Audit Report

OFFICE OF THE INSPECTOR GENERAL

THE DEFENSE NUCLEAR AGENCY'S THERMAL RADIATION SOURCE SIMULATION SYSTEM

Report No. 94-177 August 26, 1994

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Department of Defense

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Acronyms

AFB	Air Force Base
BFEC	Bendix Field Engineering Corporation
DNA	Defense Nuclear Agency
HET	High-Explosive Test
SAIC	Science Applications International Corporation
TRS	Thermal Radiation Source
WSMR	White Sands Missile Range

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MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY
ASSISTANT TO THE SECRETARY OF DEFENSE FOR ATOMIC ENERGY
DIRECTOR, DEFENSE NUCLEAR AGENCY

SUBJECT: The Defense Nuclear Agency's Thermal Radiation Source Simulation System (Project No. 4AB-5021)

Introduction

We are providing this memorandum report for your information and use. The audit was made in response to a request from Representative Steven Schiff of New Mexico. Representative Schiff received allegations regarding contractor management of the Thermal Radiation Source (TRS) simulation system of the Defense Nuclear Agency (DNA). It was alleged that the contractor, Bendix Field Engineering Corporation (BFEC), had not properly maintained the TRS. The TRS system simulates the temperatures a nuclear explosion generates. The TRS can be used as a stand-alone test device or with a high-explosive test (HET) to simulate multiple effects of a nuclear explosion.

Audit Results

The allegations of contractor mismanagement of the TRS system are invalid. The complaint did not apply to operational units of the TRS. The conditions only applied to a TRS unit that was under construction. The DNA was aware of the condition of that TRS unit. We found no problems in contractor management of the TRS system.

Objectives

The primary objective of the survey was to determine the validity of the allegations relating to the management by BFEC of the TRS system. The audit also evaluated internal controls concerning DNA's oversight of the contractor.

Scope and Methodology

We visited the Headquarters, DNA, Alexandria, Virginia, and the Field Command, DNA, Kirtland Air Force Base (AFB), New Mexico. We reviewed contracts and other program documentation dated from April 1987 through January 1994. Additionally, we discussed the allegations with the individual who initially raised the concerns to Representative Schiff. We also discussed the allegations and the system's operation with DNA officials and contractor personnel who had knowledge of the TRS system. In addition, we reviewed the

performance requirements in the contracts and the reports of tests that included the TRS system. We limited our review to contracts awarded to BFEC for the operation of the TRS system.

This program audit was made from March 10 through May 11, 1994, in accordance with auditing standards issued by the Comptroller General of the United States as implemented by the Inspector General, DoD, and accordingly included such tests of internal controls as were considered necessary. The audit did not rely on computer-generated data.

Internal Controls

We evaluated the effectiveness of the DNA's internal controls applicable to the oversight of the support contractor. The evaluation consisted of reviews of applicable records and interviews with knowledgeable personnel. The internal controls applicable to the audit objectives were deemed to be effective in that the audit identified no material deficiencies.

Prior Audits and Other Reviews

No audit in the last 5 years covered this system.

Background

The TRS system was developed in the early 1980s to simulate the heat generated by a nuclear explosion. The TRS generates the heat by igniting a mixture of liquid oxygen and aluminum. A single TRS unit can simultaneously produce as many as eight flames for a test. Each flame measures approximately 6 feet across and 19 feet high, producing temperatures at approximately 4,900 degrees Fahrenheit. The TRS is operated at White Sands Missile Range (WSMR), New Mexico, and Kirtland AFB.

The Science Applications International Corporation (SAIC) designed and built the TRS system. SAIC then operated and maintained the TRS system for DNA. In 1988, DNA awarded an operation and maintenance contract to BFEC. This contract was succeeded by a similar contract in 1991, also awarded to BFEC. Both contracts were general instrumentation support contracts, under which BFEC was to provide operation and maintenance on multiple DNA systems, including the TRS, in support of the DNA's test program. BFEC operated under the direction of the DNA on these contracts. The two contracts with BFEC were awarded for a total of $19.7 million. Of this amount, the TRS support consisted of approximately $680,000. Concurrently, SAIC was under contract with the DNA to provide research and development along with product improvement.

Discussion

Allegations. In a letter dated November 18, 1993, several allegations regarding the TRS system were made to Representative Schiff. Accordingly, in a January 10, 1994, letter, Representative Schiff requested that we review the allegations. Specifically, the allegations were that upon completion of the BFEC effort:

- o the TRS system was left in a marginally operational status,
- o the safety interlocks were removed,
- o the computer control codes were left incomplete, and
- o the documentation was not accounted for.

In saying that the system was left marginally operational, the complainant stated that at the completion of the BFEC operation and maintenance of the system, the TRS equipment was found to be neither adjusted nor maintained properly. It was alleged that the safety interlocks, which were a part of the TRS system SAIC developed, were removed. The safety interlocks are controls that monitor the conditions of the test. If the safety interlocks detect a problem, then they will shut the system down to avoid a major failure. It was also alleged that the control code was missing portions after it had been modified. The computer control code is the program that runs the TRS system. The control code also gathers data on the test performed. The control code needs to be kept current with modifications to the system. It was also alleged that the documentation on the modified control code was non-existent. The documentation provides a written copy of the control code, along with rationale for steps in the code. The documentation is especially helpful in making modifications.

Contract Requirements. Since 1987, Bendix has had two contracts to provide support to the DNA. The contracts were for support of multiple DNA systems, including the TRS system, and covered from November 1987 through December 1995. The contracts required BFEC to support the DNA's underground tests, the HETs, and the TRS system. The requirements included the repair, calibration, maintenance, and inventory of the DNA's equipment. However, the requirements were not specific. For both contracts, BFEC operated under the direction of the Contracting Officer or the Contract Technical Manager, both of whom provided more detailed requirements and oversight.

Contract DNA001-88-C-0035. The first contract that included requirements for TRS system support was signed in February 1988. The contract, titled "Maintenance and Field Support of Government Owned Equipment and Facilities," was awarded for $6.6 million. Projected funding for TRS system support accounted for 6.8 percent, or $448,800. The contract had a period of performance from November 1987 through October 1990, which was extended through December 1990. The contract required BFEC to repair, calibrate, inventory, and issue the DNA's instruments used on underground

nuclear tests, high-explosive simulations of nuclear events, and thermal radiation simulation of nuclear effects. Specifically, the contractor was required to:

o operate the facility at Las Vegas, Nevada;

o provide support for underground tests and HETs; and

o provide technical support through work authorizations as the Contract Technical Manager directed.

In addition, BFEC would provide technical support in the development of new equipment and techniques, provide instrumentation, operations, software development, and maintenance support for the TRS facility at Kirtland AFB and maintain and calibrate the equipment supporting electromagnetic pulse testing at Kirtland AFB. BFEC would also enhance the TRS control and monitor systems.

Contract DNA001-91-C-0013. This "Instrumentation Support" contract succeeded the 1988 contract. This contract was signed December 26, 1990, with a period of performance from January 1, 1991, through December 31, 1995. The contract amount was $13.1 million, of which approximately $230,360 was for TRS system support, less than 2 percent of the contract cost. The contract requires BFEC to provide support for underground tests, HETs, and the TRS system. The TRS support was limited to the TRS inclusion in one HET, which occurred in June 1991. Under the contract, BFEC would maintain, calibrate, configure, modify, account for, and transport equipment for the testing and the TRS, under the direction of the Contracting Officer. The specific TRS support requirements were to:

o field the TRS units for the HET,

o maintain an inventory of spare parts,

o transport the TRS equipment from Kirtland AFB to WSMR,

o test the TRS units both at Kirtland AFB and at WSMR to verify unit performance,

o provide preventive maintenance and repairs to ensure that the TRS units are in a reliable operating condition, and

o ensure the successful operation of the TRS system for the HET.

In May 1992, the contract was modified to specify additional tasks for support of underground tests, the TRS system, and additional DNA testing. The contract modification provided an additional $890,800 for work through October 1993. At the time of the modification, the TRS support was complete. Therefore, the modification required BFEC to maintain the TRS system's

capability, support an additional HET, and then support the large blast thermal simulator. The funding for the additional work the modification required was increased to a total of $2.3 million in June 1993.

TRS System Condition. The complainant alleged that the TRS system was marginally operational at the expiration of the TRS portion of the second BFEC contract. The concern was that the system would be dangerous to operate. However, the TRS units were used on three HETs during the time that BFEC provided the system maintenance. On the first test, which was in 1989, 8 TRS units were used to support 8 of the 97 experiments in the testing. The next HET, which occurred in 1991, used seven TRS units. The third HET used 8 TRS units to support 9 of the 80 experiments involved. This third test occurred in 1993. For all three tests, the TRS units functioned properly. The TRS system report for the 1991 test concluded that "The fielding of TRS units . . . was a total success."

New TRS Unit. In 1993, a contract was awarded to SAIC for the development of the Large Blast Thermal Simulator to be built at WSMR. The contract also required the integration of an improved TRS system with the Simulator. Concurrently, BFEC was developing the new TRS unit. The BFEC effort was under a portion of contract DNA001-91-C-0013. Additionally, the TRS system support requirements in the contract were from January 1991 through the summer of 1993. As a result, the new TRS unit was still under development when the BFEC contractual obligation for TRS support expired.

The problems and allegations regarding the TRS system applied to the condition of the then-incomplete, i.e., new, TRS system instead of the old TRS units used in the DNA's testing. The areas that were alleged as lacking are the result of the expiration of BFEC's contractual obligations and were steps in the development of the new TRS system that had not yet been reached. The DNA decided to include the completion of this TRS unit in a contract for complete TRS system support. Therefore, the DNA did not extend the BFEC effort to complete the unit, as the completion requirement was included in the complete TRS support contract.

Conclusion

The TRS units used in the DNA's test program were fully operational. The units successfully supported three HETs from 1989 through 1993. BFEC operated the units under the direction of DNA contract management as part of two consecutive support contracts. The allegations raised did not apply to units of the TRS system used in testing. The operation and maintenance concerns applied to a TRS unit BFEC was assembling. The non-operational condition of that unit resulted from the expiration of the BFEC contractual effort. The TRS system support effort of the contract was for a specific period. The DNA was aware of the TRS unit's condition at the completion of the support effort. Therefore, the allegations that BFEC mismanaged the TRS system are invalid.

Management Comments

We provided a draft of this report to the addressees on June 29, 1994. Because there were no recommendations, no comments were required from management, and none were received. Any comments on this final report should be provided by September 26, 1994.

The courtesies extended to the audit staff are appreciated. If you have questions on this audit, please contact Mr. Raymond Spencer at (703) 604-9071 (DSN 664-9071) or Mr. Richard Collier at (703) 604-9063 (DSN 664-9063). The distribution of this report is listed in the Enclosure. The audit team members are listed inside the back cover.

Robert J. Lieberman
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Representative Steven Schiff

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