

OCT 12 1978

INTERIM REPORT

Accession No. \_\_\_\_\_

Contractor's Report No. \_\_\_\_\_

Contract Program or Project Title: Physical Protection of Nuclear

Material In-Transit Project

Subject of this Document: Progress reported for August 1978

Type of Document: Informal letter progress report

Author(s): Leon D. Chapman

Date of Document: 9/29/78

Responsible NRC Individual and NRC Office or Division: \_\_\_\_\_

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Prepared for  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555  
NRC STANDARD ORDER NO. 60-78-096  
NRC FIN No. A1173

7810200009

INTERIM REPORT

PHYSICAL PROTECTION OF NUCLEAR MATERIAL IN TRANSIT

Progress Report

August 1978

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NRC Research and Technical  
Assistance Report

13 September 1978



# PHYSICAL PROTECTION OF NUCLEAR MATERIAL IN TRANSIT

## Progress Report

### I. Program Staffing

Principal members of the technical staff at Sandia Laboratories who participated in the Nuclear Regulatory Commission (NRC) physical protection of nuclear material in transit program during August are listed in Table I.

TABLE I

#### Participating Technical Staff

<u>Name</u>	<u>Principal Activity</u>
D. Engi	Conflict Analysis
C. Harlan	CONVOY Review
P. De Laquil	SABRES II
W. D. Lyle	Communications Modeling
R. L. Rinne	Documentation
K. G. Stimmell	SOURCE
N. R. Wagner	Weapons Effects

### II. Highlights

Representatives from the NRC Office of Regulatory Research (RES) and NRC Office of Nuclear Material Safety and Safeguards (NMSS) visited Sandia Laboratories, Albuquerque (SLA) on August 15 and 16 for an informal meeting to review current research activities. Charlie Frasier of Science Applications, Inc. (SAI) presented the results of Tasks II and III of the SAI communications modeling work, and various SLA staff members demonstrated interactive computer models.

### III. Program Developments

Convoy Analysis -- The user version of SOURCE is presently being tested. The user version differs in several aspects from earlier versions in that refinements have been made to the data base and output capabilities. Several example problems are being run to test the new code and demonstrate the output formats.

Conflict Analysis -- Work was begun on the development of subroutines for SABRES II which will be used to simulate movement during combat. In these simulations, individuals will move in straight lines from their present locations to a series of objectives. The individuals will take advantage of any cover or concealment along the route. Movement rates are determined according to the slope of the terrain, the vegetation traversed, the posture and suppression level of the mover, and whether or not the mover is currently under fire.

The SABRES interactive version was updated to include the new detection model. It is planned that the movement routines will first be incorporated into the interactive version, where movement objectives can be plotted by the user.

Casualty Assessment -- The methodology for computing an equivalent cube mass-velocity term for an arbitrary bullet for use in the Kokinakis-Sperrazza equation was integrated into the Small Arms Casualty Evaluation Model (SACEM). This method computes the incapacitating potential of a striking bullet from the estimated energy deposited in the target. The bases for these computations are the drag coefficients from gelatin block firing test data and existing sphere and cube incapacitation data.

Representative accuracy and incapacitation data were developed to characterize the .30-06 and .30-30 sporting rifles. These data are intended for use in an unclassified version of the SOURCE convoy ambush model.



Emergency Assistance Request Simulator -- A simulation model of a communication system similar to the government SECOM II system is under development. When fully operational, this model, the Emergency Assistance Request Simulation (EARS), will be capable of simulating a communication system containing up to 100 transporters. The model will also be capable of handling system jamming. An important output from this model will be a statistical characterization of first alert time, which is defined as the time difference between initiation of a transporter emergency message and receipt of the message at the movement control center (MCC). This time segment is the most important measure of the effectiveness of the communication system. Projected future work includes the development of a response force arrival time model that would use this time as an input to the model.