearby military organizations were generally used for support, calibration intervals were not always established and were loosely controlled. Also, because equipment recall systems were generally not used, some required equipment calibrations were not done.

Coast Guard

The U.S. Coast Guard has provided its district offices with instructions describing the essential features of a calibration system and showing advisory calibration intervals for specific test equipment. Each district, however, is responsible for devising its own system, including establishing appropriate intervals and either developing inhouse capabilities or seeking support from outside sources. Visits to two districts showed:

--Both districts have formalized their calibration activities through central office instructions, and these activities provide for accuracy traceable to the national standards; assign calibration responsibility; and establish calibration maintenance intervals, equipment recall, appropriate documentation, and certification.

--One district has developed a very limited inhouse activity which is supplemented by major support from a nearby Air Force activity.

--One district delegated system responsibility to two suborganizations. The smaller organization relies on a nearby Navy organization for most of its support. The larger organization has developed its own calibration facility to process equipment forwarded from user activities and relies on a contractor to satisfy calibration requirements beyond its own capabilities.

Energy Research and Development Administration

The Energy Research and Development Administration does not have a central calibration system. Instead the

agency's 56 facilities are allowed to identify their calibration needs individually and to develop their own procedures for satisfying these needs. Agency officials told us that 23 of these facilities have established calibration laboratories while the remaining facilities satisfy their calibration needs using other non-inhouse sources.

Agency officials also advised us that 14 facilities with laboratories hold about 87 percent of the agency's calibration equipment. Activities at these 14 facilities are coordinated and controlled by three major agency program divisions. Each of these divisions has its own calibration system.

We visited one of the 14 facilities with its own calibration capability and observed that calibration responsibility is divided between two subgroups with non-overlapping jurisdiction. The group with the largest calibration workload performs over 11,000 repair or calibration actions each year. These groups develop their own calibration procedures and provide for accuracy traceable to the national standards.

Agency officials stated that items normally have established calibration intervals and are tagged to indicate when calibration is required. Facility officials stated that they do not prescribe an automatic instrument recall system, but calibrate at the user's request and normally at the time of instrument repair.

NEED FOR CENTRALIZED DIRECTION TO IMPROVE COORDINATION AND REDUCE COSTS

Expertise is necessary to understanding equipment calibration requirements, developing effective calibration procedures, and establishing appropriate equipment calibration intervals. A well-developed management information system is also required for providing management with the cost and performance data needed to assess operations and making appropriate program adjustments. Finally, where users are scattered, strategically placed intermediate calibration facilities must be available to provide convenient and dependable links between the user and the National Bureau of Standards.

The military services, although they continue to operate separate systems, have each demonstrated that the above requirements can be effectively met with central

direction. The Air Force, for example, directs its entire calibration system from one central activity; this central activity also operates a primary standards laboratory which provides the essential link to the national standards. Adding only nine strategically placed secondary facilities and 123 intermediate facilities, the Air Force is able to effectively satisfy and control its diverse worldwide calibration and repair requirements.

Equipment calibration, as a functional support activity, is particularly suited to centralized direction and mutual support. Although precision measuring equipment may have individual differences, a given type of equipment measures only for the presence or value of one attribute in another object, regardless of the measured object's intended use. For example, the same voltmeter may be used to measure voltage in an object used to control commercial navigation and in an object used as part of a scientific experiment. The voltmeter, in either case, is concerned only with the objects's voltage, not with its end use.

Because calibration is function-oriented, the equipment, facilities, and skills required to calibrate and repair precision measuring equipment can generally support a wide range of agency programs. This basic point is illustrated by those instances where different sources of calibration capability are used by separate functions within the same agency. The previous discussion concerning the National Aeronautics and Space Administration is a good example. (See p. 2.) This point can also be seen in the many instances where different agencies have consolidated their needs and shared their resources.

In Hawaii, for example, a National Aeronautics and Space Administration activity recently agreed to support the calibration workload of a Navy activity on the same island. The Navy had previously obtained calibration support from a contractor on an island 130 miles away. In addition to saving $20,000 in annual contractor costs, officials at each activity were pleased to find that their cooperation also reduced equipment damage, increased repair capability, and improved their capacity for absorbing emergency workloads.

Because calibration equipment is specialized, this equipment is likely to sit idle, awaiting work requiring their particular measurement capability. Coordination of calibration maintenance schedules would not only provide for better equipment utilization but would also help prevent

unneeded expansion of calibration activities. The Federal Aviation Administration, for example, asked for $500,000 in its fiscal year 1977 budget submission to buy equipment needed to establish calibration functions at about 19 locations. In preparing its proposal, the agency did not fully consider alternative sources such as contractors and civil and military agencies. Although the requested funds were deleted because of subsequent budget cuts, consideration of calibration supply alternatives might have prevented the agency from requesting the funds.

It is difficult to determine the total savings that would result if civil agencies' calibration requirements and resources were better coordinated, but savings would be substantial because of better equipment utilization, reduced acquisition costs, reduced transportation costs, and reduced supervision and other indirect support costs.

CONCLUSIONS

Each Federal organization having calibration requirements, including diverse suborganizations within the same agency, tends to devise its own methods for satisfying its calibration needs with little consideration of existing resources. As a result, the overall Federal calibration program, which would prove easy to standardize, is poorly coordinated and sometimes duplicates activities. Some agency calibration systems are also incomplete and, as such, threaten the safety and success of those agencies' programs.

We believe centralized direction and coordination of calibration systems is desirable and can produce improved calibration support services at much less cost. Many existing resources can be drawn upon in deciding how more centralized direction and coordination can be best accomplished. The military services, for example, have worked for some time on coordinating and consolidating their calibration resources. Although civil agencies have progressed in reducing duplicate activities in their programs, they have not adequately considered their resources in assessing consolidation potential. Likewise, the civil agencies have not taken full advantage of existing proximate military activities as alternative sources of calibration support.

Expertise in calibration programs also can be found in the National Bureau of Standards. In addition, the General Services Administration has much experience in dealing with multiagency matters and could be a source for improving coordination. Regardless of which agency or

agencies are called on for assistance, civil agencies will benefit from both centralized management and closer coordination with the military services.

RECOMMENDATIONS

We recommend that you (1) provide for central program direction and coordination of civil agencies' calibration systems and (2) require closer coordination with the Department of Defense for standardization and consolidation of the total Federal calibration program.

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 Chairmen, House and Senate Committees on Appropriations; the Chairman, House Committee on Government Operations; and the Chairman, Senate Committee on Governmental Affairs.

Sincerely yours,

D.P. Anderson

for Victor L. Lowe
Director

APPENDIX I

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.

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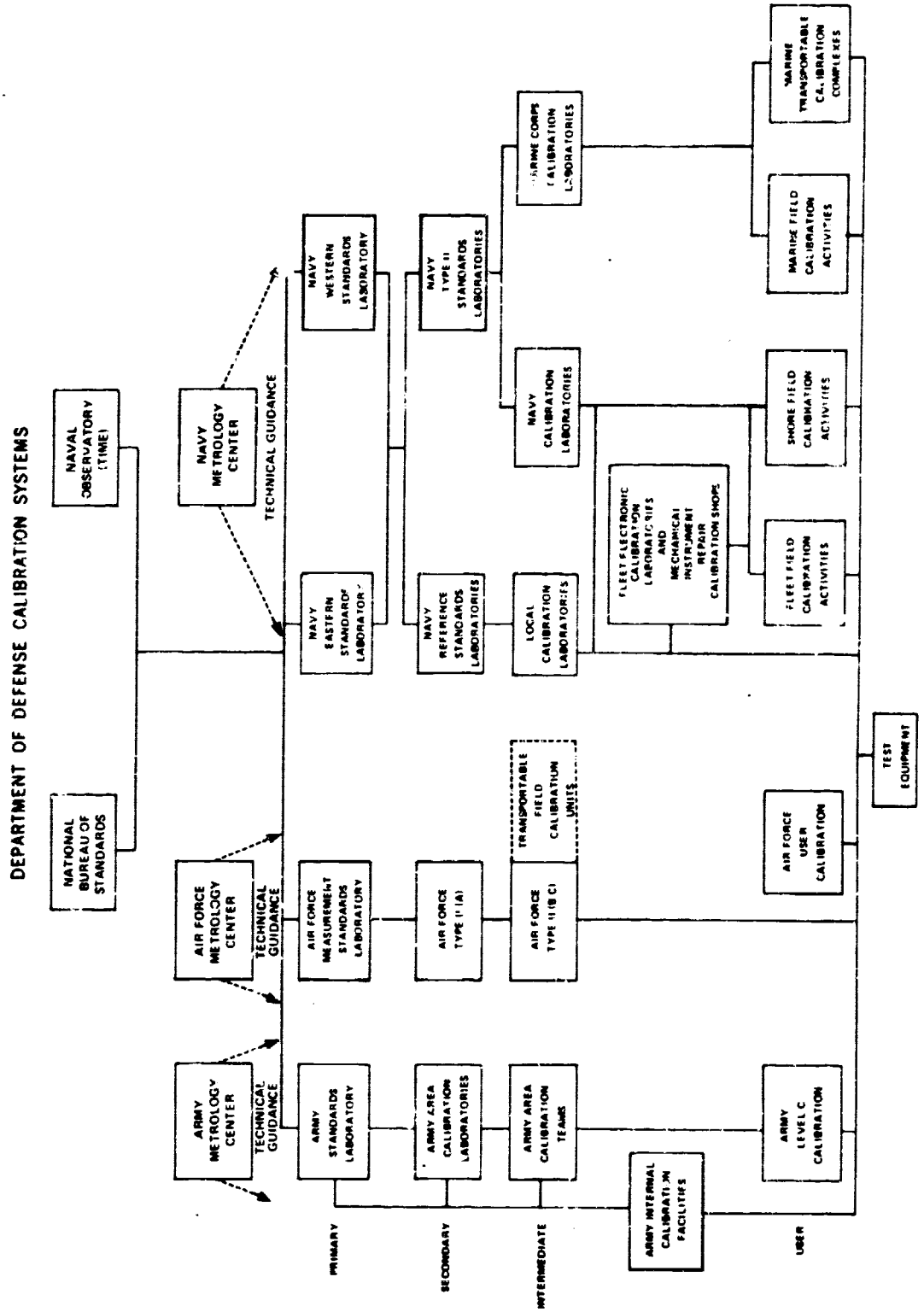
DEPARTMENT OF DEFENSE CALIBRATION SYSTEMS
NAVAL OBSERVATORY (TIME)
NAVY METROLOGY CENTER
TECHNICAL GUIDANCE
NAVY WESTERN STANDARDS LABORATORY
NAVY TYPE II STANDARDS LABORATORIES
MARINE CORPS CALIBRATION LABORATORIES
MARINE TRANSPORTABLE CALIBRATION COMPLEXES
MARINE FIELD CALIBRATION ACTIVITIES
NAVY CALIBRATION LABORATORIES
SHORE FIELD CALIBRATION ACTIVITIES
NAVY EASTERN STANDARDS LABORATORY
NAVY REFERENCE STANDARDS LABORATORIES
LOCAL CALIBRATION LABORATORIES
FLEET ELECTRONIC CALIBRATION LABORATORIES AND MECHANICAL INSTRUMENT REPAIR CALIBRATION SHOPS
FLEET FIELD CALIBRATION ACTIVITIES
NATIONAL BUREAU OF STANDARDS
AIR FORCE METROLOGY CENTER
TECHNICAL GUIDANCE
AIR FORCE MEASUREMENT STANDARDS LABORATORY
AIR FORCE TYPE I (1A)
AIR FORCE TYPE II (1B C)
TRANSPORTABLE FIELD CALIBRATION UNITS
AIR FORCE USER CALIBRATION
TEST EQUIPMENT
ARMY METROLOGY CENTER
TECHNICAL GUIDANCE
ARMY STANDARDS LABORATORY
ARMY AREA CALIBRATION LABORATORIES
ARMY AREA CALIBRATION TEAMS
ARMY INTERNAL CALIBRATION FACILITIES
ARMY LEVEL C CALIBRATION
PRIMARY
SECONDARY
INTERMEDIATE
USER

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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).

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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).

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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.

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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

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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:

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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

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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 use 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.

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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

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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.

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.