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**Lawrence Livermore National Laboratory
Safeguards and Security Quarterly Progress Report
to the U.S. Department of Energy**

Quarter Ending March 31, 1994

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April 1994

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Table of Contents

Preface	iv
Safeguards Technology Program	STP-1
Introduction.....	STP-1
Summary of Major Accomplishments.....	STP-1
Task Description and Quarterly Progress.....	STP-2
I. NDA MC&A Measurement Technology R&D	STP-2
II. Emission and Transmission Computed Tomography.....	STP-3
III. Support to DOE Facilities in Implementation, Testing and Evaluation of LLNL Developed NDA Techniques.....	STP-4
IV. Monte Carlo Calculations of Gamma- Ray Spectra	STP-5
Appendix A: A Summary of all Milestones and Deliverables for the Quarter.....	STP-8
Appendix B: A List of all Publications Produced During This Quarter.....	STP-9
 Safeguards and Decision Support.....	 SDS-1
Introduction.....	SDS-1
Summary of Major Accomplishments.....	SDS-1
Task Descriptions and Quarterly Progress.....	SDS-2
I. Electronic Transfer of Personnel Security Data Technology Development.....	SDS-2

II. Analysis of Insider Threats Against Computerized Nuclear Materials Accountability Applications.....	SDS-4
III. Safeguards Systems Studies	SDS-5
IV. Analysis of Safeguards & Security Requirements of Treaties that Impact DOE Mission.....	SDS-5
V. CTA Support.....	SDS-6
Appendix A: A Summary of all Milestones and Deliverables for the Quarter.....	SDS-7
Appendix B: A List of all Publications Produced During This Quarter.....	SDS-8
 Computer Security - Distributed Systems	CSS-1
Introduction.....	CSS-1
Summary of Major Accomplishments.....	CSS-1
Task Description and Quarterly Progress.....	CSS-3
I. Computer Incident Advisory Capability (CIAC).....	CSS-3
II. Network Intrusion Detector (NID).....	CSS-3
III. Security Profile Inspector for Unix and VMS Operating Systems (SPI/UV).....	CSS-4
IV. Text Analysis Project (TAP).....	CSS-5
V. Network Mapping and Detection of Unauthorized Cross-Connections (NetMap).....	CSS-5
VI. Computer Viruses: Prevention, Detection and Mitigation.....	CSS-6
VII. Distributed Auditing Systems (DAS) Development and Standards.....	CSS-6
Appendix A: A Summary of all Milestones and Deliverables for the Quarter.....	CSS-7

Appendix B: A List of all Publications Produced During This Quarter.....	CSS-9
--	-------

DOE Automated Physical Security.....DAPS-1

Introduction.....	DAPS-1
-------------------	--------

Summary of Major Accomplishments.....	DAPS-1
---------------------------------------	--------

Task Description and Quarterly Progress.....	DAPS-1
--	--------

I. Technology Transfer	DAPS-1
------------------------------	--------

II. Argus Standardization effort	DAPS-3
--	--------

Appendix A: A Summary of all Milestones and Deliverables for the Quarter.....	DAPS-4
---	--------

Appendix B: A List of all Publications Produced During This Quarter.....	DAPS-4
--	--------

DOE Automated Visitor Access Control System..... DAVACS-1

Introduction.....	DAVACS-1
-------------------	----------

Summary of Major Accomplishments.....	DAVACS-1
---------------------------------------	----------

Task Description and Quarterly Progress.....	DAVACS-1
--	----------

I. Classified Visit Procedures Improvement - Clearance Query Screen Enhancements	DAVACS-2
--	----------

II. Visitor Biometrics Verification	DAVACS-2
---	----------

III. DISS Communication Security Analysis.....	DAVACS-2
--	----------

Appendix A: A Summary of all Milestones and Deliverables for the Quarter	DAVACS-4
--	----------

Appendix B: A List of all Publications Produced During This Quarter	DAVACS-5
---	----------

Preface

The Lawrence Livermore National Laboratory (LLNL) carries out safeguards and security activities for the Department of Energy (DOE), Office of Safeguards and Security (OSS), as well as other organizations, both within and outside the DOE. This document summarizes the activities conducted for the OSS during the Second quarter of Fiscal Year 1994 (January through March, 1994).

The nature and scope of the activities carried out for OSS at LLNL require a broad base of technical expertise. To assure projects are staffed and executed effectively, projects are conducted by the organization at LLNL best able to supply the needed technical expertise. These projects are developed and managed by senior program managers. Institutional oversight and coordination is provided through the LLNL Deputy Director's office.

At present, the Laboratory is supporting OSS in five areas:

- Safeguards Technology
- Safeguards and Decision Support
- Computer Security
- DOE Automated Physical Security
- DOE Automated Visitor Access Control System

The remainder of this report describes the activities in each of these five areas. The information provided includes an introduction which briefly describes the activity, summary of major accomplishments, task descriptions with quarterly progress, summaries of milestones and deliverables and publications published this quarter.

The LLNL welcomes the opportunity to apply its expertise in these technical areas. Although the aggregate of activities for OSS is modest, LLNL strives to provide quality responses to OSS needs and stands ready to assist OSS on these and other technical areas.

If OSS management or staff have questions about this report or LLNL's capability to assist in satisfying an OSS need, contact L. Lynn Cleland, 510/422-4951, or one of the program managers for the five technical areas.

Safeguards Technology Program

**Wayne D. Ruhter, Program Manager
Nuclear Chemistry Division**

INTRODUCTION

The Safeguards Technology Program (STP) is a program in LLNL's Nuclear Chemistry Division that develops advanced, nondestructive-analysis (NDA) technology for measurement of special nuclear materials. Our work focuses on R&D relating to x- and gamma-ray spectrometry techniques and to the development of computer codes for interpreting the spectral data obtained by these techniques.

A review of the Safeguards Technology Program at LLNL by representatives of the Department of Energy Office of Safeguards and Security and Office of Research was conducted via teleconference on March 4, 1994. Objectives, milestones, and recent accomplishments were presented for each of the four LLNL tasks in NDA, and plans to address user needs in these NDA areas were discussed.

An informal presentation on the LLNL Safeguards Technology Program was presented to the JOWOG-30 meeting at the Los Alamos National Laboratory on March 10, 1994. The JOWOG meetings bring together representatives from Laboratories in the DOE complex, as well as their counterparts from the United Kingdom. Within JOWOG-30 a variety of topics are discussed, including NDA and its various applications within the U.S. and U.K. complexes.

SUMMARY OF MAJOR ACCOMPLISHMENTS

I. NDA MC&A Measurement Technology R&D

- A library of spectra from samples that pose Pu analysis problems has been established and a study to enhance the analysis on these samples has begun.
- The local release of the Unix/Motif version of SpecView for use in conjunction with MGA has been accomplished.

II. Emission/Transmission Computed Tomography

- The design of most components of a tomographic scanner for small dense samples is complete and fabrication has begun.
- The Monte Carlo simulation of voids in Pu MSE buttons is continuing.

III. Support to DOE Facilities in Implementation, Testing and Evaluation of LLNL Developed NDA Techniques

- The Plutonium Solution Assay Instrument at LLNL has been tested, calibrated and put into operation.
- The IAAS Operator's course has been written and taught. Upgrades continue as operation permits.

IV. Monte Carlo Simulation of Gamma-Ray Spectra

- A simulation of the Pu PIDIE source #1 with 40 times the particles of our initial calculation confirms that patterns in the residuals after fits with MGA are due to the low statistics of the initial simulations.
- Relative efficiency calculations continue for CdZnTe crystals compared to germanium crystals of the same size and geometry.

TASK DESCRIPTIONS AND QUARTERLY PROGRESS

Accomplishments achieved during the second quarter of FY94 by STP are described below:

I NDA MC&A Measurement Technology R&D

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060102	\$292K	\$150K

The overall objective for this task is to research and develop state-of-the-art nondestructive analysis (NDA) instruments, methods, and techniques that address top priority material control and accountability (MC&A) problems and will result in improved MC&A of SNM at DOE facilities. Activities include assistance to the field in resolving major and significant problems associated with holdup, heterogeneous materials, lump corrections, waste measurements, and shipper-receiver measurements.

Plutonium Isotopic Analysis Development

Joseph B. Carlson, Kenneth E. Raschke, and Eugene A. Henry

Domestic safeguards R&D work related to MGA has concentrated on the measuring of plutonium isotopics for samples for Materials Management at LLNL. Because many of these samples now being measured are low in plutonium relative to other nuclides (uranium, ²⁴¹Am, for example), the analysis is not straight forward. Thus far successful analysis of some samples has only been accomplished with a combination of analyses using both the MGA and GRPANL programs, with

significant user interaction during the analysis. We have begun a program to study the analysis of a variety of "problem" samples in order to enhance the analysis performance.

We have identified a number of different types of samples at LLNL which offer problems for Pu isotopic determination, and have established a library of spectra for these samples to use in the study of MGA performance and the testing of various analysis enhancements. An important subclass of these samples is those which are high in ^{241}Am . We are investigating the failure mode of MGA when analyzing high americium samples. Modifications of MGA will be undertaken to improve the robustness of MGA when analyzing high americium samples, and provide a total Am/Pu ratio in those instances when detailed isotopic determination is not possible.

Second Generation Software

William M. Buckley

The SpecView application is a viewing "engine" which will form the basis of new data acquisition, manipulation, analysis, and management applications under Microsoft Windows and Unix Motif environments. This will provide a common, vendor-independent graphical user interface that should simplify operations of systems and software, and reduce training requirements.

The first local release of a Unix/Motif version of SpecView has been accomplished. The Motif version has some new capabilities, most significantly the use of toolbars, which we will now implement for the Windows version. The Unix Motif version of MGA will be the first application that uses SpecView in the Unix environment.

II. Emission/Transmission Computed Tomography

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060202	\$150K	\$67K

This technology combines the advantages offered by two well-developed, nondestructive assay techniques: gamma-ray spectrometry and computed tomography (CT). Coupled together these two techniques may be used to nondestructively and quantitatively measure uranium and plutonium in samples where the U and/or Pu are heterogeneously distributed, distributed in lumps of varying size, or the sample matrix varies in density and composition. This technology potentially offers significant improvements over current segmented gamma-scanning (SGS) techniques.

Gamma-ray spectrometry passively and nondestructively measures the gamma-ray emissions from a sample. From the measured gamma-ray spectrum one can identify the radioactivities detected and determine their abundances, if appropriate

corrections for sample self-attenuation are made. Transmission or active CT is a nondestructive technique, already widely used in medical and industrial applications, that uses an external-radiation beam to map photon attenuation within a sample. This attenuation data can be used to correct the emission data for sample self absorption. The result is an accurate, quantitative assay of all detectable radioactivities within a sample regardless of its form or composition.

Emission and Transmission Computed Tomography Application

Tzu-Fang Wang and Eugene A. Henry

During FY93 a partial scan of a plutonium MSE button was accomplished using both transmission and emission computed tomography. Analysis of these data indicated that this button had voids, cracks, and isotopic heterogeneities that could be of concern for the accurate determination of the isotopic content of such buttons.

Because the experimental apparatus used for these first measurements was of a temporary nature, we began the design of a tomography scanner suited to the study of items such as MSE buttons. The design of the stable base and frame, as well as the collimators, has been completed. The fabrication of the scanner (funded in part by LLNL and with the cooperation of EG&G) has begun during the last quarter, with the ordering of parts for the rigid base and frame, and the machining of the collimators. This scanner will be crucial to accomplishing tomographic R&D studies of small dense SNM objects (up to a few tens of centimeters across) in a timely, reproducible, and high-quality manner.

In the last quarter, we also performed a Monte Carlo simulation of a MSE button with and without a void so that we could begin the study the effect of the void in the button. The results from the simulation have poor statistics due to enormous self attenuation of the gamma rays in the MSE button. We have begun a simulation for selected gamma rays emitted from Pu where biased intensities have been used to overcome the attenuation so that the effect of the void can be studied. We have also completed a simulation of a rectangular slab of Pu to contrast with the shape of the MSE button to study various geometrical effects.

We have installed a copy of the program VIEW on our computer. This program performs a variety of reconstruction and visualization functions and will be applicable to our initial tomography R&D data.

III. Support to DOE Facilities in Implementation, Testing and Evaluation of LLNL Developed NDA Techniques

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060302	\$92K	\$24K

The primary objective of this task is to assist DOE sites in implementation of LLNL developed NDA technology; in particular, assist Westinghouse Savannah River Company facilities; LLNL's Materials Management; and LANL's TA-55 facility. A brief description of activities under this task are given below.

Analysis of Plutonium Solutions

William M. Buckley and Kenneth E. Raschke

Calibration and final testing was completed on a Plutonium Solution Assay Instrument for Analytical Chemistry at LLNL. The instrument provides the plutonium concentration as well as the plutonium isotopic determination. Measurement of prepared plutonium solutions with a known concentration of Pu (approximately 5 g/l Pu) obtained concentration values within 1% of the known values. This instrument has been installed in the Plutonium Facility and is in operation. A draft of the operator's guide has been written and released to the operators. This instrument is the first production use of the MGA program for concentration determination and isotopic analysis of plutonium solutions.

Intelligent Actinide Analysis System

William M. Buckley, Wayne D. Ruhter, Kenneth E. Raschke, and Austin L. Prindle

The Intelligent Actinide Analysis System instrument at LLNL was in operational use most of this quarter. The electronic noise problems that limited the count rate the IAAS could sustain have been traced to faulty detector preamplifier components and noise sensitive cabling. These problems have been rectified, and large samples have been run at high count rates with good results. The IAAS Operator's Course has been written and taught, and the IAAS Supervisor's course is in preparation. As operational needs permit, we will install and test the intelligent scan option and other software upgrades.

Support of LANL

William M. Buckley, and Wayne D. Ruhter

We hosted a visit by Teresa Cremers from LANL TA-55 to discuss isotopic system upgrades and TA-55 isotopic analysis problems. We have provided her with estimates to upgrade their two-detector isotopic system, and to build a gamma isotopic solution assay system.

IV. Monte Carlo Calculations of Gamma-Ray Spectra

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060202	\$150K	\$67K

The simulation of gamma-ray spectra for a known radioactive source, sample matrix, and geometry can be an important tool in designing and understanding

non-destructive analysis (NDA) instruments such as Pu gamma-ray isotopic analysis systems. There are also a number of significant and major MC&A problems associated with heterogeneous materials, lump corrections, holdup, waste, and shipper-receiver measurements that can be addressed with this calculational tool. The gamma-ray spectra from each of these problems can be simulated with a Monte Carlo method by mocking up various geometries and transporting the gamma-rays of a known source through the material to a detector. Monte Carlo calculations may be used to calculate plutonium "standard" gamma-ray spectra that may be used to determine such characteristics as systematic biases in spectral data-analysis codes. With so many possible variations of the problems described above, the simulation of gamma-ray spectra from them is more efficient and cost effective than the development and measurement of various reference materials.

Monte Carlo Simulation of Plutonium Gamma-Ray Spectra

Tzu-Fang Wang, and Joseph B. Carlson

During the last quarter we have completed an additional Monte Carlo simulation of the standard Plutonium Isotopic Determination Intercomparison Exercise (PIDIE) source #1. This simulation has about 40 times more particle tracks than the first reported simulation. The data has been analyzed with MGA; the MGA fits are very good ($QFIT = 1.00$ and $NQFIT = 1.000$) with residuals within one standard deviation. These residual fluctuations are less than the residuals from a MGA fit of the measured spectrum. These results confirm our speculation that statistical effects are responsible for the pattern of residuals from MGA fits of simulated spectra.

A 3.0 gigabyte hard disk has been installed for use with Monte Carlo calculations. Because of restrictions of the operating system, the disk is partitioned into two areas, one of 2.0 Gbyte and one of 1.0 Gbyte.

The Monte Carlo MCNP version 4A has been installed, and work on implementing the multiprocessor capabilities of this version are almost completed. Test versions of the multiprocessing code were used to calculate spectra from a bare Pu sphere and a Pu sphere with a thin U layer to see what effect the U layer had on the low energy spectral region of Pu. By running the problem across ten processors, the total time to calculate this problem was reduced from over two weeks to about one and one-half days.

A visualization program called SABRINA was acquired from RSIC and installed. This code will accept MCNP input geometry files and allow the user to generate rendered 3D perspective views of the geometry. Additionally, particle track information can be input from an MCNP run and superimposed over the view. This capability will enhance our ability to generate and verify complicated simulation geometries.

Monte Carlo Simulation of CdZnTe Crystal Efficiency

Tzu-Fang Wang

During the last quarter we have performed a Monte Carlo simulation of the absolute efficiency of cadmium-zinc-telluride detectors (CdZnTe) with the thickness ranging from 2 to 20 mm. The usage of this detector material might replace a standard germanium LEPS detector for certain applications. For this reason we have performed a simulation comparing the relative efficiency of a CdZnTe detector that has an active area of 200 mm² and is 13 mm thick with the LEPS detector of the same dimensions. The relative efficiencies are (CdZnTe/LEPS) 1.15 at 92.7 keV, 1.29 at 102 keV, 2.18 at 183 keV, 2.47 at 227 keV and 2.82 at 292 keV. Note that these energies are those relevant to the measurement of ^{235,238}U, indicating that a detector made of CdZnTe will have higher efficiency for measuring these isotopes, or alternatively, the detector crystal could be made thinner than a LEPS germanium crystal.

APPENDIX A: A SUMMARY OF ALL MILESTONES AND DELIVERABLES FOR THE QUARTER

I. NDA MC&A Measurement Technology R&D

B&R No. **GD060102**

A study of MGA performance for Pu samples with high Am content has been started..

The first release of a Unix/Motif version of SpecView has been accomplished.

II. Emission/Transmission Computed Tomography

B&R No. **GD060202**

Fabrication of a tomography scanner for R&D studies has begun.

III. Support to DOE Facilities in Implementation, Testing and Evaluation of LLNL Developed NDA Techniques

B&R No. **GD060302**

The Plutonium Solution Assay Instrument is in operation at LLNL.

The IAAS instrument is operational and upgrades continue as operations permit.

IV. Monte Carlo Calculations of Gamma-Ray Spectra

B&R No. **GD060102**

The analysis of the effect of the statistical significance of simulated spectra on the residuals of MGA fits has been completed.

Simulations of the relative efficiency of CdZnTe crystals relative to germanium crystals used in LEPS detectors have been performed.

APPENDIX B: A LIST OF ALL PUBLICATIONS PRODUCED DURING THIS QUARTER

"Advanced Concepts for Gamma-ray Isotopic Analysis and Instrumentation", William M. Buckley and Joseph B. Carlson, abstract submitted the 1994 INMM Annual Meeting.

"Three Dimensional imaging of Molten-Salt-Extracted Plutonium buttons using both active and passive gamma-ray computed tomography", T. F. Wang, E. A. Henry, W. D. Ruhter, H. E. Martz, G. Patrick Robertson, and L. O. Hester, abstract submitted to the 1994 Symposium on Radiation Measurements and Applications, May 16-19, 1994; UCRL-JC-116139-Abstract.

"A Gamma-Ray Verification System for Special Nuclear Material", Robert G. Lanier and William M. Buckley, submitted to the 1994 INMM Annual Meeting.

"Monte Carlo Simulation of Plutonium Gamma-Ray Standards", T. F. Wang, J. B. Carlson, Z. Koenig, W. D. Ruhter, T. S. H. Lee, and J. Winn, abstract submitted to the 1994 Symposium on Radiation Measurements and Applications, May 16-19, 1994; UCRL-JC-116138-Abstract.

Safeguards and Decision Support

**R. Scott Strait, Deputy Associate Program Leader
Fission Energy and Systems Safety Program**

INTRODUCTION

The Fission Energy and Systems Safety Program (FESSP) Safeguards and Decision Support program area provides support to the DOE and other government sponsors in two related areas: (1) development and application of systems approaches for improving the security of nuclear and other critical facilities; and (2) decision analysis and risk management to support policy and decision making processes. The purpose of the program is to integrate advanced analytic methods with an understanding of technologies, economics, and the policy making process. We develop systematic approaches and analytic tools for enhancing the effectiveness of safeguards and security systems, including MC&A, physical protection, and personnel security. We transfer the technology developed through workshops and field consultations, and we evaluate available tools to determine their applicability to DOE safeguards and security interests. We also provide technical support to OSS on program planning, assessment and integration, and implications of arms control treaties.

SUMMARY OF MAJOR ACCOMPLISHMENTS

- Phase I design review of the DISS module for security clearance electronic processing, transfer, and recordkeeping (also called SCEPTR); and
- Began development of Phase I functionality of the DISS electronic transfer module (SCEPTR).

TASK DESCRIPTIONS AND QUARTERLY PROGRESS

I. Electronic Transfer of Personnel Security Data Technology Development

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GH-03	\$3,050K	\$742K

We are in the second year of this three-year project. The overall project will develop an integrated system for the electronic transfer of personnel security data between the DOE and the Office of Personnel Management (OPM) and between DOE Operations Offices. This module of DISS for security clearance electronic processing, transfer, and recordkeeping (also called SCEPTR), will use existing hardware and software to the extent possible. The system will be compatible with the OPM main frame computer in Boyers, PA, and with currently Federal Bureau of Investigation (FBI) approved electronic imaging for transfer of fingerprints. DOE operations to be automated include the clearance process at the field offices and the contractor sites.

A Phase I Design Review was held in January at LLNL. Invitees included DOE headquarters Office of Safeguards and Security personnel, Safeguards and Security and IRM personnel from each Operations Office, security personnel from the M&O Contractors, SCEPTR interface personnel from the OPM, and DoD DIS personnel responsible for similar systems at the DOD. At the review, the User Survey and Phase I Requirements documents were distributed. The Phase I design was also presented to the OPM On-Line Task Force on February 9. We also had separate meetings with the DoD DIS personnel

Detailed implementation of the Phase I functionality is currently underway. Specific development areas include:

- Regional personnel security (RPS) database design and implementation
- Applicant user interface (AUI):

- Data entry forms development (SF-86 et.al.)
 - PC notary
 - Private key/public key/certificate issuing
 - Scanned document capture
 - E-mail communication

- Digital signature and data encryption for both AUI and PC notary

- E-mail communication to the RPS from both AUI and PC notary

- Contractor and DOE user interface forms development

- Contractor and DOE user interface secure communication to the RPS

- Receipt and database storage of:

- Forms data, scanned document data, and OPM results at RPS

RPS case data at OPM Gateway
RPS interaction with the contractor and DOE user interface
RPS communication to OPM Gateway

Several commercial products have been selected for use:

ORACLE relational database
JetForms forms data entry software
RSAREF - No cost RSA based digital signature and encryption software
libraries

for PC compatible and Macintosh computers.
TISPEM - No cost Privacy Enhanced Mail for Sun/Unix platforms.

We have determined most of the Phase I hardware and software needs, and are placing orders to meet our schedule. Details of the firewall hardware for the DOE OAK and OPM, and LLNL Clearance Office data entry computers are not finalized. We are working with OPM to finalize their procurement needs. We are reviewing 5 vendors that can provide Internet connection services to OPM at Boyers, PA, and plan to have a recommendation for the OPM by the end of April.

Tests with the scanner and printer for fingerprint and scanned document capture are underway. At this time we believe we have a scanner/printer combination which provides adequate resolution for fingerprints. Results have been reviewed by LLNL fingerprint personnel who believe them to be of good quality, and need to be reviewed by the FBI. Fingerprint print out is currently too slow. We are working with the printer vendor (HP) to determine if print speed can be improved. If not, we will identify a faster, more expensive computer with acceptable performance.

We are currently evaluating a commercial software product by OCSG Inc. to provide secure communications between the contractor or DOE users and the RPS database (response time requirements in these areas prohibit use of secure e-mail). The product uses Kerberos for authentication and DES encryption for privacy. If the product is not acceptable, there is one potential hardware solution we will evaluate. If neither solution is acceptable, locally developed software will be written, and may impact the September deployment date.

Due to scheduling conflicts, June 1 is the date for the May functionality demo, where we will demonstrate SCEPTR underlying software capability. The demo will include a portion of the SF-86 applicant data entry, communication of the data to the RPS database, and then on to the OPM Gateway. All demo hardware will be local at LLNL. As we have not yet received the RS/6000 OPM Gateway test system, the demo gateway may be a Sun SPARCstation.

After the January design review, one attendee and two individuals not participating in the review prepared comments on the SCEPTR design and, particularly, the planning process. These individuals were from Operation Offices IRM organizations. We have attempted to address those concerns and have supported OSS in their meetings with the HQ IRM. We have increased the involvement of the OAK IRM team in the SCEPTR development and have increased our communication with other IRM elements.

We are planning on fielding a two person deployment team beginning this summer. This team will be responsible for deployment across the DOE complex. The team consists of a system/network administrator and a computer systems analyst. During fiscal 1994, the team will visit all Operations Office and most contractor sites. The team will, in conjunction with site personnel, determine how and where the RPS computers will be deployed at each site. They will also assist site personnel in integration at each site, and will identify any additional functionality required to support this integration. The result of the summer visits will be a deployment plan, which will include a deployment schedule and details of the deployment at each site. During 1995, the deployment team will physically deploy the system, per the plan, at the sites (Phase III).

In response to new direction from OSS, we are beginning to plan for the modernization of the mainframe based CPCI and related databases. We expect to field a team of 3 systems analysts/designer who will review CPCI and related headquarters systems, review the interface needs of the Operations Offices and M&O contractors, and develop requirements and design for integration of this functionality. We will have this team in place during the summer.

II. Analysis of Insider Threats Against Computerized Nuclear Materials Accountability Applications

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD-06-01-03	\$340K	\$20K

This project is developing methodology to be used in the evaluation of insider threats against computerized nuclear materials accountability applications. This methodology is important, because the Department relies heavily on computer systems to manage nuclear materials accountability data and to detect diversion of nuclear materials. The project will assess current materials accounting applications to identify information flows representing insider activities with potential serious consequences. We will document a methodology for performing insider analysis of current application systems, such as LANMAS, as well as for future designs. The

assessment of applications will be useful in future materials control and accountability (MC&A) and computer security policy development.

Work on this project began on Feb. 22. The task statement was further revised in March by OSS staff. We have assembled a team of experts at LLNL in current MC&A systems, insider threats and vulnerability assessments, systems risk analysis, and computer/software systems. Other LLNL experts in MC&A and vulnerability assessments have agreed to provide peer review. We began systems familiarization by identifying and obtaining documents on orders, systems requirements, user manuals, audits, descriptions of LANMAS, etc. We have held discussions with SNL and LANL personnel about MC&A systems and LANMAS. We began information analysis methodology development by literature searches of previous approaches to similar problems and by brainstorming sessions.

III. Safeguards Systems Studies

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD 06-02-05	\$70K	\$24K

This task develops systematic approaches and analytic tools for evaluating and enhancing the effectiveness of safeguards and security systems. We develop methodologies and tools for evaluating material control and accountability systems, measures protecting against insider threats, and measures that may contribute to deterrence of threats. We also transfer the technology developed through consultations, as needed. We continue to provide field assistance for ASSESS and in the general application of evaluation methods, and tools. We evaluate available tools to determine their applicability to DOE safeguards and security interests.

Our largest-effort task this year is the development of a vulnerability assessment technology transfer manual. We have been awaiting the DOE vulnerability assessment task force meeting to kick-off the majority of that effort. We have been coordinating the planning of this work with Sandia.

IV. Analysis of Safeguards and Security Requirements of Treaties that Impact DOE Mission

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD 05-08-03	\$132K*	\$1K

This task provides OSS with comprehensive technical reviews of the safeguards and security implications of pending arms control treaties. Under this task, we analyze impact on DOE sensitive facilities and related inspection readiness planning requirements. We also evaluate alternative approaches to

readiness to determine most efficient methods to achieve treaty compliance and protect DOE vital assets.

This quarter we were not requested to provide OSS with significant support on treaty requirements. In a related effort we participated in a LLNL OPSEC assessment of the impacts of on-site inspections at LLNL.

*All carry-over from prior years.

V. CTA Support

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD 05-06-02	\$28K	\$25K

This task supports the DOE Central Training Academy (CTA) in preparing course materials and presenting safeguards courses in areas of LLNL expertise. We had no teaching obligations this quarter.

We continue to work with CTA to limit our teaching role to the most technical course subjects as CTA personnel take on an expanded teaching role. This year CTA is teaching the insider VA section without LLNL support. However, we continue to have a major teaching role in the ASSESS Course, and CTA personnel have not yet begun to have substantial participation. We have proposed areas of the course for transfer to CTA personnel next fiscal year. CTA has told us that they plan the development of an intermediate VA course, and they have requested our participation in that endeavor.

The Protracted theft module of ASSESS is ready for distribution to the field, but has not been distributed due to lack of training resources. We have discussed the training options with OSS and CTA, and the most cost-efficient option seems to be to develop a self-guided tutorial. The tutorial would explain the concepts and modeling approach for protracted theft scenarios, as well as teach the ASSESS Protracted module user interface. The tutorial, along with exercises, would be aimed at experienced ASSESS Insider module users. Per CTA request, in July we submitted a proposal for developing this tutorial.

APPENDIX A: SUMMARY OF MILESTONES AND DELIVERABLES:

I. Electronic Transfer of Personnel Security Data Technology Development

B&R No. GH-03

- Completed Phase I design review
- Accepted partial delivery of pilot system hardware

II. Risk-based Evaluation of Computerized Nuclear Materials Accountability Systems LLNL 94005-94

B&R No. GD 06-01-03

None this quarter

III. Safeguards Systems Studies LLNL 91019-94

B&R No. GD 06-02-05

None this quarter

IV. Analysis of Safeguards and Security Requirements of Treaties that Impact DOE Mission

B&R No. GD 05-08-03

None this quarter.

V. VA Fundamentals and ASSESS Courses

B&R No. GD 05-06-02

None this quarter.

APPENDIX B. A LIST OF ALL PUBLICATIONS PRODUCED DURING THIS
QUARTER

Phase I design review documentation.

Computer Security - Distributed Systems

**Doug L. Mansur, Program Manager
Computer Security Technology Center**

INTRODUCTION

The Computer Security Technology Center (CSTC) serves the Department of Energy and its community by providing expertise and solutions to the many information security problems present in today's computer systems and networks. Incidents of intrusions, computer viruses, the purposeful replacement of legitimate software for illegal purposes, and similar acts are being addressed by the creation of security software, the delivery of incident response expertise, and research and development into secure systems.

SUMMARY OF MAJOR ACCOMPLISHMENTS

I. Computer Incident Advisory Capability (CIAC)

The Computer Incident Advisory Capability (CIAC) assisted DOE sites with computer security incident handling and provided research into new security vulnerabilities.

CIAC was heavily involved in responding to the much publicized nationwide Internet attack that affected thousands of computers at hundreds of private and government sites. The full impact of this attack is still unknown and CIAC will continue to serve as a key resource to the DOE sites affected.

II. Network Intrusion Detector (NID)

We continued on schedule for a NID 1.0 product release in mid-April. We continued our work on user awareness, training, and support; this included general awareness activities and focused support for intrusion incidents. We also surveyed the marketplace for the availability and cost of hardware platforms on which the NID product can run, and evaluated the range of cost portability tradeoffs for use in presentations, incident handling, and site monitoring.

III. Security Profile Inspector for Unix and VMS Operating Systems (SPI/UV)

SPI 3.0.1 for Unix was released on March 21st. Over 140 individual SPI 3.0.1 distribution packages were mailed to DOE CSSM and CPPM personnel. The product and documentation are available electronically via the CSTC FTP file server, and tapes are available upon request. This maintenance release contains both functional and portability enhancements.

We also established filename pattern-matching conventions for the VMS data-extraction libraries and identified file data modifications needed to accommodate VMS-unique file attributes. User account information libraries are in the implementation phase.

IV. Text Analysis Project (TAP)

The current prototype TAP software (based on three DOE Classification Guides) is now being used to read samples of local LLNL program back-up tapes as a test of our ability to read real files of different formats. A pre-analysis file filtering capability has been added to the TAP software tool set, allowing the analysis of files from various word processing programs.

V. Network Mapping and Detection of Unauthorized Cross-Connections (NetMap)

A requirements analysis survey of DOE network security officers was completed this quarter and was used to develop the NetMap Project Requirements document. We also continued testing of commercial network management software packages after narrowing the field to two candidates.

VI. Computer Viruses: Prevention, Detection, and Mitigation

Specific tasks to meet our research objectives in the area of malicious code were identified and agreed upon. A sub-contract to UC Davis was initiated and will be in effect for the second half of this fiscal year.

VII. Distributed Auditing System (DAS) Development and Standards

Debra Banning, the principal investigator on this effort, departed SPARTA, Inc. to work elsewhere. As a result, we have been discussing the direction of this effort with newly assigned SPARTA personnel. We aim to continue the original scope of work, while perhaps placing new emphasis on certain parts of the DAS.

VIII. Computer Security Guidelines Development

Although this task is not funded for FY94, it continues to be reported because the effort is being completed with FY93 obligated funding resulting from the lateness of the contract award with SPARTA, Inc. The current VMS System Security Guideline is being enhanced to improve its overall outline, to include new technical areas, and to update existing information in line with the new versions of the VMS operating system. This effort is also being impacted to some degree due to the departure of Debra Banning.

TASK DESCRIPTION AND QUARTERLY PROGRESS

I. Computer Incident Advisory Capability (CIAC)

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060303	\$349K	\$293K

The Computer Incident Advisory Capability (CIAC) team members continued to assist DOE sites with numerous computer security incidents.

During this quarter, CIAC was heavily involved in responding to the Internet attack that is currently still affecting the whole country. To date, we know of 12 DOE sites that were compromised. Our efforts in assisting these sites and all of the DOE have consisted of issuing 4 advisory notices describing vulnerabilities, attack profiles and appropriate responses, answering numerous phone calls, and initiating numerous E-mail communications. One team member flew to a site to assist their effort in responding to this attack. Of the 12 DOE sites, 709 machines were compromised and nearly 11,000 logon sessions were captured.

CIAC distributed the first two issues of its electronic publication, CIAC Notes. The response to these issues was very positive. Issue Number 2 dealt extensively with the Internet attack. In addition, the CIAC Project Manager prepared white papers and briefings for DOE management about this incident. A member of CIAC taught one workshop at Hanford on Information Technology Security for Technical Staff and Managers. The CIAC Project Manager also presented at the ESnet Coordinating Committee Meeting in San Diego on February 15-17, 1994.

II. Network Intrusion Detector (NID)

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060103	\$355K	\$129K

We continued work on product configuration management and on completing a user package for release in April.

As part of our users' training efforts, we made a presentation in January for CPPM's and others at a course in Automated Information Systems Security at Oak Ridge. We also made preparations on the NID for both a program presentation and a birds of a feather session at the upcoming DOE Computer Security Group Training Conference in May.

We explored hardware platforms for use as mid-term loan stations for quick installations of NID and for incident response. We began the acquisition process for one platform.

We continued distribution and limited telephone, fax, and US Mail support for the beta NID product (known as NSM).

We assisted CIAC in fielding versions of NSM locally in response to an intrusion incident.

We continued to collect attack signatures as intrusions were recognized and added these signatures to our informal database.

Work on real-time NID has been rescheduled to the third quarter, shortly after release of NID version 1.0.

III. Security Profile Inspector for Unix and VMS Operating Systems (SPI/UV)

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060103	\$315K	\$225K

SPI 3.0.1 for Unix was released on March 21st. Over 140 individual SPI 3.0.1 distribution packages, including User's Guides, informational briefs, and release notes, were mailed to DOE CSSM and CPPM personnel. This maintenance release contains both functional and portability enhancements. Modifications to the installation procedures now allow the product to be built on multiple machines while sharing an NFS-mounted SPI source directory. Portability has been extended to the DEC-Alpha platforms running under OSF-1 Unix. The microphone vulnerability has been addressed through inspection of device permissions. The Build procedure now works even when the "yacc" utility is not present.

SPI-ANNOUNCE and SPI-NOTES E-mail subscription lists were established to provide uniform and timely announcements of SPI release information, and to consolidate requests for SPI product enhancements from the user community. These are network-based electronic mail systems for rapidly sending and receiving information on SPI.

The SPI team will develop SPI training workshops to be conducted at Los Alamos National Laboratory in early June. It is expected that other major DOE sites may request these workshops.

To provide continuing and up-to-date authentication tables for the SPI Binary Inspector Tool (BIT), the SPI team, in cooperation with Sun Microsystems, is developing a table standard called BASIS. The proposed standard will be

presented at the 16th DOE Computer Security Group Training Conference in Denver on May 4th.

Progress continued in the effort to port the SPI/Unix security inspector to VMS systems. System-dependent file I/O codes were isolated for replacement with generic calls to the appropriate VMS or Unix support libraries; and filename manipulation/recognition routines were written which support both VMS and Unix conventions. A DCL (DEC Command Language) installation script was created to build the SPI/Unix code hierarchy in the VMS environment.

Data extraction routines for user account information from the VMS SYSUAF.DAT are in the implementation phase. This work involves generalization of the encrypted password formats and encryption routines between the Unix and VMS models.

IV. Text Analysis Project (TAP)

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060103	\$315K	\$98K

TAP's analysis capabilities continue to be improved: specific distinctions are now made between dates and quantities in order to guard against certain false positive possibilities. TAP can now pre-filter files from commonly used word processors to facilitate the text analysis process. We continue to look for possible methods of automatically encoding other DOE Classification Guides. Discussions were initiated with William Huntman (LANL) about the possibility of testing TAP at Los Alamos in June. Additional test files to further calibrate the prototype TAP software continue to be sought both at LLNL and in Washington.

V. Network Mapping and Detection of Unauthorized Cross-Connections (NetMap)

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060103	\$182K	\$47K

Jim Rothfuss joined the NetMap Project during this quarter. He contributed significantly to the project through a survey of computer security and network management staff at more than twenty DOE facilities. The survey concentrated on the classified computing environments found within the DOE and the trends expected in the future. Principal results showed strong and growing presence of both IBM-PC, DEC, and Unix networks, dominated

by the TCP/IP, DECNET, and Novell NetWare protocols. The results of this survey were used to construct the NetMap Project Requirements document.

Tool selection continued, making use of the survey results, and the possible candidates were narrowed to two: SunNet Manager from SunConnect and OpenView from Hewlett Packard. Both support hardware platforms and network protocols shown to be dominant within DOE. Hands-on evaluation began, and the final selection is expected soon.

VI. Computer Viruses: Prevention, Detection, and Mitigation

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060103	\$55K	\$55K

The process for establishing a sub-contract to UC Davis to meet our research objectives in the area of malicious code was completed and work will commence during the second half of this fiscal year.

VII. Distributed Auditing System (DAS) Development and Standards

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD060103	\$100K	\$43K

Debra Banning, the principal investigator on this effort, departed SPARTA, Inc. to work elsewhere. As a result, we have been discussing the direction of this effort with newly assigned SPARTA personnel. We aim to continue the original scope of work, while perhaps placing new emphasis on certain parts of the DAS.

**APPENDIX A. A SUMMARY OF ALL MILESTONES AND DELIVERABLES
FOR THE QUARTER**

I. Computer Incident Advisory Capability (CIAC)

B&R No. GD060303

No milestones or deliverables to report this quarter.

II. Network Intrusion Detector (NID)

B&R No. GD060103

The presentation at the Automated Information Systems Security course in Oak Ridge in January stands for a partial completion of the "Users/Training Session" milestone.

The "Delivering NID 1.0" milestone was moved back to mid-April.

III. Security Profile Inspector for Unix and VMS Operating Systems (SPI/UV)

B&R No. GD060103

Full release of SPI 3.0.1 for Unix systems was delivered on March 21st. DES-encrypted product and documentation are available electronically as well as in a variety of magnetic tape formats.

IV. Text Analysis Project (TAP)

B&R No. GD060103

No milestones or deliverables to report this quarter.

**V. Network Mapping and Detection of Unauthorized Cross-Connections
(NetMap)**

B&R No. GD060103

The Software Requirements Specification for the NetMap Project was completed.

VI. Computer Viruses: Prevention, Detection, and Mitigation

B&R No. GD060103

The sub-contract was placed with UC Davis.

VII. Distributed Auditing System (DAS) Development and Standards

B&R No. GD060103

No milestones or deliverables to report this quarter.

APPENDIX B. A LIST OF ALL PUBLICATIONS PRODUCED DURING THIS
QUARTER

None.

DOE Automated Physical Security

Greg Davis, Program Manager

INTRODUCTION

The continuing goal of the DOE Automated Physical Security task (DAPS) is to enhance the LLNL developed Argus Integrated Security system to meet DOE security needs and to transfer Argus to the private sector.

Having entered into a Cooperative Research and Development Agreement (CRADA) with Martin Marietta Information Systems (MMIS) to make the Argus Security technology ready for applications in the commercial sector, our goal is to successfully complete the 3 year course outlined in the CRADA.

SUMMARY OF MAJOR ACCOMPLISHMENTS

I. The Argus Security system CRADA document was completed and signed. The signing ceremony took place at Livermore on 2/4/94 and a progress review was held at Livermore on 4/6/94.

TASK DESCRIPTIONS AND QUARTERLY PROGRESS

<u>B&R No.</u>	<u>Funding</u>	<u>Obligated</u>
GD 06 0201	\$300K	\$140K

I. Technology Transfer

The LLNL/MMIS Argus CRADA was signed on February 4 in a signing ceremony at LLNL. The CRADA was signed for the Laboratory by Associate Director Ronald Cochran and for Martin Marietta by Vice President Richard Costa. Photographs from the event and press releases were generated and provided to Darryl Toms and Carl Pocratsky during briefings in Germantown Feb. 23 and 24.

Five Martin Marietta employees have taken up residence in T1677, the building which houses the Argus development team. The five MMIS employees are: Janette Bullard (database), Jack Gittings (software lead), Allen Stephen (database), Nick Vanatta(system engineering), and Rick Weatherspoon (system engineering). They arrived at the Lab early March and, due to space availability problems, they were not able to move into the Limited area where the Argus development team resides. Limited area space

is now being made available by the FESSP program and final moves are expected to take place on 5/13/94.

The newly arrived MMIS CRADA team members were immediately connected to the Lab backbone communications network to allow electronic mail and electronic file transfer. Briefing sessions were held with all development team leaders and a complete documentation set was provided. Within a few weeks, the CRADA team members were attending regularly held development team meetings and beginning to become familiar with the Argus system. Access to the Argus software development system was hampered by the fact that the team was housed outside the limited area. Argus development rules place security restrictions on access to the software development system. We made a limited area office available to the team for connection to the development system. They then had equipment delivery problems from their computer vendor, so some loaner terminals were obtained and set up in the room. For the last few weeks, the CRADA team has had the ability to read and review source code for all of the Argus software in our code management system.

A review of the CRADA was held on 4/6/94 in Livermore. It was attended by Richard Costa, VP of Martin Marietta Information Systems, CK Chou, Deputy Associate Director for Energy and FESSP program leader, the Martin CRADA team and FESSP program management. The review indicated that the CRADA is off to a good start. The tasks outlined in the joint work statement were reviewed and the schedule developed by the Martin team for the next three years was presented.

One development was that the milestone for demonstration of the small host Argus system was modified to be more of a full Argus demo. The plans were expanded from a small, single computer demonstration to a larger comprehensive demonstration facility. The facility is planned to be constructed and tested at LLNL. We are actively seeking space from the FESSP program to assemble the facility. After demonstrating Argus functionality, the facility is scheduled to be moved to Orlando, Florida and placed in a permanent demonstration facility. Martin has requested a rescheduling of the 3/29/94 milestone to 8/1/94 to allow them time to learn more about Argus and to properly plan the facility.

Martin has expressed concern to us and to our Technology Transfer program that funding limitations for the LLNL support of this CRADA may hamper their ability to rapidly commercialize the Argus technology. The first month of full CRADA activities generated charges which cannot be sustained with the current available funding. We anticipate that these charges are associated with the starting up of the project and that they will drop to sustainable levels.

II. Argus Standardization effort

There has been no activity in this area.

APPENDIX A. A SUMMARY OF ALL MILESTONES AND DELIVERABLES FOR THE QUARTER

DELIVERABLE STATUS TABLE

Original Deliverable	Description of Deliverable	Status
11/29/93	A Joint Work Statement for Argus CRADA will be Completed.	Completed 11/29/93
03/29/94 moved to 8/1/94	A prototype single small computer Argus Host with Access Control, Intrusion Detection, and Console operational capability will be demonstrated at DOE HQ or Livermore	Milestone delivery date moved On schedule
09/30/94	Final report on Electronic Security System standardization will be submitted. A year end report on CRADA activities will be submitted.	On schedule

APPENDIX B. A LIST OF ALL PUBLICATIONS PRODUCED DURING THIS QUARTER

None

DOE Automated Visitor Access Control System

Eric Steele, Program Manager

INTRODUCTION

The goal of this project is to minimize delays experienced by DOE employees for legitimate classified visits to DOE sites and enhance the ability of visitor facilities to positively identify the visitor.

An improved procedure for handling classified visits was developed as part of this task in FY 93 and support for the extension of these procedures to other sites is part of this year's objectives. Additionally, a feasibility study using hand geometry biometrics technology to validate visitors was completed, and the objective of this year's tasking is to extend these results to a prototype system that can be implemented complex-wide. Support for the extension of these procedures to other sites as well as making critical enhancements is part of this year's objectives.

SUMMARY OF MAJOR ACCOMPLISHMENTS

- I. Improvements on the DISS biometrics interface for the Macintosh system were accomplished. Major portions of the biometrics verification routines were completed.
- II. Draft biometrics verification procedures were developed. The final version will be integrated and published with the DOE Automated Visitor Access Control System Guide.

TASK DESCRIPTIONS AND QUARTERLY PROGRESS

Accomplishments achieved during the first quarter of FY 94 by STP are described below:

B&R No.
GD 06 0201

Funding
460K

Obligated
190K

I. Classified Visit Procedures Improvement - Clearance Query Screen Enhancements

It was determined during the DAVACS testing period that additional data fields would be required on the Clearance Query screen. Survey forms were distributed to all facilities within the DOE complex requesting input for the additional fields. Survey results have identified the need for multiple clearance information including all active clearances, grant dates, and clearance numbers. This additional data on the Clearance Query screen will allow facilities to make a more informed decision regarding requests for classified visits.

A meeting has taken place at LLNL with Rob Carpenter, the CDSI programmer from DOE/HQ to discuss the feasibility of the additional fields. Mr. Carpenter concurred that the fields were feasible. Mr. Carpenter indicated a 30 day turn around time would be required to complete the programming at DOE/HQ. A letter has been drafted to Ernie Wagner DOE/HQ for the final approval process.

II. Visitor Biometrics Verification

Improvements on the DISS biometrics interface for the Macintosh system were accomplished. Major portions of the biometrics verification routines were completed. Draft biometrics verification procedures were developed. The final version will be integrated and published with the DOE Automated Visitor Access Control System Guide.

Rob Carpenter-CDSI programmer from DOE/HQ, visited LLNL on 1/10/94 to get an overview of the biometrics verification task and progress. Another meeting was held with Mr. Carpenter on 2/24/94 to resolve the issues of biometrics template storage and retrieval. Tasking for the modification of the CICS query screen for biometrics utilization was discussed. A letter to Ernie Wagner outlining the CICS query screen modification task was sent 03/31/94.

A meeting was held with CTA Corporation to discuss 3D hand geometry testing results. This company has done extensive testing for NSA on biometrics devices.

III. DISS Communication Security Analysis

A meeting was held 2/23/94 with Information Resource Engineering Inc. (IRE) regarding testing of their encryption equipment at DOE/HQ. This second encryption device was installed in order to compare the two encryption devices in operation. Operational testing of the CYLINK Corporation's encryption was installed as part of the FY 93 tasking.

Coordination with Joe Juras HR-251 to allow modifications to the DISS computer system has begun. A meeting was held 2/24/94 with Mr. Juras and HR representatives regarding DISS encryption. This meeting was to discuss HR's involvement with the design and installation of a DISS encryption system.

This task has been placed on hold pending direction from Darryl Toms, SA-121.

APPENDIX A. A SUMMARY OF ALL MILESTONES AND DELIVERABLES FOR THE QUARTER

Original Milestone	Description of Milestone	Status
01/01/94 -	Classified Visit Procedures Improvement - Document additional data field Requirements of DISS/CVCS Query screen; draft report to DOE HQ for review and concurrence.	Completed
01/15/94 -	Classified Visit Procedures Improvement - Identification of DISS/CVCS data fields for file transfer to DOE sites. This task has been delayed pending review and approval of SA-122.	Pending SA-122
03/01/94 -	Classified Visit Procedures Improvement - Implement DISS/CVCS data fields into production system for file transfer to DOE sites. This task has been delayed pending review and approval of SA-122.	Pending SA-122
03/01/94 -	DISS Communications Security Analysis - Begin encryption test. This task is on hold pending direction from Darryl Toms SA-121.	On Hold
03/15/94 -	Classified Visit Procedures Improvement -Begin testing by LLNL of DISS/CVCS data fields for file transfer for DAVACS back-up and cancellation of active visits based on terminated clearances. This task has been delayed pending review and approval of SA-122.	Pending SA-122

**APPENDIX B. A LIST OF ALL PUBLICATIONS PRODUCED DURING THIS
QUARTER**

None

**DATE
FILMED**

6 / 28 / 94

END