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BY THE COMPTROLLER GENERAL

Report To The Chairman,
Subcommittee On Defense,
Committee On Appropriations,
House Of Representatives
OF THE UNITED STATES

Army Actions To Resolve Issues Affecting Procurements Of Automated Calibration Equipment

In April 1981, GAO made three recommendations on actions the Army should take before determining the benefits to be achieved from automating its calibration equipment. The Army started but has not completed its work on those recommendations. GAO believes the Army should not purchase more new automated equipment until all necessary evaluations are completed.



120622

GAO/PLRD-83-35
FEBRUARY 11, 1983

224658

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

B-202652

The Honorable Joseph P. Addabbo
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

This is the followup report, as you requested, on allegations of improper procurements by the Army Metrology and Calibration Center (PLRD-81-16, Apr. 3, 1981).

We are sending copies of this report to the Secretary of Defense; the Secretary of the Army; and Julie Research Laboratories, Inc. As agreed with your office, we also will make copies available to other interested parties upon request.

Sincerely yours,

A handwritten signature in cursive script that reads "Charles A. Bowsher".

Comptroller General
of the United States



D I G E S T

The Army has yet to resolve the central issue in the longstanding controversy surrounding its procurement of calibration equipment--whether automated systems can replace manual equipment in field Army units.

The Army uses thousands of instruments to test and troubleshoot its equipment. Periodically, these instruments must be calibrated to be sure they are still accurate. In this way, calibration equipment plays an important role in supporting the Army's ability to fight a war.

Julie Research Laboratories, Inc. (JRL), a small business and a manufacturer of automated calibration equipment, has criticized Army procurements of calibration equipment as wasteful and improper. JRL asserts that savings can be realized by using its automated calibration equipment. (See p. 2.)

In response to a request from the Chairman, Subcommittee on Defense, House Committee on Appropriations, GAO reported in April 1981 that before JRL's claimed automation savings could be reliably estimated, the Army needed to assess its actual calibration workload and determine what portion of that workload would benefit from automation. GAO recommended, that the Secretary of Defense direct the Secretary of the Army to:

- Develop accurate workload data on field Army calibrations because reliable data is needed to validate equipment requirements.
- Reexamine equipment capabilities to determine the extent to which automated equipment can replace manual equipment in field Army calibration units.
- Require independent hardware demonstrations be conducted to establish the cost effectiveness and productivity increases that may be attributed to automating the field Army calibration units.

GAO noted that the question of whether automated systems could replace manual systems should be answered through hardware demonstrations by the people who will use the equipment in performing calibrations and repairs. (See app. I.)

In July 1982, the Chairman asked GAO to evaluate the Army's actions in responding to GAO's April 1981 recommendations. (See app. II.)

ARMY ACTIONS SINCE GAO'S
APRIL 1981 REPORT

The Army has performed a number of investigations, studies, and tests to evaluate its calibration and repair program since GAO's April 1981 report.

First in November 1981 and again in March 1982, two separate Army investigations confirmed the need for accurate workload data and disclosed management problems affecting calibration equipment procurements to such an extent that JRL was misled or adversely affected. The Army investigations found that, from 1974 to 1981, JRL's ability to compete may have been unduly restricted. However, these investigations did not substantiate allegations of an Army conspiracy against JRL's interests. (See pp. 20-21.)

Army and Air Force technical teams, in the summer of 1981, evaluated JRL's system in a laboratory-type environment, but these evaluations were inconclusive concerning whether JRL's system satisfied field Army needs.

On November 5, 1981, at a hearing before the Senate Committee on Governmental Affairs, the Army acknowledged that JRL had not received fair treatment. The Army promised to correct this and conduct a fair and objective test to evaluate various automated calibration systems. The promised test results were to be used in decisions on future procurements of calibration equipment. (See p. 9.)

To fulfill this promise, in January 1982, the Army asked interested contractors for proposals on a two-step procurement of automatic meter calibration equipment. In the first step, the Army would buy one and test off-the-shelf commercial equipment. In the second step, the Army would purchase larger quantities of automatic meter calibrators. The exact quantities would

depend on the results of Army evaluations of the sample calibrators purchased in step one.

The Army limited the "buy one and test" solicitation to low accuracy meters only. However, JRL's equipment can calibrate both low and high accuracy meters in addition to other types of direct current low frequency instruments. JRL did not participate in this "buy one and test" procurement, because it viewed the solicitation as technically and legally defective and believed it to be another attempt to eliminate JRL from competition. (See p. 16.)

An agency of the National Academy of Science, the National Research Council, assessed the Army's "buy one and test" project. It found that this project suffered from too many constraints on the project's scope, on the conduct of the test, and on the evaluation methodology. For these reasons the Council found that the test cannot serve as a good prototype for more general procurement evaluations of automated calibration systems. (See p. 13.)

On November 15, 1982, the Chairman and members of the Senate asked the Army to delay a decision on step two until GAO completes this report. The Army is complying with this request. (See p. 9.)

On the basis of its finding that JRL was a vital defense contractor and because JRL might go out of business before these issues are resolved, the Department of Defense (DOD) directed the Army, in May 1982, to buy six JRL automated calibration systems at a price of \$840,120. DOD did this because it found that JRL's equipment was highly capable, very accurate, reliable, well designed, and of quality construction. DOD stated that JRL's equipment offered potential for an early return on investment if used frequently. DOD also found that JRL presented an in-place research and development/production capability for automated calibration equipment which was not readily available from other sources. (See p. 19.)

CONCLUSIONS

The Army appears to be improving its management information system and making workload data more accessible for informed management decisions. This is a necessary first step in deciding on

the value of automated equipment in the field. However, the Army has not completed its entire workload assessments nor examined whether automated systems can replace manual equipment in field Army units as GAO recommended in 1981.

GAO believes the Army decision to constrain the test project and conduct those tests before fully completing an assessment of its needs was a serious flaw in the Army's plan. A central issue during the past 8 years of the Army/JRL controversy has been whether or not automated calibration used in the field Army is economical and effective. This was the reason for GAO's 1981 recommendation. This issue remains unresolved and GAO believes the Army should not go forward with plans to purchase more automated meter calibrators until the issue is resolved.

RECOMMENDATION

GAO recommends that the Secretary of the Army cancel the second step of the so-called "buy one and test" two-step procurement of automated meter calibration systems, until the issue of whether or not automated calibration equipment to be used in the field Army is economical and effective has been resolved. (See p. 25.)

AGENCY COMMENTS

DOD and the Army have concurred in and agreed to implement GAO's April 1981 recommendations. DOD said it would combine its written response to those recommendations with its response to this report and would provide details on its implementation plans. However, DOD believes the Army should go forward with step two of the planned procurement, because the meter calibrators tested in step one meet a valid specific Army requirement and the Army's analysis shows the procurement would be cost effective. DOD cannot foresee, but will not know until all evaluations are complete, a need for calibration equipment as complex as JRL's. Furthermore, DOD believes that cancellation of the award would be a breach of faith with the three participating contractors. (See pp. 25-26.)

GAO questions DOD's comment that going forward with step two of the proposed procurement would be cost effective. Step one was designed to provide information on a decision between candidate systems; it was not designed to decide the

issue of whether or not the systems should be purchased. The National Research Council questions whether the information developed in step one--including cost effectiveness analyses--can be used to make this procurement decision without additional data on important characteristics. GAO believes any procurements of automated calibration equipment would be premature without a comprehensive evaluation which would include factors not considered in the Army's test to date. (See pp. 13-15.)

GAO believes the Army should take the time necessary to complete all applicable studies. GAO believes the Army should not continue with step two of the "buy one and test" procurement because it addresses only one portion of the Army's calibration equipment--certain types of meters. The Army has acknowledged that such an approach is suboptimal. GAO believes that if the Army goes forward with step two, it may lead to piecemeal procurement of many different types of automated calibration equipment in the future, and thus might not be the most cost effective course for the Army to follow.



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ABBREVIATIONS

AC	Alternating Current
AMCS	Automated Meter Calibration Systems
AMSAA	Army Material Systems Analysis Activity
AR	Army Regulation
DARCOM	Materiel Development and Readiness Command
DOD	Department of Defense
GAO	General Accounting Office
IG	Inspector General
JRL	Julie Research Laboratories, Inc.
MICOM	Missile Command
NRC	National Research Council
PLRD	Procurement, Logistics and Readiness Division
RFP	Request for Proposal
TMDE	test, measurement, and diagnostic equipment
WSMR	White Sands Missile Range

CHAPTER 1

INTRODUCTION

The Army uses over a half million instruments to test and diagnose faults on equipment supporting military operations worldwide. Each of these instruments must be periodically checked, or calibrated, to validate that accuracy is maintained. Consequently, calibration is essential to effective military operations.

On April 3, 1981, we reported to the Chairman, Subcommittee on Defense, House Committee on Appropriations, concerning allegations of improper procurements in the Army's calibration and repair program and recommended that the Army determine the most cost effective equipment to satisfy its needs. (See app. I.) On July 13, 1982, the Chairman requested that we follow up on our previous report to determine whether the Army responded to our recommendations in a timely and effective manner. (See app. II.)

CALIBRATION AND REPAIR PROGRAM TERMS

To appreciate the technical aspects of the calibration and repair program in the Army, it is necessary to define some terms. First, it is important to distinguish between calibration and repair. Calibration is a term used to describe the act of establishing the value of an unknown by comparing it to a known value. Repair is the actual correction of a malfunction.

A calibration standard is an item of equipment whose accuracy and values are established by a chain of measurements from the National Bureau of Standards. Thus, a calibration standard as used in this report is not a goal, level of achievement, or a number; it is a measurement instrument.

The Army defines test, measurement, and diagnostic equipment (TMDE) as any system or device used to evaluate the operational condition of a system or equipment to identify and/or isolate any actual or potential malfunction. The spectrum of TMDE is broad and ranges from automotive support equipment to complex electronic test sets for missiles and communications. There are five general classifications of TMDE:

1. Direct current and low frequency instruments such as multimeters, oscilloscopes, and low frequency signal generators.
2. Physical or mechanical instruments such as torque wrenches, mechanical scales, and thermometers.
3. Microwave instruments such as high frequency signal generators and radio frequency resistors.

4. Radiac instruments to measure radiation.
5. Infrared instruments to measure radar wavelengths.

ARMY CALIBRATION AND REPAIR PROGRAM ORGANIZATION AND RESPONSIBILITIES

Overall management responsibility for TMDE functions, including the Army's calibration and repair program, belongs to the Materiel Development and Readiness Command (DARCOM). Calibration and repair program operations are different for the field Army than for industrial-type facilities, such as depots and laboratories.

The U.S. Army TMDE Support Group, located in Huntsville, Alabama, manages the field Army calibration and repair program, except for the Army National Guard. The primary mission of the field Army program is to support tactically deployed, general-purpose test equipment in the hands of field Army troops through calibration and repair teams assigned and deployed with tactical combat units they support. The Army states that these teams must have full mobile capability. Calibration and repair teams use instruments grouped together in a configuration, commonly referred to as a calibration and repair set.

Industrial-type Army calibration facilities, on the other hand, are fixed and provide calibration support to depots, laboratories, arsenals, proving grounds, and ranges. They are managed by the operating commands which they support. The White Sands Missile Range (WSMR) calibration laboratory is one of such industrial-type facilities.

CONGRESSIONAL INTEREST IN ARMY CALIBRATION AND REPAIR PROGRAM

In recent years, the Congress expressed increased interest in the Army's calibration equipment programs largely as a result of allegations by Julie Research Laboratories, Inc. (JRL), a small business and a manufacturer of calibration equipment. JRL has criticized Army procurements of calibration equipment as wasteful and improper. JRL asserts that savings can be realized by using its automated calibration equipment. In August 1980, JRL published a cartoon booklet, "You're Not Supposed To Get Mugged By Your Own Army," which satirically depicted JRL's long-standing attempts to sell automated calibration systems to the Army. In June 1981, JRL published a second cartoon booklet, "Where Were You During The Coup?" which described JRL's continuing problems with the Army's calibration and repair program and lack of Army corrective action as perceived by JRL.

In response to a request from the Chairman, Subcommittee on Defense, House Committee on Appropriations, we reported on JRL's allegations of improper procurements by the Army Metrology and Calibration Center (PLRD-81-16, Apr. 3, 1981). Although we were

unable to verify the accuracy of all JRL's allegations, we concluded that the Army had not adequately considered JRL's system, particularly in its evaluation of the system's ability to satisfy field Army calibration program requirements. While we could not verify that using JRL's equipment would result in the amount of cost savings claimed by JRL or that the JRL system would satisfy the Army's needs, we concluded that before these determinations could be made, the Army needed to completely assess its actual workload and determine what portion of that workload would benefit from automation. The question of whether the JRL or other automated systems could replace equipment in field Army vans, in our opinion, could best be resolved through hardware demonstrations by the people using the equipment to perform the calibration mission.

Our April 1981 report recommended that the Secretary of Defense direct the Secretary of the Army to:

- Develop accurate workload data on field Army calibrations because reliable data is needed to validate equipment requirements.
- Reexamine equipment capabilities to determine the extent to which automated equipment can replace manual equipment in field Army calibration units.

We also recommended that the Secretary of Defense require an independent hardware demonstration be conducted to establish the cost effectiveness and productivity increases that may be attributed to automating the field Army calibration functions.

On November 5, 1981, as a part of a series of hearings on the Department of Defense (DOD) acquisition process, the Senate Committee on Governmental Affairs used, as a case study, the incidents surrounding JRL's attempts to gain Army contracts. During those hearings, the Under Secretary of the Army testified that he did not believe JRL received fair and equitable treatment by the Army, but promised that corrective steps would be taken to address the Army's calibration and repair program and to conduct a fair and objective test of various automated calibration systems so that ultimately a procurement would result. At that time, Committee members were concerned that JRL was nearly out of business and expressed a strong view that the controversy between the Army and JRL should be resolved.

In the House report accompanying the fiscal year 1982 DOD Appropriations Act, dated December 15, 1981, the Committee directed the following action:

"The conferees direct the Army to assemble and analyze all of its previous findings, from whatever source, and to submit to Congress no later than March 15, 1982, a final comprehensive report, including a detailed

"implementation plan for the acquisition of calibration equipment."

In September 1982, the Subcommittee on Defense, Senate Committee on Appropriations, expressed additional concerns and included the following statement in the fiscal year 1983 Senate Report on the Department of Defense Appropriations Bill (No. 97-580):

"The Committee is concerned that the Army has failed to resolve the serious problems which have pervaded its calibration program. Recent request for proposal (RFP) solicitations have presented an acquisition strategy for calibration equipment which appears not to be supported by an accurate data base or a detailed implementation plan.

"The Committee reiterates its request for a comprehensive report and a detailed implementation plan for acquisition of calibration equipment. The Army is advised to obtain prior approval of the Committee prior to awarding any production contract for purchase of calibration equipment pending submission of the comprehensive report and the acquisition plan."

ARMY ACTIONS SINCE OUR PRIOR REPORT

After our April 1981 report, the Army performed investigations, studies, and tests to evaluate its calibration and repair program management, identify related procurement problems, and determine the capabilities of three automated meter calibration systems. (See app. III and IV.)

OBJECTIVE, SCOPE AND METHODOLOGY

Our objective was to respond to the Chairman's July 13, 1982, request for followup on our prior report. (See app. II.) We reviewed the reports, studies, and plans prepared as a result of the Army actions set forth in appendices III and IV and reviewed the supporting data which formed the basis for these documents. In addition, we reviewed a WSMR report evaluating JRL's automated calibration system capabilities at the White Sands calibration laboratory.

We discussed these actions with responsible officials at the following locations:

- Office of the Secretary of Defense, the Pentagon, Washington, D.C.
- Office of the Secretary of Army, the Pentagon, Washington, D.C.
- Headquarters, DARCOM, Alexandria, Virginia.

- Headquarters, U.S. Army Missile Command (MICOM) and U.S. Army TMDE Support Group (formerly the Army Metrology and Calibration Center), Huntsville, Alabama.
- U.S. Army Materiel Systems Analysis Activity (AMSAA), Aberdeen, Maryland.
- White Sands Missile Range, White Sands, New Mexico.

We prepared a chronology of major events since our April 3, 1981, report (see app. III) and a time-line chart showing starting and completion dates of the various studies (see app. IV). We identified and obtained pertinent information concerning Army calibration equipment contracts awarded since April 1981. (See app. V.) We concentrated our efforts on those contracts relating to the tests of automated meter calibration systems. Also, we contacted firms who despite solicitation did not participate in the procurement associated with tests of automated meter calibration systems to obtain their reasons for not participating and their opinion on the fairness of the proposed test program, as described in the solicitation. In addition, we met with the president of JRL to obtain his views.

In assessing the Army's test of automated meter calibration systems, we relied on reports prepared by the National Research Council (NRC), a principal operating agency of the National Academy of Sciences, and the AMSAA. These organizations, at the request of DARCOM, conducted independent assessments of the test program.

In determining the Army's compliance with rules and regulations, we reviewed the solicitation for procurement concerning the tests of automated meter calibration systems. For other procurements, we relied on the results of the investigations by the Army Inspector General (IG) and the Army Regulation (AR) 15-6 teams. We selectively examined supporting evidence gathered during these investigations to determine the adequacy of their findings. We used generally accepted standards of evidence as the criteria for making these judgments.

We performed our fieldwork during the period August 15 through November 19, 1982. Our work was performed in accordance with generally accepted government audit standards.

CHAPTER 2

ARMY RESPONSES TO GAO'S REPORT RECOMMENDATIONS

Our April 3, 1981, report recommended that the Army take steps to establish the most cost effective calibration equipment to satisfy its needs. Our followup disclosed that the Army

- confirmed its need for accurate workload data and initiated steps to improve the TMDE data base and reporting system and to assess the potential for automating calibrations based on an analysis of workload;
- did not reexamine through hardware demonstrations whether automated equipment could replace manual equipment in field Army units; and
- tested automated calibration systems, but limited those tests to such an extent that the application of results to other procurements is questionable and contractor participation was affected.

The Army assessed its European workload data and found that automated calibration systems may be economically justified not only for meters, but for other types of electrical instruments. However, the Army still needs to examine the extent to which automated equipment might replace manual equipment in field Army units.

WORKLOAD ASSESSMENTS

The Army requested studies in response to our April 1981 report which showed that it needed improvements in its workload data base and reporting system. On April 30, 1981, the Secretary of the Army directed the IG to conduct a comprehensive investigation of the JRL allegations. The IG's work began in May 1981 and ended in October 1981. The summary report of this investigation was released on November 5, 1981. We refer to this report again on page 20. On May 14, 1981, the Secretary of the Army requested the U.S. Air Force to technically review certain aspects of the Army's calibration program and assist in resolving key issues involving equipment manufactured by JRL. The purpose of requesting the Air Force to conduct the review was to assure unchallenged objectivity. The Air Force Aerospace Guidance and Metrology Center conducted the review from July 1, 1981, to August 29, 1981. We also refer to this report on page 18.

The IG investigation team, for example, reported that the Army still had an inadequate data base, even after a substantial effort to introduce improved reporting, so that acceptable cost savings analyses could be made. The IG team concluded that the Army needed to further refine and strengthen the accuracy and availability of its workload data. Similarly, the Air Force

Aerospace Guidance and Metrology Center found that the Army calibration data and records available for its analysis and report were generally inadequate. For example, the Air Force report states that from the Army records it considered usable, the information had to be sorted, scanned, extracted, and compiled on a strictly manual basis. Both the IG and the Air Force found that some Army calibration activities were not centrally reporting workload data.

These weaknesses and the promised plans for improving the Army's workload data were discussed during hearings before the Senate Committee on Governmental Affairs in November 1981. At those hearings, the Under Secretary of the Army confirmed the IG's findings and stated that an adequate data base was needed to make acceptable cost savings analyses. The Under Secretary announced that a comprehensive assessment of the Army's calibration program would be made and a report would be issued by March 15, 1982. A TMDE Action Team, under the direction of the Deputy Chief of Staff for Logistics, started this assessment, referred to as the "Bonner Study," in December 1981 and completed it in March 1982. On April 27, 1982, the Secretary of the Army approved the study findings and recommendations.

The Army TMDE Action Team, charged with the responsibility for this assessment, found similar weaknesses to those identified by the IG and Air Force. The team's report states that the TMDE data base was fragmented, designed to parochial needs, and was neither readily accessible nor usable for overall management purposes. To correct these problems, the TMDE Action Team recommended the following four actions:

1. Determine management information needs. This includes an evaluation of the current management information system data bases and the performance requirements of the new TMDE management information system.
2. Develop programs to provide complete TMDE profile. Compile an inventory of TMDE authorized and on-hand Army-wide.
3. Identify and assess the merits and utility of all existing TMDE data bases.
4. Implement the central management information system.

The implementation of these recommendations is to be performed by a number of Army activities in phases from June 1982 through March 1985.

For the field Army, the TMDE Action Team found that a comprehensive workload data base existed but needed to be improved so that it would be useful and available for management purposes. As a result, the team outlined steps needed to improve data files and permit rapid access of workload by location and category of

TMDE. These improvements are scheduled for completion in February 1983.

The TMDE Action Team also conducted a detailed workload assessment relative to evaluating the potential for automation in Europe. They concluded that existing European automated meter calibration systems were economically justified, but further cost analysis was needed to assess the potential for automating calibrations of other types of direct current and low frequency TMDE. In 1981, the Army fielded 18 automated meter calibration systems in Europe at a cost of about \$400,000. The team found that based on workload analysis, some of these systems should be reallocated to high density workload areas. According to the team, the other high potential candidates for automation were oscilloscopes, signal generators, oscillators and electronic counters. The team also found other Army instruments that were used in substantial quantities, but these include physical or mechanical types that are not readily amenable to automated calibration. Examples include torque wrenches, pressure and dimension gauges, micrometers, and scales.

Responding to a TMDE Action Team recommendation, the Support Group in June 1982 initiated feasibility analyses of automating oscilloscopes, signal generators, and electronic counters. Additionally, the Support Group plans to complete a workload analysis of calibration activities in locations other than Europe. At the conclusion of our fieldwork, these analyses were underway and scheduled for December 1982 completion.

EXAMINATION OF THE EXTENT
AUTOMATED SYSTEMS COULD
REPLACE MANUAL EQUIPMENT

In our April 1981 report we recommended that the Army reexamine the extent to which automated equipment could replace manual equipment in field Army calibration units because neither JRL nor the Army had proven whether the JRL system could replace manual equipment in mobile vans. As of November 1982 the Army had not done this.

The November 1981 IG investigation report concurred with our recommendation and concluded that the reexamination could include all calibration activities in the Army at fixed sites or in mobile vans, field Army and otherwise. IG investigators told us that recent changes in the calibration program possibly could make automation more economical. An IG investigator said that the Army lacks a real cost comparison for manual versus automated equipment.

During the November 5, 1981, Senate hearings, the Under Secretary of the Army was specifically asked if the Army had reexamined the extent to which automated equipment could replace manual equipment in field Army calibration units. The Under Secretary's written response was that the Secretary of the Army

had directed an extensive study of calibration procurement and related issues conducted by the Army TMDE Action Team. However, this issue was not specifically addressed during this study. Also, neither the implementation plan which resulted from this study nor the "buy one and test" procurement plan for automated meter calibration systems addressed this issue. The test only examined general purpose meter functions which augmented existing manual standards.

Army officials provided several reasons for not examining the potential for replacing manual calibration standards with automated systems. One reason was that calibration equipment was also needed for repairing TMDE, and repair is presently a manual operation. Another reason was if the Army required the automated systems to perform every calibration function for the total meter population in the "buy one and test" procurement, it would have limited vendor participation. Also, the Army considered manual equipment as a "sunk cost;" therefore, it would be premature to examine replacing that equipment until its useful life is expended.

In October 1982 the Under Secretary told us that a detailed study will be initiated to address this issue in about 1 year after reorganization of calibration activities. (See p. 22.)

TESTS OF AUTOMATED CALIBRATION SYSTEMS

At the November 5, 1981, hearings the Under Secretary of the Army promised to have the Army conduct a fair and objective test of automated calibration equipment. He wanted such a test to have future applications.

On December 3, 1981, the Under Secretary of the Army approved a two-step procurement plan. The first step was an open competition to buy one automated meter calibration system (AMCS) from each responsive vendor for testing and evaluation. The second step ultimately would result in the procurement of larger quantities of the winning equipment. The first step was completed in July 1982. The second step has not been completed because JRL filed a bid protest. The protest was not decided until November 16, 1982, with a finding that JRL's submission was untimely. However, on November 15, 1982, the Chairman and members of the Senate asked the Army to delay a decision on the procurement until our report is completed. The Army is complying with this request.

In preparing the solicitation, Army officials told us they took extraordinary measures to ensure objectivity and encourage participation. Constraints imposed on the project, however, affected procedures and decisions relating to (1) the project's scope, (2) the conduct of the test, and (3) the evaluation methodology. Consequently, the application of the test results to future procurements is questionable and time constraints affected vendor participation. Army officials attributed these constraints

to their perceived urgency for accomplishing the Under Secretary's November 5 promise at the hearings.

Description of the test program

The purpose of the "buy one and test" program for an automated meter calibration system was described in the automated meter calibration system test "Project Management Plan," dated February 5, 1982, as follows:

"The purpose for this program is to evaluate off-the-shelf commercial automatic meter calibration equipment and select, for acquisition, the most cost effective system to satisfy the Army's immediate requirement. This will be accomplished by purchasing candidate contractor calibration equipment, conducting comparative testing and analytically determining the most cost effective approach for augmenting existing manual instrumentation for this generic class of TMDE."

That same Management Plan described its test objectives as follows:

1. Identify Army requirements for automatic meter calibrations and prepare a request for proposal for industry proposed solutions.
2. Purchase one set of each acceptable industry proposed calibration system for evaluation.
3. Conduct comparative tests to obtain automatic meter calibration system performance data and determine the extent to which all systems meet the contract requirements.
4. Purchase and demonstrate one set of maintenance software for the performance testing, adjustment, and basic repair functions for one representative TMDE test unit.
5. Conduct an appropriate analysis to determine the most cost effective automatic meter calibrator for augmenting existing manual instrumentation for this generic class of TMDE.
6. Procure the most cost effective equipment.

Army measures to ensure a competitive and objective test

The solicitation for the test, according to senior Army officials, was prepared with the intent of encouraging participation; measures to ensure objectivity were considerably beyond that normally involved in a test program of this small size.

The solicitation contained specific measures to encourage participation:

- It did not include a mobility requirement because Army officials believed fewer suppliers could meet the more stringent performance specification of a mobile environment.
- It did not require systems covering a broader range of electronic instruments because more manufacturers produce automated meter systems.
- It did not require proposed systems to be capable of automatically calibrating all parameters of meters in the test program in order to ensure that the solicitation did not exclude a system which might not be capable of calibrating all of the selected meters, but which might be the most cost effective system overall.

According to the Army, specific measures to ensure independence and objectivity included:

- Assigning responsibility for conducting the test to the Army Missile Laboratory, an organization that previously was not involved directly in the Army's calibration and repair program.
- Directing the AMSAA, an independent test and evaluation agency, to evaluate test plans, results, and cost effectiveness analysis.
- Consulting with the NRC for oversight and an independent assessment of the test and evaluation.
- Requesting the National Bureau of Standards to verify the accuracy of equipment used in the test program.

Prior to its January 14, 1982, release, the solicitation for the "buy one and test" procurement was reviewed and evaluated by personnel at MICOM, DARCOM and Headquarters, Department of the Army. Army staff personnel of the WSMR calibration laboratory and the Army Audit Agency also reviewed the purchase description. According to the Under Secretary of the Army, the specification for the "buy one and test" procurement was established under his direction and technical advice, with participation from DARCOM and MICOM technical representatives. It was his opinion that JRL would have provided a version of its LOCOST 106 system which would have met the requirements of the specification. From JRL sales literature, MICOM personnel believed that JRL could have supplied one of its models of the LOCOST 106 system, and could have been competitive.

The White Sands representative told us he was asked to come to the Pentagon to review the proposed purchase description and

to provide advice and comments on whether it included anything that would preclude JRL from participating. He arrived on December 22 and departed on December 24, 1981. The White Sands representative said that his comments were that JRL would probably not bid and he believed JRL would file a bid protest. His reasons were: (1) the delivery time required was 30 days and he did not believe JRL could respond in 30 days, (2) the purchase description was asking for standard off-the-shelf equipment with a system having less capability than what JRL offered so that JRL would have to modify its system making it less capable to be price competitive, and (3) the purchase description called for diagnostic software, which was not standard software for JRL so that JRL would have to rewrite its software to comply. The White Sands representative said he gave his candid opinion that it would take JRL 3 to 6 months to build the system called for in the proposed purchase description.

An Army official stated that the White Sands representative told him that technically there was no problem in JRL's satisfying the specification requirements and that JRL equipment exceeded the capabilities required, at least in terms of the LOCOST 106 at White Sands. According to this official, the White Sands representative also said that JRL probably would not be able to provide the equipment within 30 days if the company did not have it on the shelf. We asked this official for any written corroborating evidence or memorandum of the White Sands representative's review, but he told us that he had not prepared any. Another Army official told us that JRL indicated in December 1981 that JRL probably could provide a LOCOST model similar to the one at White Sands in 30 days. This official also indicated that the delivery period was increased by 15 days, to a total of 45 days, to ensure that JRL could compete and deliver its equipment. We asked this official for written corroborating evidence in the form of notes or memoranda of JRL's visits with Army officials in December 1981. He also said none was prepared.

The Army contends that the visit by the White Sands representative was an extraordinary "good faith" measure to assure there was nothing in its "buy one and test" solicitation to preclude JRL from submitting a proposal. On the other hand, JRL contends the opposite stating that this event was an attempt by the Army to make sure JRL would not submit a proposal.

The Army Audit Agency also had reservations about the solicitation based on its December 22, 1981, desk review. The Army Audit Agency observed that

--no selection criteria was stated to determine what hardware and software would be bought for testing;

- the acquisition strategy for the follow-on contract was unclear;
- inclusion of affordability level statements in the solicitation could permit rejection of a contractor's proposal, or could be interpreted as permitting rejection of a contractor's proposal on the basis of price alone;
- uncertainty existed as to how contractors whose equipment may exceed requirements would be treated;
- the limitation on the contractor to propose only one system could be viewed as restrictive;
- the reasons or rationale for selecting a particular meter model for demonstrating calibration adjustments and fault diagnostics were unclear.

DARCOM and MICOM reviewed and commented on these observations after the January 14, 1982, release date of the solicitation. In a January 19, 1982, position paper, MICOM presented its point-by-point response to each observation and clarified intentions and justifications for its position. For example, under selection criteria, MICOM commented that it intended to buy any system that met requirements unless the system proposed was substantially in excess of system requirements and caused costs to be above affordability levels. Under the affordability level observation, MICOM stated that the intent was to notify any potential bidder that systems which grossly exceeded the express requirement would not be accepted. In regard to a demonstration of the capability of an automated calibration system to calibrate instruments other than meters, MICOM noted that its intent was to allow demonstration of additional capability, but such demonstration would not be an evaluation factor in the planned follow-on buy. Based on these reviews, however, they judged changes to the solicitation as unnecessary.

Constraints on the test program

On September 29, 1982, the National Research Council (NRC), a principal operating agency of the National Academy of Sciences, transmitted its report entitled "Assessment of an Evaluation by the U.S. Army of Commercial Calibration Equipment" to the Commander, MICOM. The purpose of the report was to advise the Commander of its assessment of the experimental and analytical aspects of the Army test program.

Regarding the test program, NRC concluded that:

"The project taken as a whole developed considerable information pertinent to a decision in the present procurement. In particular, the results of the formal evaluation model fairly display gross differences among automated meter calibration systems as an aid to

"a decisionmaker. * * * However, this particular project suffered from too many constraints to serve as a good prototype for more general procurement evaluations of automated calibration systems."

NRC identified constraints relating to the project scope, conduct of the test, and evaluation methodology.

MICOM, designated as the responsible activity for conducting the test, proposed on November 17, 1981, a broad-scoped evaluation of automated calibration systems capable of calibrating all TMDE in the field Army workload that are amenable to automation. This would include TMDE items such as meters, signal generators, oscilloscopes, and electronic counters. MICOM estimated that this evaluation would take 14 months. During the 2-week period that followed, MICOM's proposed approach was reduced in scope to cover only automated meter calibration systems for certain fixed sites and the time to complete was compressed from 14 to 6 months.

The Commander, DARCOM, told us that because of the urgency conveyed to him by the Under Secretary of the Army, he directed that the time to complete the project be compressed to 6 months. The Under Secretary told us that he wanted the tests initiated quickly because of his belief that members of Congress wanted the JRL matter resolved quickly.

Because the project was limited to 6 months, the scope of the project was narrowed to consider only:

- The calibration needs of 27 fixed sites in the continental United States.
- The calibration of meters.
- Off-the-shelf calibration equipment, to meet the 45-day delivery time specified in the request for proposal.
- Only one automated meter calibration system per manufacturer.

According to NRC, the following constraints affected the test procedures:

- The test concerned only the calibration of the 15 most common type meters in the Army's inventory.
- The experimental portion of the test was limited to determining the time needed to perform calibrations of the meters. Shorter calibration time was the only one of the potential advantages of the automated meter calibration equipment that could be measured with acceptable confidence within the test schedule.

NRC cited additional test constraints such as the need for rapid test results, the budgetary limitations, and DARCOM directives all acting to further impose less-than-optimal test conditions. Specifically, (1) the test was conducted at only one station, (2) adjustment and repair capabilities were limited to a single-sample demonstration, (3) vendors had only a limited opportunity to demonstrate additional automated meter calibration systems capabilities, (4) in accordance with DARCOM's directive, the test operators were enlisted calibration specialists rather than the civilian employees who would actually operate the equipment at the test sites, and (5) there was no means to test whether the single automated meter calibration system from each vendor was truly representative of all units of the same model.

The Army limited its evaluation methodology to the use of three criteria: (1) life-cycle cost advantage, (2) equipment performance, and (3) results of an opinion survey of the operators testing the equipment. NRC also considered this to be a constraint.

NRC reported the following three consequences of the tight schedule and resulting necessity to impose certain test limitations:

1. The test provided extensive data on only one of several possible advantages of the competing systems--checking the calibration of a meter. The values and weights given to other functions, such as adjustment and diagnosis, had to be estimated from limited data, thus detracting from the project design's original intent of maximum objectivity.
2. The ability to generalize from the test results was diminished.
3. The differences between the test and the field situation were great enough to warrant some caution as to the validity of the results.

NRC also concluded that limiting the analysis to only meter calibration prevented consideration of the system's ability to calibrate other types of instruments, and limiting the analysis to off-the-shelf systems precluded the possibility of evaluating new equipment tailored to the Army's requirements.

Contractor participation in the test program

Of 25 firms solicited, 3 participated in the "buy one and test" program. The firms and the contract amounts are as follows:

--John Fluke Manufacturing Company, Everett, Washington, at \$114,958.

--Rotek Instrument Corporation, Waltham, Massachusetts, at \$37,573.

--Valhalla Scientific, Inc., San Diego, California, at \$78,075.

Correspondence provided to our office indicated that each of these firms considered the solicitation fair and objective. According to correspondence in the contract file, however, the John Fluke Manufacturing Company considered the requirements and evaluation criteria associated with the procurement to be complex and somewhat conflicting, and requested that the Army consider two other Fluke systems in place of the one originally proposed. The Army, however, did not permit this substitution.

According to JRL, it declined to participate in the tests because it viewed the solicitation as technically and legally defective and believed it to be another attempt to eliminate JRL from competition. Specifically, JRL was concerned that the Army limited the test to the lowest performance meters for use at fixed sites, while previously emphasizing a need for high accuracy calibration systems covering a wide range of test instruments for both fixed and mobile applications. JRL was also concerned about provisions in the solicitation permitting the Army to reject a system if it was substantially excessive or deficient to system requirements and disclaiming an obligation to evaluate capability in addition to that specified. Furthermore, JRL told us that it could not reconfigure a system to calibrate only 15 meters within the 45 days allowed in the solicitation and still be cost effective.

We contacted the 21 other firms who despite solicitation did not participate in the tests of automated meter calibration systems to obtain their reasons for not participating and their opinions concerning the fairness of the proposed test program, as described in the solicitation. Of the 12 firms that responded, virtually all indicated that they did not normally manufacture the required product. Half of the firms believed that they were not afforded sufficient time to adequately prepare a bid, while the remaining firms did not comment on this. Five of the firms specifically stated that the proposed test program was fair, and one firm viewed it as unfair. The remaining firms did not comment on the fairness of the proposed test program.

CHAPTER 3

EVALUATIONS OF JRL'S AUTOMATED CALIBRATION SYSTEM CAPABILITIES

JRL equipment is applicable to only the first of the five general classes of TMDF described in the introduction. This class represents direct current and low frequency instruments such as multimeters, oscilloscopes, and low frequency signal generators. Since our April 1981 report, Army and Air Force teams evaluated JRL's automated system in a laboratory-type environment. These evaluations were inconclusive, however, regarding the extent the JRL system satisfies field Army needs. The Army used the results of the Army evaluation, as well as a DOD survey to support a recent procurement of six JRL LOCOST systems for about \$840,000.

WHITE SANDS MISSILE RANGE EVALUATION

On June 30, 1981, the Army's WSMR calibration laboratory completed an evaluation of a JRL automated calibration system that showed its cost effectiveness in the WSMR environment. The evaluation team determined cost effectiveness by comparing time to perform calibrations manually or on other automated systems to that of the JRL system, and applying cost factors to those calibration times. For example, the team found that a calibration by JRL's system required about 24 minutes, while calibrations performed manually required about 1 hour and 18 minutes. A uniform annual operating cost for the JRL system was about \$61,000 as compared to about \$108,000 for the manual equipment. The Comptroller, WSMR, validated these calibration times and cost calculations.

In commenting on the White Sands report, the IG investigation team stated that these results had potential for application in the field Army at fixed and mobile operations and JRL should not be excluded from competition against such requirements. In addition, the IG team observed that:

- The JRL configuration procured by White Sands was basically the same configuration offered to other JRL customers.
- The operators used during the test were very experienced contractor personnel and different results might be expected from less experienced personnel.
- The presence of a stopwatch might tend to skew actual times to accomplish calibrations.

AIR FORCE AEROSPACE GUIDANCE AND METROLOGY CENTER EVALUATION

In August 1981, as mentioned on page 6, the Air Force Aerospace Guidance and Metrology Center completed its evaluation of JRL's LOCOST system at WSMR calibration laboratory. The team evaluated and identified some shortfalls in the system's measurement accuracy, operations, and economic effectiveness in a mobile environment. Further the team questioned, but did not determine, the JRL system's ability to withstand the use, shock, and vibration that takes place in a mobile environment.

In measurement accuracy, the team found that the system did not meet some performance specifications. A summary of tests showed that 8 out of 10 instruments comprising the system either did not meet specifications or were out of tolerance in specified ranges.

In system operations, the team showed that the JRL system could calibrate an instrument in the time claimed, but skilled technicians were needed to program and operate the system. Also, shortcomings were identified in the system's self tests and ability to interface with other programmable equipment.

In evaluating economic effectiveness, the evaluation team found little merit in using automated equipment in an Army van, but found automation to be applicable to at least seven fixed laboratory-type sites. Through various calculations, the team showed that automating a portion of the workload in a van environment did not necessarily increase the rate of calibration, when confined to certain personnel levels to perform nonautomated calibration operations including repairs. However, at fixed locations, where production exceeds 15,000 annual actions, the team found automation with JRL's system to be economical. The team cited seven Army fixed laboratories recording workloads near or greater than 15,000 annual actions as follows: (1) Anniston, Alabama, (2) WSMR, New Mexico, (3) Fort Huachuca, Arizona, (4) Corpus Christi, Texas, (5) Sacramento, California, (6) Fort Bragg, North Carolina, and (7) Fort Hood, Texas.

In commenting on the Air Force Aerospace Guidance and Metrology Center Report, the IG investigation team referred to on page 6, noted that the Air Force team performed an exceptionally comprehensive job within the time limitations, but many areas were not fully covered because of those time limitations. For example, the IG reported that some measurements were made on equipment that, because of insufficient test data, had been incorrectly calibrated before starting the tests. The IG concluded, therefore, that the overall technical assessment of the JRL system was valid, but the measurement information was weak and had a low level of confidence. The IG further concluded that nothing in the Air Force report should preclude further technical consideration of the JRL system, including clarifying or correcting of uncertainties. Concerning the Air Force's

economic evaluation, the IG concluded that the Air Force's approach to determining workload and personnel requirements significantly differed from that used by JRL and the Army. Therefore, the IG cautioned against using the Air Force's economic conclusions.

PROCUREMENT RESULTING FROM DOD ASSESSMENT

The Office of the Under Secretary of Defense for Research and Engineering assessed JRL's importance to the industrial mobilization base and surveyed all previous purchasers of the JRL system. Based on the responses to that survey, DOD found that "the equipment had a high capability for calibration and measurement with great accuracy, was reliable, well designed and of quality construction, and offered the potential for an early return on investment if utilized frequently." The DOD assessment, complemented by user input, indicated that JRL presented an in-place research and development/production capability for automated calibration equipment. In addition, DOD found no other readily available source for equipment having all the described capability of the JRL system. As a result of this assessment, on May 10, 1982, the Under Secretary of Defense for Research and Engineering directed the Army to initiate a sole-source procurement of a limited number of the JRL's LOCOST automated calibration systems. The purpose of this action was to provide JRL with enough business to assure its continued existence. On May 26, 1982, the Army awarded a letter contract to JRL for six systems at a proposed price of \$840,120. This procurement action is the subject of another GAO review requested by Senator Jackson.

CHAPTER 4

RESULTS OF INVESTIGATIONS OF PROCUREMENT MATTERS.

Army investigations completed after our April 1981 report disclosed management problems affecting calibration equipment procurements to such an extent that JRL was misled or adversely affected and from 1974 to 1981 JRL's ability to compete may have been unduly restricted. The Army initiated corrective actions, including a reorganization of the field Army calibration program, to improve calibration equipment management.

PROCUREMENT PROBLEMS RESTRICTED COMPETITION

As noted on page 6, on April 30, 1981, the Secretary of the Army directed the IG to conduct a comprehensive investigation of the JRL allegations. The IG's work began in May 1981 and ended in October 1981. The summary report of this investigation was released on November 5, 1981.

On November 10, 1981, the Commanding General, DARCOM, appointed a General Officer to investigate, under AR 15-6, whether the Army acquired calibration equipment in accordance with applicable rules, regulations, policies, and established procurement practices during 1974 to 1981. The Commanding General, DARCOM, approved the report on March 11, 1982.

Both the IG and AR 15-6 investigations identified procurement problems and regulation abuses in the Army's calibration and repair program, but did not attribute this to misconduct by any individual. The IG investigation attributed this condition to systemic weaknesses in managing the program.

Department of the Army Inspector General Investigation

Systemic weaknesses in the management of the Army's calibration program identified during the IG investigation included

- no single central management office above the support group level,
- lack of oversight by higher levels, and
- no clear cut chain of approval for calibration acquisitions.

These weaknesses, according to the IG team, were demonstrated by unacceptable actions, such as a sole-source procurement recommendation not vigorously challenged by the contracting officer, contrary to the spirit of Defense Acquisition Regulations; unsolicited proposals not processed fairly and impartially according

to DARCOM regulations; and calibration equipment acquired without coordination as prescribed by regulation.

In the opinion of the IG team, the above weaknesses allowed a bias against JRL's interests. Specifically, the IG team provided the opinion that JRL was not afforded, at least in the period from 1974 to 1981, a full opportunity to compete on an equal basis with other vendors. Moreover, a bias against JRL's interests (largely a result of JRL's aggressive marketing techniques combined with the Army's familiarity with other vendor products) existed at the TMDE Support Group as well as in the supporting procurement and legal staffs. The report further concluded that JRL had, at times, been inadvertently misinformed by the Army, although JRL's contention of a deliberately malicious campaign against its interests by the Army was not substantiated.

The IG investigation spanned a period of 7 months reviewing 58 separate allegations made in the JRL cartoon booklets, an editorial in a private publication, and our previous report. We reviewed selected exhibits supporting the IG report. Based on both the documentary and testimonial evidence, the IG conclusions, in our opinion, appeared reasonable.

The AR 15-6 report

Regarding violations of procurement rules or regulations, the AR 15-6 report found that JRL's unsolicited proposals had not been properly evaluated. However, the AR 15-6 team viewed the lack of observing published regulations and procedures as isolated instances, not indicative of a conspiracy against JRL.

Although the AR 15-6 report's overall assessment found no impropriety by any individuals, it states that Army procurement management decisions on automated calibration equipment may have misled and adversely affected JRL to the extent that its ability to compete for Government contracts was unduly restricted. According to the report, actions that seemed proper at the time may have, over the long term, adversely effected JRL's ability to compete.

During a 4-month period the AR 15-6 investigating team reviewed records of contracts and unsolicited JRL proposals, as well as other procurement actions involving automated calibration equipment. The team also interviewed MICOM personnel and other witnesses.

We reviewed selective exhibits and testimony on which the AR 15-6 conclusions were based, and in our opinion, the documentation and other evidence collected adequately supported the conclusions reached.

CORRECTIVE MEASURES RESULTING
FROM INVESTIGATIONS

The Army initiated both immediate and long-term measures in response to the investigations. As an immediate measure, personnel involved in calibration equipment procurements at MICOM were reassigned to equivalent duties and their former duties assigned to another purchasing branch. According to the Commander, MICOM, this measure was an administrative action, not a punitive action, and was done to protect the rights of Government personnel as well as to protect the rights of contractors to obtain equal access to Government contracts should any subsequent or then ongoing investigation prove conclusively that actual wrongdoing had occurred at MICOM. As another measure, the Commander, DARCOM, issued instructions to procurement personnel reemphasizing the importance of (1) maintaining integrity in the procurement process by adhering to the spirit and intent as well as, the letter of applicable directives or regulations, and (2) ensuring that all unsolicited proposals were processed and economic analysis conducted according to Army and DARCOM regulations.

As a long-term measure, the responsibility for overseeing the calibration and repair program at DARCOM was transferred from the Product Assurance and Test Directorate to the Directorate for Supply, Maintenance and Transportation and the Executive Director for TMDE. In addition, the Secretary of the Army ordered the comprehensive assessment of Army-wide TMDE with emphasis on management covering

- present regulations and provisions to ensure full, competent advocacy, and execution of TMDE concepts, equipment acquisition, and performance monitoring;
- the most appropriate way to serve the field calibration and repair function, either fixed base or mobile units;
- how the Army can verify the operational readiness of primary equipment and systems affected by calibration and maintenance; and
- how the Army can eliminate obsolete TMDE from its inventory.

Recommendations of that assessment were incorporated into an implementation plan addressing 22 findings with 75 primary tasks and 170 subtasks. Implementation is underway and includes:

- A centralized management structure for TMDE was chartered by the Secretary of the Army. The charter designates the Commander, DARCOM, as the Department of the Army Executive Agent for TMDE and the Deputy Commander for Materiel Readiness, DARCOM as the Executive Director for TMDE.

--Revision to regulations involving calibration program management and TMDE acquisition responsibilities would be considered.

The Army held its first progress review of the implementation on November 23, 1982. A DARCOM official advised us that the review showed that the Army is on schedule for the most part.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Since our April 1981 report, the Army spent a significant amount of its resources in attempting to resolve its conflict with JRL and addressing problems in its calibration and repair program. However, the controversy between the Army and JRL still has not been resolved. Army officials told us they believe the Army has taken extraordinary measures to treat JRL objectively. JRL continues to believe the Army is doing everything possible to avoid purchasing its automated calibration system for the field Army calibration and repair program.

In our view, the decisions to constrain the test and evaluation of automated calibration systems and to conduct those tests before fully completing an assessment of its needs was a serious flaw in the Army's plan. A central issue during the past 8 years has been whether or not automatically calibrating direct current/low frequency category of TMDE in the field Army is economical and effective. Placing a time constraint of 6 months on those tests, in our opinion, could extend rather than expedite resolution of this 8-year controversy. Nonetheless, we find no legal basis to question the two-step procurement procedures used by the Army.

Regarding our other recommendations, the Army has not completed its entire workload assessments nor examined whether automated systems can replace manual equipment in field Army units. However, the Army appears to be improving its management information system and making workload data more accessible for informed management decisions. This could assist the Army's implementation of our recommendations.

The Army has evaluated JRL's system capabilities for automated calibration in laboratory-type applications, but has not conclusively determined the extent to which JRL's system satisfies field Army needs, particularly relating to replacing manual equipment in field Army vans. We believe the Army should not go forward with its plans to purchase more automated meter calibrators until the issue is resolved.

Corrective measures initiated by the Army to improve calibration program management and preclude further violations of acquisition regulations appear to be reasonable, but in our opinion, it is too early to fully assess their effectiveness.

The Secretary of Defense, as of January 5, 1983, has not completed its 60-day response to our April 3, 1981, recommendations, as required by Section 236 of the Legislative Reorganization Act of 1970 (31 U.S.C. 720). We still believe our 1981 recommendations are sound and, therefore, we are not changing them. (See app. I.)

RECOMMENDATION

We recommend that the Secretary of the Army cancel the second step of the so-called "buy one and test" two-step procurement (DAAH01-82-R-A274) of automated meter calibration systems, until the issue of whether or not automated calibration equipment to be used in the field Army is economical and effective has been resolved.

AGENCY COMMENTS AND OUR EVALUATION

DOD concurred with all three recommendations in our April 3, 1981, report. DOD cited certain completed and ongoing Army actions which it believes will comply with our recommendations. On the issue of canceling the second step of the two-step "buy one and test" procurement, both DOD and the Army did not concur citing the following reasons:

- There is a valid specific requirement for automated meter calibrators to be used at fixed sites within the continental United States.
- The Army has conducted a valid test against this meter calibrator requirement and at this time sees no need for more complex equipment such as that offered by JRL.
- The evaluation of the candidate automated meter calibration systems in the "buy one and test" first step supports the acquisition of a number of automated meter calibrators as cost effective for use at fixed sites in the United States.
- DOD cannot now foresee a need for more complex equipment, such as JRL's, but will not know until all evaluations are complete.
- DOD believes cancellation of the second step would be a breach of faith with the contractors who participated in the first step of the "buy one and test" program.

Although DOD has not completed its 60-day response to our April 1981 report, it advised us that it intends to combine its response to that report with its 60-day response to this report.

In our discussions with Army officials, they emphasized that the Army originally proposed a structured unbiased full test of a design sample of Army workload requirements at each organizational level. The purpose of this proposed test was to determine what automation could reasonably be achieved economically. The proposed test was subsequently constrained to run 6 months from a desired length of 14 to 24 months. Army officials pointed out that they have now either accomplished or initiated a whole series of tasks which will provide valuable input to an overall evaluation of automated calibration equipment. The Army

advises us, however, that only the testing of meters has been completed and that while the total workload assessment is underway, it will not be completed until July 1984. The Army points out that the "buy one and test" program was implemented to evaluate available automated equipment and to achieve early procurement. According to Army officials the program was never intended to be a full response to our April 1981 recommendations on the need for requirement validation and a determination whether automated equipment can replace manual equipment in field environments. Army officials stated that the Army still intends to respond to those questions but it has not yet had time to do so.

We question DOD's comment that going forward with step two of the proposed procurement would be cost effective. Step one was designed to provide information on a decision between candidate systems; it was not designed to decide the issue of whether or not the systems should be purchased. The NRC questions whether the information developed in step one--including cost effectiveness analyses--can be used to make this procurement decision without additional data on important characteristics. In our opinion, any procurements of automated calibration equipment would be premature without a comprehensive evaluation which included those factors not considered in the Army's tests to date.

We believe the Army should cancel the second step of the so-called "buy one and test" program. In our opinion the Army should take the time necessary to complete all applicable ongoing studies to settle equipment and organizational issues, do a careful automation evaluation based on the new workload mix that might result from the ongoing studies, and then competitively procure automated calibration systems to meet the entire Army calibration need. We believe the Army should not continue with step two of the "buy one and test" procurement because it addresses only one portion of the Army's calibration equipment--certain types of meters. The Army has acknowledged that such an approach is suboptimal. We believe that if the Army goes forward with step two, it may lead to piecemeal procurement of many different types of automated calibration equipment in the future, and thus might not be the most cost effective course for the Army to follow.



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

B-202652

APRIL 3, 1981

The Honorable Joseph P. Addabbo
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

Subject: Allegations of Improper Procurements by the Army
Metrology and Calibration Center (PLRD-81-16)

In response to your July 22, 1980, letter and in subsequent discussions with your Office, we reviewed allegations by Julie Research Laboratories (JRL) Inc., that operations at the U.S. Army Metrology and Calibration Center, Huntsville, Alabama, are inefficient and wasteful and that the Center's procurement practices are restrictive. JRL's allegations are depicted in its 1980 cartoon booklet, "You're Not Supposed to Get Mugged By Your Own Army." Our findings and conclusions, which were discussed with your Office on March 25, 1981, are as follows:

- The Army, contrary to what it has told JRL, has both laboratory and field requirements for automated calibration equipment.
- The Army's technical evaluations of JRL's equipment appear to be based on some questionable conclusions and assumptions and largely ignore favorable impressions by Army representatives who saw the equipment in operation.
- We cannot verify the Army's nor JRL's cost analyses at this time because both used estimated workload data and other unsupported assumptions.

Our findings and conclusions are based on interviews and examinations of records at Headquarters, U.S. Army Materiel Development and Readiness Command (DARCOM), Army Metrology and Calibration Center, JRL offices, White Sands Missile Range, and a commercial user of JRL equipment.

Although we did not review each JRL allegation in detail, we believe our work has disclosed that the Departments of Defense and the Army need to reexamine the field Army requirements for calibration equipment and to test various

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equipment in the operating environment. Such tests should establish the most cost-effective equipment that will satisfy valid Army requirements.

BACKGROUND

The Army's calibration and repair program is designed to validate the accuracy of test equipment and to provide necessary adjustments and repairs. DARCOM is responsible for the program.

The calibration and repair program is managed and operated differently for the field Army and for industrial-type Army calibration facilities. The primary mission of the field Army program is to support tactically deployed, general-purpose test equipment in the hands of field Army troops. This is done through mobile and fixed calibration teams scattered worldwide and managed by the Army Metrology and Calibration Center. In the event of mobilization for war, some of these calibration teams are assigned and deployed with the tactical combat units they support. The Army must have full mobility for these teams. The industrial-type Army calibration facilities are fixed and provide calibration support to depots, laboratories, arsenals, proving grounds, and ranges. They are managed by the operating commands which they support.

According to 1978 Army data, the estimated calibration workload for the field Army is 570,000 calibrations a year and 270,000 for other calibration facilities. Because of the Army's recent realignment combining calibration and repair support to the tactical units, DARCOM officials explained that current workload information, showing the major categories of items calibrated and the locations where those calibrations were made, is not readily available from Army records.

THE ARMY HAS REQUIREMENTS FOR AUTOMATED CALIBRATION EQUIPMENT

The Army told JRL that it does not have requirements for automated calibration equipment for the field Army. Various studies and procurements show, however, that the Army has requirements for automated calibration equipment for both the field Army and other calibration facilities.

During the 1970s, the Army and the National Bureau of Standards recognized the Army's need for automated calibration equipment in both the field Army and other calibration facilities. For example, the Army bought an automated

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calibration system in December 1974 and another in February 1975 to test the feasibility of using automated equipment in mobile vans for the field Army. The Army also bought five laboratory automated calibration systems in 1975 because inspections showed that laboratory calibration programs were either marginal or inadequate. In addition, in 1976 the National Bureau of Standards recommended that automation of the vans be accelerated because manual equipment may not be adequate to support future computer controlled weapon systems.

The Army's experience with automated equipment during the 1970s, however, was not very good. For example, an Army Metrology and Calibration Center May 1978 report concluded that no laboratory had fully used the five automated systems. According to laboratory reports, the systems were not fully utilized because of maintenance problems and availability of programs. Army officials told us that they believe that failure to use the laboratory automated systems was due to a lack of management emphasis and the unwillingness of laboratory technicians to use automation. Two of the five automated systems are no longer being used and one system is being phased out of operation. Also, tests to determine the feasibility of using automated equipment in mobile vans were terminated before completion because they conflicted with another Army test program for the automated test support system being developed at another Army activity.

Recent calibration equipment purchases show a continuing need for automated calibration equipment. Army officials told us the field Army does not need large automated systems, such as those used in laboratories, but it does need small automated systems. For example, as of March 1981, the Army purchased 18 automated meter calibrators from the John Fluke Manufacturing Company, Inc., to supplement manual equipment in Europe and to decrease the time required for meter calibrations. Army officials believe that because these automated meter calibrators will improve overall efficiency, the resulting productivity increases can be used to help reduce the growing backlog of equipment needing repair. Nine systems have been delivered to the Army but have not yet been sent to Europe.

Also, White Sands Missile Range bought two of JRL's LOCOST automated meter calibrators in September 1979 to replace marginally effective automated calibration equipment. The LOCOST systems were delivered in September 1980.

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ARMY TECHNICAL AND COST EVALUATIONS
OF JRL EQUIPMENT WERE INCONSISTENT

Army officials insist that JRL did not bid in response to what the Army determined its requirements to be, but instead submitted unsolicited proposals which were JRL's assessment of how its equipment could fill the Army's requirements. By submitting two unsolicited proposals, JRL caused the Army to consider using JRL automated LOCOST systems in its calibration and repair program. The first proposal, which was submitted in May 1976, projected that the Army could save \$13 million annually by establishing three high-speed automated calibration facilities using LOCOST systems. The second proposal, which was submitted in October 1979, projected that the Army could save \$200 million over a 10-year period by installing 69 leased LOCOST systems in 138 mobile vans partially equipped with manual equipment instead of completely outfitting 200 mobile vans with manual equipment.

The Army completed its technical and cost evaluations of these two unsolicited JRL proposals in March 1977 and January 1980, respectively, and reported that the LOCOST system would not perform as claimed and would not be cost effective. As discussed below, it appears that the Army based its evaluations on some questionable assumptions and ignored favorable impressions by several Army representatives who saw the LOCOST system in operation.

Technical evaluations

DARCOM, in response to JRL's May 1976 unsolicited proposal, completed the first evaluation of JRL's LOCOST system in March 1977. DARCOM concluded that equipment and programs offered by JRL were not new or unique to the industry nor were they state of the art. DARCOM based its conclusions on (1) comparisons of the technical characteristics of the LOCOST system with other systems and (2) assumptions about the LOCOST system's performance capabilities. However, DARCOM may have understated performance capabilities of the LOCOST system and overstated performance capabilities of competing systems. DARCOM also appears to have discounted favorable reports from Army representatives who observed the LOCOST system in operation. For example:

--DARCOM reported that the Modularly Equipped and Configured Calibrator/Analyzer (MECCA) would calibrate about 80 percent of the direct current/low frequency workload and about 50 percent of the total Army workload,

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including meters, signal generators, oscilloscopes, counters, and pressure gages. At that time, the Army had not received a MECCA system with these capabilities, and in fact prototype MECCA equipment received at a later date did not effectively calibrate signal generators, counters, and oscilloscopes. Furthermore, the prototype MECCA meter calibrator had unacceptable problems and limitations.

--DARCOM was skeptical of JRL's claim that equipment could be programed in about 15 minutes because the Army's experience with competing systems showed an average requirement of 120 hours. Representatives of Harry Diamond Laboratories and the Army Metrology and Calibration Center, however, had reported observing program preparation for a simple test instrument in less than 3 minutes and the instrument's calibration in another 3 minutes. The Harry Diamond representatives also reported that (1) the LOCOST system could calibrate a variety of instrumentation in less than 30 minutes, as JRL claimed, (2) The simplicity of programing and using the system was evident, and (3) the system could produce significant savings at their laboratory.

The Army Metrology and Calibration Center, in response to JRL's October 1979 unsolicited proposal, completed the second evaluation of JRL's LOCOST system in January 1980. The Center also concluded that equipment and programs offered by JRL were not new or unique to the industry nor were they economically competitive with other available automated systems. The Center based its conclusions on the same data used in DARCOM's earlier review. Center officials believed that because of a lack of technical details, JRL's second proposal was not too different from its first proposal. The Center did not contact JRL to determine whether additional capability had been added to the LOCOST system or to ensure that it understood what JRL had to offer. Data provided to us by JRL, for example, shows that the LOCOST system has capability in areas where the Army reported it to be inadequate. Moreover, between the first and second evaluations, problems had surfaced with the five laboratory automated calibration systems which DARCOM had compared with LOCOST. In addition to the problems experienced with the MECCA system, for example, some laboratories were reporting significant problems with the automated calibration system.

The Army's assertion that JRL's LOCOST system is not unique or new to the industry nor state of the art is inconsistent with

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reports from LOCOST system owners. The reports suggest that the LOCOST system may indeed offer advantages because of shorter programming time and simpler operation. For example, White Sands Missile Range officials report that 100 programs were developed in about 75 hours and that average programmer training time was 24 hours. Another LOCOST system owner, an aerospace company, told us that program preparation time on the LOCOST system ranged from 15 minutes to 1 hour with most programs taking 30 minutes or less. This company also told us that it knows of no other commercial off-the-shelf calibrator that will perform as well as the LOCOST system.

Cost evaluation

As previously mentioned, JRL's 1976 and 1979 unsolicited proposals projected significant savings for the Army. JRL based its claimed savings in both proposals on increased productivity and decreased equipment, personnel, and training costs. In evaluating these proposals, however, DARCOM and the Army Metrology and Calibration Center neither agreed with the amounts of JRL savings nor with the concept by which JRL projected those savings. The Center, for example, reported that accepting JRL's 1979 unsolicited proposal could result in a \$42 million loss rather than a \$200 million savings.

We have been unable to fully evaluate the Center's or JRL's cost analyses because of unreliable workload data and unresolved questions about whether the LOCOST system could replace the manual equipment in mobile vans.

In performing the cost analyses, both JRL and the Center used 1976 estimates of Army workload levels and apparently used 1972 estimates of the major categories of Army test equipment that would require calibration. We have been unsuccessful in obtaining actual current workload data by major categories of Army test equipment because this information is not readily available from Army records.

Also, JRL's 1979 unsolicited proposal assumed that 69 LOCOST systems could replace 50 percent or \$100,000 of the manual equipment in each van. In evaluating this proposal, however, the Army assumed that the LOCOST system could not replace any equipment in mobile vans because of a need to retain manual equipment for other calibration and repair operations. Neither JRL nor the Army has validated its assumptions through operational testing of the LOCOST system in a mobile van.

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In addition to the above unresolved issues, several other inaccuracies appear in the JRL and Army cost analyses. For example, in the 1979 unsolicited proposal and subsequent Army evaluation:

- JRL calculated the cost of each van's equipment, which the LOCOST system would replace, to be \$100,000, but an itemized listing of equipment from JRL shows the cost to be about \$35,000. The Army said JRL's equipment would not replace any equipment.
- The Army elected to delete from JRL's proposal, cost savings attributed to an oscilloscope and a signal generator that JRL had not produced, but it did not reduce the associated lease price for these deleted items from what JRL had originally proposed.
- The Army used one workload level to determine the number of LOCOST systems needed and a different workload level to determine the manual equipment needed.

In both evaluations, the Army said that the LOCOST system was more costly than other automated systems. In the second evaluation, the Army based its conclusion on estimated costs of from \$25,000 to \$30,000 for the MECCA and \$154,000 for a LOCOST system as configured for laboratory use at White Sands Missile Range. According to JRL, a LOCOST system configured for the field Army application would cost less than the LOCOST system at White Sands. The Army, however, has not asked JRL for the purchase price of a LOCOST system configured for field Army application. Both JRL's analyses supporting its unsolicited proposals and the Army's evaluations were based on paper studies.

CONCLUSIONS

Although we are unable to verify the accuracy of all JRL's allegations, we believe that the Army has not adequately considered JRL's LOCOST system, particularly in its evaluation of the system's ability to satisfy field Army calibration program requirements. We could not verify that using JRL's equipment would result in the amount of cost savings as claimed by JRL or that the LOCOST system could satisfy the Army's needs. Before these determinations can be made, the Army needs to completely assess its actual workload and determine what portion of that workload would benefit from automation. The question of whether the LOCOST or other automated systems can replace equipment in field Army vans should be resolved through hardware demonstrations

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by the people who will use the equipment in carrying out the calibration mission.

RECOMMENDATIONS

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

- Develop accurate workload data on field Army calibrations because reliable data is needed to validate equipment requirements.
- Reexamine equipment capabilities to determine the extent to which automated equipment can replace manual equipment in field Army calibration units.

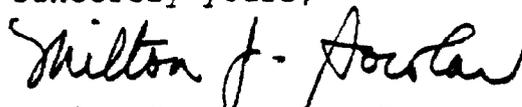
In addition, we recommend that the Secretary of Defense require that an independent hardware demonstration be conducted to establish the cost effectiveness and productivity increases that may be attributed to automating the field Army calibration functions.

Until the Army has acted on our recommendations, we plan no further work on allegations in JRL's cartoon booklet because we believe such efforts would be unproductive. We are ready to assist you, should you deem it necessary, in monitoring the Army's responses.

During our review, we saw several aspects of the Army Metrology and Calibration Center activities which appear to warrant our further examination. Accordingly, we plan to pursue these matters in a separate review to begin shortly. We will provide you with copies of reports resulting from that effort.

As requested by your Office, we have not taken the time necessary to obtain official comments from either the Army or JRL on the matters discussed in this report. As agreed with your Office, we are sending copies of this report to the Secretary of Defense, the Secretary of the Army, JRL, and interested congressional offices.

Sincerely yours,



Acting Comptroller General
of the United States

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Congress of the United States
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Committee on Appropriations
 Washington, D.C. 20515.

July 13, 1982

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TELEPHONE:
 (202) 225-3771

Honorable Charles A. Bowsler
 Comptroller General of the United States
 441 G Street, N.W.
 Washington, D. C. 20548

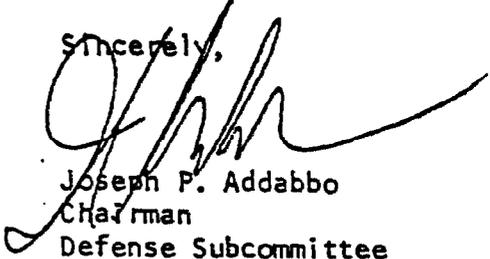
Dear Mr. Bowsler:

In July of 1980, I asked your predecessor to investigate allegations of improper procurements of calibration equipment by the Department of the Army. A number of recommendations were made in the resulting report (B-202652, April 3, 1981), including one that the Secretary of Defense direct the Secretary of the Army to "Reexamine equipment capabilities to determine the extent to which automated equipment can replace manual equipment in field Army calibration units" and to conduct "an independent hardware demonstration to establish the cost effectiveness and productivity increases that may be attributed to automating the field Army calibration functions."

This is a request that you follow-up on the previous investigation to determine whether the Army has responded to these recommendations in a timely and effective manner. This should include a review of any Army procurements of calibration equipment initiated subsequent to GAO's first investigation, to determine whether they responded adequately to the recommendations made by GAO, and to determine whether all relevant procurement laws and regulations were complied with. Also, as part of this investigation, please determine whether the Army has given due consideration to the capabilities of calibration equipment produced by Julie Research Laboratories (JRL) Inc. and any other interested company.

Your prompt attention to this matter would be appreciated.

Sincerely,


 Joseph P. Addabbo
 Chairman

Defense Subcommittee

CHRONOLOGY OF MAJOR EVENTSSUBSEQUENT TO GAO'S APRIL 3, 1981, REPORT

<u>1981</u>	<u>Event</u>
April 3	GAO issued report (B-202652) to Representative Addabbo, Chairman, Subcommittee on Defense, Committee on Appropriations, concerning allegations of improper procurements by the Army Metrology and Calibration Center (PLRD-81-16, Apr. 3, 1981).
April	Secretary of Army directed the Inspector General to conduct an independent assessment of JRL matters and provide a report of results by about mid-September 1981. The IG's work begins in May 1981 and ends in October 1981. (Incorporating extension.)
May 14	Secretary of Army requested and received Air Force assistance for review of the Army calibration program to assure unchallenged objectivity. The Air Force's review begins July 1, 1981, and ends August 29, 1981.
June	JRL published second cartoon booklet entitled, "Where Were You During The Coup?"
June	JRL bids on U.S. Army Missile Command's request for proposals for manual AC voltage standards.
June	Army informed GAO that response to April 3, 1981, report to Congressman Addabbo would be delayed pending consideration by the Secretary of the Army of the above mentioned Inspector General Report of Inquiry, the U.S. Air Force report, and other inputs.
July 29	White Sands Missile Range issued its report on the JRL system. On March 17, 1981, the Commander, DARCOM, requested White Sands Missile Range to evaluate the JRL automated calibration system. Results of test indicated that the JRL

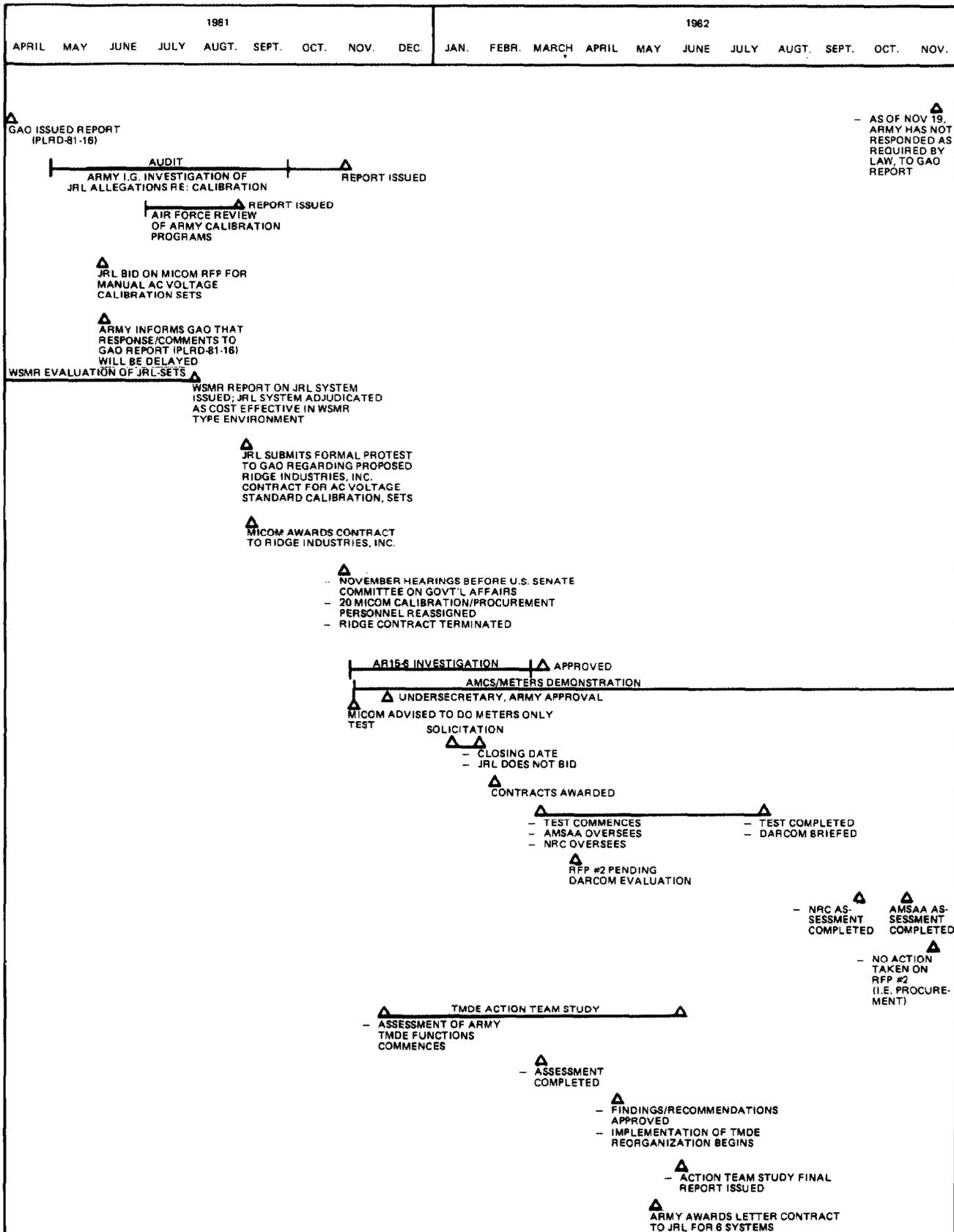
<u>1981</u>	<u>Event</u>
July 29 (cont'd)	system can be a cost effective automated calibration system in the White Sands Missile Range type environment.
August 29	Air Force report on Army calibration program issued.
August (late)	The Secretary of the Army asks James R. Ambrose, Under Secretary of the Army, to oversee investigation by the Inspector General of matters relating to JRL.
September 2	JRL protested proposed contract award to Ridge Industries, Inc. for AC voltage standard calibration sets.
September 4	U.S. Army MICOM awards \$612,140 contract to Ridge Industries, Inc. for 53 precision AC voltage standard calibration sets.
September (mid)	Inspector General investigation extended because of September 4, 1981, contract award to Ridge Industries, Inc., and subsequent JRL charges that arose from that procurement action.
November 5	Hearings before the Committee on Governmental Affairs, U.S. Senate. Sworn testimony by: Loebe Julie, President, JRL, Inc.; James Ambrose, Under Secretary of the Army; General Robert Solomon, Deputy Inspector General; Seymour Lorber, Director of Quality Assurance DARCOM; Henry Gonzalez, Team Leader, Automation, White Sands Missile Range; Joseph Rivamonte, Supervisor, Systems Integration Division, Metrology and Laboratory Directorate, Redstone Arsenal. Army IG Summary report issued. Commander, Missile Command --reassigned 20 persons associated with calibration procurement to other "equivalent duties."

<u>1981</u>	<u>Event</u>
November 5 (cont'd)	--terminated, for the convenience of the government, contract awarded September 4 to Ridge Industries for AC voltage standards.
November 10	As a result of Under Secretary of Army, Ambrose's November 5 testimony, the Commanding General, DARCOM, appointed a General Officer to investigate, under Army Regulation 15-6, whether the acquisition of calibration devices was conducted in accordance with applicable rules, regulations, policies, and established procurement practices. Work begins December 1981, and ends March 3, 1982.
November 12	As a result of Under Secretary of Army, Ambrose's November 5 testimony, DARCOM advised MICOM to conduct an assessment, i.e., hardware demonstration of commercially available automated calibration equipment.
December 1	As a result of Under Secretary of Army, Ambrose's November 5 testimony, the Deputy Chief of Staff for Logistics, with Assistant Secretary Bonner chairing, started a comprehensive assessment of the Army's TMDE (test equipment) functions. Study begins December 1, 1981, and ends March 12, 1982.
December 3	The Under Secretary of the Army approved the MICOM plan to assess commercially available automated calibration equipment, in a hardware demonstration of meters only calibrators. A two-step procurement was used where step one entailed open competition to buy one automated meter calibration system from all acceptable bidders who then would be tested and evaluated; the second step to ultimately result in procurement to the winner. NRC and AMSAA were requested to oversee tests.
December 13	60 Minutes TV broadcast on JRL's attempts to sell to the Army.

<u>1981</u>	<u>Event</u>
December 22	Mr. Julie visits Army officials at the Pentagon to discuss JRL equipment capabilities.
December 22-24	WSMR representative reviews purchase description for step one of the "buy one and test" procurement program at the Pentagon.
 <u>1982</u>	
January 14	Solicitation issued for proposals to competitively determine the equipment best suited to the Army's automated calibration needs.
January 29	Closing date of January 14 solicitation, but JRL does not bid.
February 10	Contracts awarded for automated calibration systems to each of three manufacturers who responded to a request for proposal. One "test specimen" procured from each manufacturer. Manufacturers were: Valhalla Scientific, San Diego, California; Rotek, Waltham, Massachusetts; and John Fluke, Inc., Seattle, Washington.
March 9	Hardware demonstration test for Fixed Site Automated Meter Calibration Systems (Fixed AMCSs) commences; AMSAA oversees, acts as Red Team.
March 11	AR 15-6 report on investigation is approved by the Commander, DARCOM.
March 30	NRC oversees test.
April (early)	Army released requests for proposals to each of the above manufacturers for follow-on procurements. Exact quantities purchased would depend on results of DARCOM's evaluation.
April 27	Secretary of the Army approves all findings and recommendations of TMDE action team study.

<u>1982</u>	<u>Event</u>
April 27 (cont'd)	As a result of TMDE action team study implementation of TMDE reorganization begins.
May 26	Army awards a letter contract to JRL for six systems.
June 8	TMDE action team final report issued. Official title--Department of the Army Test, Measurement, and Diagnostic Equipment Action Team Final Report, the Deputy Chief of Staff for Logistics.
July 23 - 30	Fixed Site hardware demonstration/test for fixed AMCSs completed and DARCOM briefed.
September 29	NRC assessment completed.
October (late)	AMSAA assessment completed.
As of November 19	No action yet taken on second step of MICOM procurement of AMCS. DOD and Army had not completed their response to GAO's April 3, 1981 report, "Allegation of Improper Procurement by the Army Metrology and Calibration Center" (PLRD-81-16).
December 21	DOD provided GAO with oral comments to a draft of this report. Army officials provided additional materials for GAO's consideration.

TIME LINE OF ARMY ACTIONS INITIATED AFTER APRIL 3, 1981



ARMY PROCUREMENT ACTIONS

APRIL 1981 TO NOVEMBER 1982

<u>Item(s)</u>	<u>Supplier</u>	<u>Quantity</u>	<u>Amount</u>	<u>Buyer</u>	<u>Contract number and date</u>	<u>Type procurement</u>	<u>User location</u>	<u>Purpose or intended use</u>
<u>COMPETITIVE EVALUATION OF AUTOMATED METER CALIBRATION SYSTEM FOR HIGH DENSITY SITES</u>								
Automated Meter Calibration Sys., incl Maint. Software, all labor/services for Equip. Maint. and Training. Two sets of manuals.	John Fluke	1	\$114,958.20	P&P Dir. Redstone Arsenal	DAAH01-82-C-A165 10 Feb. 82	Competitive	Redstone Arsenal	To buy all technically acceptable and affordable Automated Meter Calibrator Sys. and then conduct a test and evaluation of each
Automated Meter Calibration Sys., incl. Maint. Software, all labor/services for Equip. Maint. and Training. Two sets of manuals.	Rotek Instr.	1	37,573.00	P&P Dir. Redstone Arsenal	DAAH01-82-C-A166 10 Feb 82	Competitive	Redstone Arsenal	To buy all technically acceptable and affordable Automated Meter Calibrator Sys. and then conduct a test and evaluation of each.
Automated Meter Calibration Sys., incl. Maint. Software, all labor/services for Equip. Maint. and Training. Two sets of manuals.	Valhalla Scientific	1	78,075.00	P&P Dir. Redstone Arsenal	DAAH01-82-C-A167 10 Feb. 82	Competitive	Redstone Arsenal	To buy all technically acceptable and affordable Automated Meter Calibrator Sys. and then conduct a test and evaluation of each.

Source: US Army DARCOM.

<u>Item(s)</u>	<u>Supplier</u>	<u>Quantity</u>	<u>Amount</u>	<u>Buyer</u>	<u>Contract number and date</u>	<u>Type procurement</u>	<u>User location</u>	<u>Purpose or intended use</u>
<u>PROCUREMENTS FOR ARMY PRIMARY STANDARDS LABORATORY, REDSTONE ARSENAL, AL</u>								
Computer System HP 9836A w/opt. 711 System Controller	Hewlett Packard	1	\$ 20,660.60	Lab & Base Spt. Redstone Arsenal	DAAH03-82- F-1882 20 Aug. 82	Sole Source	Elect. Std. & Dev. Lab	Component of APSL planned Automatic Thermal Voltage Converter
Vector Voltmeters	Polorad Electronic, Inc.	2	29,130.00	P&P Dir. Redstone Arsenal	DAAH01-82- C-1063 30 Sep. 82	Competitive	Elect. Std. & Dev. Lab	Replacement component for APSL Micropot/TVC Calibra- tion System.
Signal Generator	Systron- Donner	1	6,065.00	P&P Dir. Redstone Arsenal	DAAH01-82- P-5324 20 Sep. 82	Competitive	Elect. Std. & Dev. Lab	Replacement component for APSL Micropot/TVC Calibra- tion System.
Digital Voltmeter	Racal Dana Inc.	1	4,258.00	P&P Dir. Redstone Arsenal	DAAH01-82- P-5264 24 Sep. 82	Competitive	Elect. Std. & Dev. Lab	Replacement component for APSL Micropot/TVC Calibra- tion System.
Constant DC Cur- rent Source for APSL Micropot/ TVC Calibration Sys.	Electronic Dev Corp.	2	9,900.00	P&P Dir. Redstone Arsenal	DAAH01-82- P-5374 13 Sep. 82	Competitive	Elect. Std. & Dev. Lab	Replacement component for APSL Micropot/TVC Calibra- tion System
Standard Cell Measurement Con- trol System 9845B Computer	Hewlett Packard	1 lot	42,491.89	MICOM	DAAH01-82- F-A016 19 Feb. 82	Sole Source	Primary Stds. USATSG	Component of APSL Std. Cell Mgmt Control System To perform standard cell measurements involving complex matrix designs

Source: US Army DARCOM

<u>Item(s)</u>	<u>Supplier</u>	<u>Quantity</u>	<u>Amount</u>	<u>Buyer</u>	<u>Contract number and date</u>	<u>Type procurement</u>	<u>User location</u>	<u>Purpose or intended use</u>
Voltmeter, Digital with AC, DC, & Resistance Measurement Capability & IEEE Bus. Control	*Not Awarded	2	Est'd \$ 14,000.00	MICOM	-	Competitive	Metrology Dir. USATSG	For evaluation purposes (MACI) in an automatic AC/DC Measurement System in APSL
HP 3456A Digital Voltmeter	*Hewlett Packard Not Awarded	2	Est'd 7,000.00	P&P Dir. Redstone Arsenal	-	Sole Source	Temp & Vibr. USATSG	Component for APSL 3450A Automatic Data Acq. Sys. for making thermocouple meas.
Multiplexer	*Not Awarded	1	5,312.00	-	-	Competitive	Temp. & Vibr. USATSG	Component of APSL auto. sound calib. system. The Multiplexer shall provide 8 channels to provide power to microphone pre-amps and to provide transient free electronic switching. The unit shall provide full compatibility with IEC 625-1 digital instrumentation bus

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*In procurement process.

Source: US Army DARCOM.

<u>Item(s)</u>	<u>Supplier</u>	<u>Quantity</u>	<u>Amount</u>	<u>Buyer</u>	<u>Contract number and date</u>	<u>Type procurement</u>	<u>User location</u>	<u>Purpose or intended use</u>
Distortion Control Unit	*Not Awarded	1	Est'd \$ 6,120.00	-	-	Competitive	Temp. & Vibr. USATSG	Component of APSL Auto Sound Calib Systems This unit will interface with a heterodyne analyzer using crystal controlled clock frequency to provide proper synchronization for the two as a system
HP3456A Digital Voltmeter	*Hewlett Packard (Not Awarded)	1	Est'd 3,500.00	P&P MICOM	-	-	Temp. & Vibr. USATSG	Component of APSL Auto Sound Calibration Sys This meter will be used with the 3052A Auto Data Acq Sys. to expand capabilities and back-up existing meter.
HP3455A Digital Voltmeter	*Hewlett Packard (Not Awarded)	1	Est'd 3,800.00	P&P MICOM	-	-	Temp & Vibr. USATSG	Component of APSL Auto Sound Calibration System. Meter will be used with the 3052A Auto Data Acq Sys. helping increase speed and accuracy of calib data for transducers.
Computer-Wang Model 2200MVP, S/N HV 7947 Data Acquisition System	Wang Labs	1	33,900.00	P&P MICOM	DAAH01-81- C-A895 7 May 81	Competitive	APSL USATSC	Automate data handling including: mathematical computations statistical analysis establish history file and print report. Interface calibration equipment systems in length, mass angle, torque & flow

*In procurement process.

Source: US Army DARCOM.

<u>Item(s)</u>	<u>Supplier</u>	<u>Quantity</u>	<u>Amount</u>	<u>Buyer</u>	<u>Contract number and date</u>	<u>Type procurement</u>	<u>User location</u>	<u>Purpose or intended use</u>
Analyzer Hetrodyne	*Not Awarded	1	Est d \$ 12,726.00	-	-	Competitive	Temp. & Vibr. USATSG	Component of APSL Auto Sound Calib Sys. This unit shall provide swept measurements of non-linear distortion in Amplifiers Speakers and Microphones when used with distortion control unit

PROCUREMENT FOR ARMY DEPOTS

Meter Calibration system, Model 5200A/5215A with OPT .5200A-05 (IEEE-488 Interface)	John Fluke	2	32,400.00	Sacramento Army Depot	DAAG08-81-C-0497 1 Sep. 81	Competitive	Sacramento Army Depot	Meter calibration system for support of depot TMDE.
Meter Calibrator Model 5101B with OPT 03 (Wideband AC) and 05 (IEEE-488 Interface)	John Fluke	3	41,169.60	Sacramento Army Depot	DAAC08-81-F-6536 29 May 81	Sole Source (GSA Schedule)	Sacramento Army Depot	Meter calibration system for support of depot TMDE
Oscilloscope Calibration System	TEKTRONIX	1	31,098.15	Sacramento Army Depot	DAAG08-82-C-0526 29 Sep. 82	Competitive	Sacramento Army Depot	Repair and calibration of depot oscilloscopes.
Calibration Indicator and Load Cell	BLH Electronics	1	3,999.00	Corpus Christi Army Depot	DAAG48-81-M-1495 17 Jul. 81	Competitive	Corpus Christi Army Depot	Calibrate engine torque system and the engine test cell.

*In procurement process.

Source: US Army DARCOM.

<u>Item(s)</u>	<u>Supplier</u>	<u>Quantity</u>	<u>Amount</u>	<u>Buyer</u>	<u>Contract number and date</u>	<u>Type procurement</u>	<u>User location</u>	<u>Purpose or intended use</u>
Meter Calibrator Model 5100B	John Fluke	1	\$ 9,072.00	Tobyhanna Army Depot	DAAG38-82 F-0060 19 Oct. 81	Competitive	Tobyhanna Army Depot	Calibration and repair of digital multimeters
Automated Calibration System, Model LOOOST 106	Julie Research Lab.	6	840,120.00	Letterkenny Army Depot	DAAG34-82-C-0036	Sole Source Directed Procurement	Six Selected Depots	Calibration of meters and other selected TMDE.
<u>OTHER ARMY PROCUREMENT</u>								
Oscilloscope Calibration System Model 7410A	John Fluke	1	57,405.00	Yuma Proving Ground	DAAD01-82-C-0040 17 Sep. 82	Competitive	Yuma Proving Ground	Calibration of oscilloscopes
Meter Calibration System, Model 1720A/5100B	John Fluke	1	31,109.00	Jefferson Proving Ground	DAAD03-81-F-0684 18 May 81	Sole Source	Jefferson Proving Ground	Calibration of meters.

Source: US Army DARCOM.

LISTING OF OFFICES CONTACTED FOR CONTRACTINFORMATION IN APPENDIX V

US Army Missile Command
US Army Armament Materiel Readiness Command
US Army Electronics Research and Development Command
US Army Test and Evaluation Command
US Army Tank-Automotive Command
US Army Aviation Research & Development Command
US Army Troop Support & Aviation Materiel Readiness Command
US Army Communications-Electronics Command
US Army Armament Research and Development Command
US Army Mobility Equipment Research and Development Command

US Army Depot Systems Command:
Anniston Army Depot
Corpus Christi Army Depot
Letterkenny Army Depot
Lexington-Blue Grass Army Depot Activity
New Cumberland Army Depot
Pueblo Army Depot Activity
Red River Army Depot
Sacramento Army Depot
Savanna Army Depot Activity
Seneca Army Depot
Sharpe Army Depot
Sierra Army Depot
Tobyhanna Army Depot
Tooele Army Depot
Navajo Army Depot Activity
Fort Wingate Depot Activity
Umatilla Army Depot Activity
Mainz Army Depot
Ober-Ramstadt Army Depot Activity

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