

INTERIM REPORT

September 3, 1980

Accession No. _____

Contractors Report No. _____

Contract Program or Project Title: Physical Protection of Nuclear

Facilities

Subject of this Document: Progress reported for July 1980

Type of Document: Informal monthly progress report

Author(s): Leon D. Chapman

Date of Document: August 19, 1980

Responsible NRC Individual and NRC Office or Division: _____

Richard C. Robinson, Safeguards Research Branch

This document was prepared primarily for preliminary or internal use. It has not received full review and approval. Since there may be substantive changes, this document should not be considered final.

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87115

Prepared for
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

NRC FIN No. A1060

DISTRIBUTION

- T. Murley
- C. Beck
- B. Erickson
- B. Evans
- G. McCorkle
- J. Partlow
- E. Perchonok
- T. Sherr
- J. Hockert
- M. Fadden
- W. Brown
- J. Montgomery
- O. Chambers
- W. Schwink
- J. Miller

INTERIM REPORT

NRC Research and Technical
Assistance Report

8009090 132

PHYSICAL PROTECTION OF NUCLEAR FACILITIES

Progress Report
July 1980

Prepared by
Leon D. Chapman
Safeguards Methodology Development Division 4416
Sandia National Laboratories

Prepared for
Division of Safeguards, Fuel Cycle and Environmental Research
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under Memorandum of Understanding DOE 40-550-75
NRC FIN No. A1060

18 August 1980

NRC Research and Technical
Assistance Report

PHYSICAL PROTECTION OF NUCLEAR FACILITIES

Progress Report

SUMMARY

In-house activities during July included continuation of vital area analyses of operating reactor facilities and further work on modifications to the Brief Adversary Threat Loss Estimator (BATLE) model.

Contractual support continued to be provided by Science Applications, Inc. (SAI) and Pritsker & Associates, Inc. SAI continued to assist in the refinement of generic sabotage fault trees (GSFTs) developed by Sandia National Laboratories, Albuquerque (SNLA). These revisions will facilitate the use of the fault trees. SAI was also involved in the application of the Matrix Analysis of the Insider Threat (MAIT) method for the evaluation of reactor sabotage. Pritsker & Associates, Inc. continued their development of a graphical input/output (I/O) for the Safeguards Network Analysis Procedure (SNAP).

FACILITY CHARACTERIZATION

In-House Activities

Vital Area Analyses

The vital area analyses of operating reactor facilities, which are being performed jointly by the Los Alamos National Scientific Laboratory (LANSL) and SNLA for the U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards (NRC/NMSS), continued during July. Three pressurized water reactor (PWR) facilities and one boiling water reactor (BWR) facility were analyzed during the month. The current status of these analyses is as follows:

1. Changes were received and analyses rerun for BWR No. 11 and PWR Nos. 19 and 21, and
2. Cards were received from LANSL and an analysis run for PWR No. 22.

A paper, Vital Area Analysis Using SETS, SAND80-1095, by D. W. Stack and K. A. Francis, was published during July. This paper describes the advantages of performing a transformation of variables without first determining the minimal cut sets of the fault trees being analyzed. A "bottom-up" approach to solving fault trees using the Set Equation Transformation System (SETS) is presented. The techniques described for vital area analyses are also suitable and efficient for many kinds of common cause analysis.

Another paper, "Vital Area Analysis for Nuclear Power Plants," was presented by G. Bruce Varnado at the annual meeting of the Institute of Nuclear Materials Management (INMM). This paper discussed the status of the LANSL/SNLA effort in support of NRC reviews of currently operational power plants.

Tentative plans for continuing the vital area analysis effort next fiscal year have been discussed with LANSL. LANSL plans to increase their staff for this project by 50% and to complete the analysis of 27 facilities during the year. SNLA has been requested to increase its level of effort to cover the expected work load.

Contractual Support

Sandia representatives visited SAI, La Jolla, California, on 17 July 1980 to discuss SAI's contractual assistance in the refinement of the GSFTs developed by SNLA. Discussions centered on the development of generic PWR and BWR tree tops and system level fault trees, questionnaires, answer sheets, and analyst's instructions similar to those recently completed for the generic component fault trees.

EVALUATION METHODOLOGY

In-House Activities

Automation of System Evaluation

Paper Presentation -- A paper entitled, "A Combined SAFE/SNAP Approach to Safeguards Evaluation," SAND80-0529, was presented at the 21st annual meeting of the INMM, 30 June to 2 July 1980. The paper addressed safeguards evaluation from both the global and the scenario approach to evaluation. The application of the Safeguards Automated Facility Evaluation (SAFE) methodology and SNAP, along with their interface, was described and illustrated through an example.

Computer Code Modifications -- Changes continue to be made to the report, "Brief Adversary Threat Loss Estimator (BATLE) User's Guide," to reflect recent improvements to the BATLE model. Also, a table of possible options for independent and dependent output variables from the BATLE Graphics code was generated, and a study of the feasibility of interfacing the BATLE plots with the EASI Graphics routines was conducted.

Contractual Support

SNAP Application Development

SNAP Graphical I/O -- Pritsker & Associates, Inc. continued their work on the development of a graphical I/O for SNAP. During July, this

work concentrated on (1) development of a code to view the SNAP trace output on the Tektronix 4014 terminal, (2) coding of several support routines, and (3) development of two support programs to aid in the generation of data files required for testing the trace output package.

The viewing code for the Tektronix 4014 terminal will be completed and debugged during August. The first of the support routines, subroutine GTRACE, has already been incorporated into SNAP to create the graphics output trace file. This subroutine is called from BMONT; minor changes to BMONT are required in order to utilize the graphical trace feature.

The first data-file generation support program is utilized to draw the facility diagram on the Tektronix 4014 terminal and to generate a correctly formatted data file. This routine can be used to generate any facility drawing, subject to the restriction that it can be stored in the format described in the SNAP graphical I/O documentation. The other support program is used to create the node record location required to move the guard/adversary figures throughout the facility. This program can be used to generate node record labels for any of the SNAP node types used in the facility diagram. Note that these routines have not been refined and, at present, will not permit editing of the files they create.

Data files required to test the trace output routines have been generated; the trace output program is currently being developed. The commands in the output documentation have been modified to reflect restrictions contained in the Tektronix terminal.

Insider Reactor Sabotage Analysis

During July, SAI continued to model the alternative physical protection system configurations and to evaluate these alternatives using the MAIT approach. A meeting was held in Washington, D.C., on 15 July 1980 to discuss the approaches being considered. During this meeting, NMSS personnel requested a major effort be expended to provide general summary results of all analyses. In response to this request, SAI has

initiated a crash effort to produce three draft working papers which deal with team and area zoning, operation zoning, and time zoning. The first of these papers has been delivered; the second and third are scheduled for delivery on 11 August and 18 August, respectively.