

INTERIM REPORT

July 22, 1980

Accession No. _____
Contractors Report No. _____

Contract Program or Project Title: Physical Protection of Nuclear Facilities

Subject of this Document: Progress reported for June 1980

Type of Document: Informal monthly progress report

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Date of Document: July 9, 1980

Responsible NRC Individual and NRC Office or Division: _____

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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.

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NRC FIN No. A1060

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8007290233

PHYSICAL PROTECTION OF NUCLEAR FACILITIES

Progress Report
June 1980

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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. A1050

2 July 1990

Assistance Report

PHYSICAL PROTECTION OF NUCLEAR FACILITIES

Progress Report

SUMMARY

In-house activities during June included (1) continuation of vital area analyses of operating reactor facilities, (2) further modification to the Brief Adversary Threat Loss Estimator (BATLE) model, and (3) additional work on the interface between the Safeguards Automated Facility Evaluation (SAFE) methodology and the Safeguards Engineering and Analysis Data-Base (SEAD).

Science Applications, Inc. (SAI) continued to provide assistance in the expansion and revision of generic sabotage fault trees (GSFTs) developed by Sandia National Laboratories, Albuquerque (SNLA) and to work on the insider reactor sabotage problem. Work by Pritsker & Associates, Inc. during June concentrated on the development of a graphics input/output (I/O) segment of the Safeguards Network Analysis Procedure (SNAP) and documentation of the results of this effort.

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 June. Two pressurized water reactor (PWR) facilities

and three boiling water reactor (BWR) facilities were analyzed during the month. The current status of these analyses is as follows:

1. Cards were received from LANSLS and analysis run for PWR No. 21,
2. Two sets of changes were received and two analyses run for PWR No. 18 and BWR No. 7, and
3. Location changes were received and analyses rerun for BWR Nos. 11 and 12.

Contractual Support

SAI continues to assist in the expansion and revision of GSFTs developed by SNLA. These revisions are being made in order to improve the utility of the trees and to reduce analyst time required for their application. During June, a report entitled, "Recommended Modification of the GSFT to Provide an Integrated Treatment of Transients and LOCAs," was submitted to Sandia for comment and review. A representative from SAI visited SNLA on 12 June 1980 to discuss this report and the three-volume report submitted by SAI in May 1980.

EVALUATION METHODOLOGY

In-House Activities

Automation of System Evaluation

Computer Code Modifications -- The BATLE code has been expanded to handle a new combatant parameter, "tactic." An individual combatant in BATLE can be described as having either a defense tactic or an assault tactic. An individual assigned an assault tactic has a 20% to 40% greater probability of becoming a casualty than an individual who uses a defense tactic. The actual percentage increase depends on the type of weapon used.

The BATLE user has the option of specifying the initial probability mass for the BATLE transition diagram. This option permits alteration of the states of the transition diagram to values other than

those used for the initial state. Such a feature would be useful, for example, if two sequential simulations were planned, with the steady-state probability mass of the first simulation used as the initial state of the transition diagram for the second simulation. An example of the use of this option has been prepared for inclusion in the BATLE user's guide, which is currently being written.

A paper on the BATLE model (SAND80-1528A) has been submitted for presentation to the Fourth Biennial Cube Symposium.

SAFE/SEAD Interface -- The SAFE/SEAD Interface (SEADIF) program has been compiled, and work continues on the division of this program to provide an overlay structure which will allow the program to be loaded onto the SNLA Network Operating System (NOS) time-sharing system. A suitable point for dividing the program must satisfy criteria from three standpoints. The point of division must assure (1) that there is no disruption of the program's instructional structure, (2) that there is no disruption of common and array usage, and (3) that the location of subroutine calls be considered with regard to the size of the subroutines. This process is nearly complete for SEADIF.

Contractual Support

SNAP Application Development

SNAP Graphical I/O -- During June, work by Pritsker & Associates, Inc. on the SNAP graphics task centered on the SAFE/SNAP interface design. The design of the interface and the user's method of manipulating the various library files was fully outlined in an internal memorandum, "Random Access Library for SAFE/SNAP Interface." This document discusses the library commands, method of operation, and overall philosophy of the system interface. In addition, the document outlines the record structures necessary for implementation of this system.

The design of the graphic input editor and the output display package has been completed. The input editor is discussed in the memorandum, "Graphic Input Editor for SAFE/SNAP Interface." This document details the commands and methodology the user will invoke when editing or creating network models. The input editor system has been designed to provide the maximum amount of user convenience while maintaining system compatibility with the Tektronix 4014 graphics terminal.

The design of the output package was also completed; this package is discussed in "SNAP Graphics Output Package." The output package permits the user to view a SNAP output trace on the Tektronix 4014 terminal and to observe security force/adversary movement throughout a SAFE digitized facility. It will also permit the user to make decisions during the display process, on whether to redraw the facility, stop the illustration output, or skip to a specified simulated time mark.

Work on the graphics task currently involves programming the output package. The design of the program structure and a trial facility description which conforms to the new record structure are both under development.

Insider Reactor Sabotage Analysis

During June, SAI work on insider reactor sabotage analysis centered on identification and consideration of details necessary for implementing alternative physical protection system configurations. In developing the candidate alternative systems, it seems apparent that no "pure" system would be universally acceptable in terms of both effectiveness and efficiency. The ultimate recommended system most likely will be synthesized from various parts of each of the zoning techniques.

Modeling activity is proceeding based on the target set defined; however, a reexamination of this set may be warranted. Such an examination would provide assurance that the targets are appropriate and that extrapolation by the NRC of generic results will apply to meaningful situations.