UCRL-52117

HOT SPOT EXERCISE—1975 (HSX-75)

R. T. Trolan
R. L. Wilson
F. W. Jessen

August 23, 1976

Prepared for U.S. Energy Research & Development Administration under contract No. W-7405-Eng-48

Printed in the United States of America
Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
Price: Printed Copy $; Microfiche $3.00

Page Range	Domestic Price	Page Range	Domestic Price
001–025	$ 3.50	326–350	10.00
026–050	4.00	351–375	10.50
051–075	4.50	376–400	10.75
076–100	5.00	401–425	11.00
101–125	5.50	426–450	11.75
126–150	6.00	451–475	12.00
151–175	6.75	476–500	12.50
176–200	7.50	501–525	12.75
201–225	7.75	526–550	13.00
226–250	8.00	551–575	13.50
251–275	9.00	576–600	13.75
276–300	9.25	601–up	*
301–325	9.75		

*Add $2.50 for each additional 100 page increment from 601 to 1,000 pages; add $4.50 for each additional 100 page increment over 1,000 pages.

Distribution Category
UC-41

LAWRENCE LIVERMORE LABORATORY
University of California Livermore, California 94550

UCRL-52117

HOT SPOT EXERCISE—1975 (HSX-75)

R. T. Trolan
R. L. Wilson
F. W. Jessen

MS. date: August 23, 1976

Contents

HOT SPOT EXERCISE—1975 (HSX-75)

Introduction

Lawrence Livermore Laboratory (LLL), in response to requirements from the U.S. Energy Research and Development Administration (USERDA), maintains a continuing capability to respond to nuclear weapon accidents or incidents upon authorization from the Assistant Administrator for National Security (AANS). The ERDA responsibilities are defined in ERDA Manual Chapter 0527, and are oriented toward providing technical support and expertise to the Department of Defense (DOD) upon formal request according to a joint agreement revised in 1970. The Joint Chiefs of Staff (JCS) will formally notify the Division of Military Application (DMA), ERDA Headquarters, that a nuclear weapon accident or incident has occurred. Subsequently, the Director, DMA, with the approval of the AANS, will arrange for the formation and dispatch of an ERDA Accident Response Group (ERDA/ARG) with the necessary specialized equipment via military or commercial transportation. If the accident is a Broken Arrow involving an LLL designed weapon, the ERDA/ARG in all probability will include the LLL HOT SPOT Team equipped with the mobile counting laboratory (Trailer 113) and decontamination facility (Trailer 114). The HOT SPOT Team will support the DOD under the direction of the on-scene ERDA representative and the LLL Senior Scientific Advisor. The ERDA/ARG is structured in this manner to provide the best utilization of the technical expertise of each individual and the design capability of specialized equipment.

A special unannounced exercise, called HOT SPOT Exercise — 1975 (HSX-75), was prepared to test the general capability of the LLL ALERT Program to activate and deploy the LLL and Sandia Laboratory, Livermore (SLL) component of the ERDA/ARG. The exercise activities were limited to the LLL facilities in Livermore and the Site 300 explosive test facility located approximately 15 miles southeast of Livermore. The exercise simulated an accident at a U.S. Army storage facility (Site 300). The simulated accident involved two LLL designed weapons (W-70). One weapon was dropped during unloading operations and ignited the gas tank of the weapon transporter. The subsequent fire caused a low-order detonation of the high explosive

component. The fire caused dispersal of fissile material downwind from the site. A second weapon was damaged in the explosion by fragments from the first weapon. The extent of damage to the second weapon was initially unknown.

The exercise was initiated through the LLL Police Communications Center. The immediate notification of a LLL Senior Scientific Advisor (SSA) and his initial actions developed essential information on which to evaluate the requirement for selection of the appropriate HOT SPOT Team members and equipment. This information was provided by an ERDA representative (played by an LLL staff member). The Army's 34th EOD Team was actually deployed to the exercise site in advance to better simulate a normal initial accident response. An Officer from the Defense Nuclear Agency (DNA) group at LLL portrayed the role of the On-scene Military Commander (Major General). These personnel constituted the military structure to which the ARG provided support. Figure 1 shows the ERDA/ARG organization and those players who fulfilled specific functions.

Exercise guidelines were established utilizing the following references:

1. Lawrence Livermore Laboratory Alert Emergency Response Plan.
2. AEC Manual Appendix 0527 "AEC Response to Accidents Involving Nuclear Weapons in the Custody of the DOD" (Handbook), February 15, 1972.
   - Part I Introduction
   - Part II Standard Operating Procedures
   - Part III AEC Accident Response Group Organization and Duties
   - Part IV AEC/ARG Roster of Qualified Personnel
3. AL Chapter 0527 "AEC Response to Accidents Involving Nuclear Weapons in Custody of the DOD," August 14, 1972.

The exercise was conducted on September 23, 1975. A complete description of the specific nature of the simulated accident is contained in the scenario. Umpires were assigned to evaluate and subsequently report on the effectiveness of the response (Appendix G). All test objectives were accomplished.

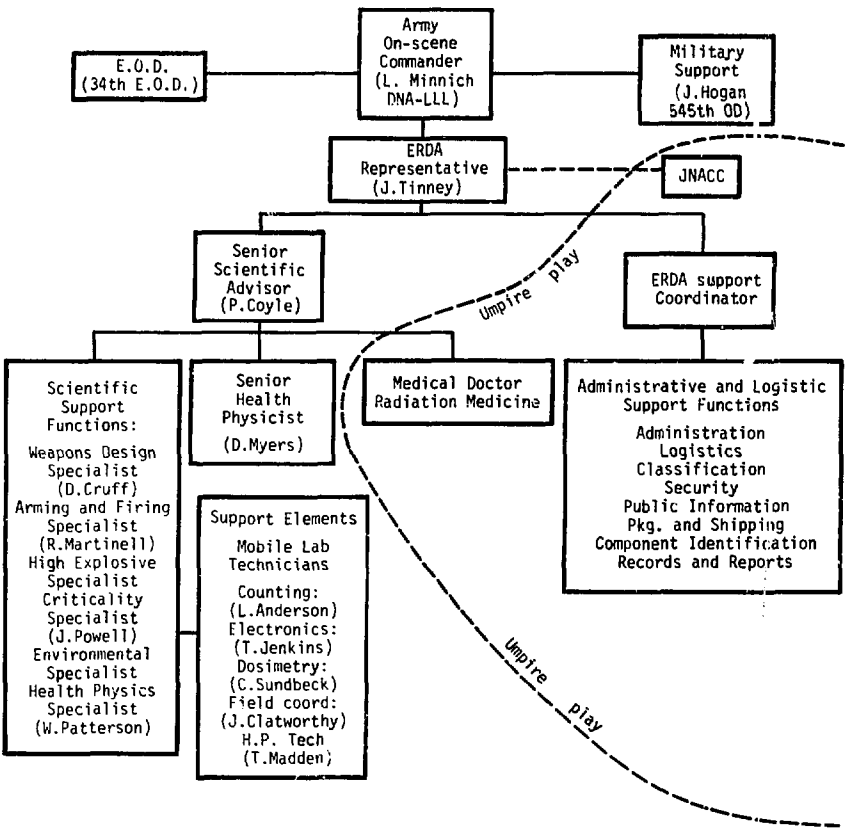

Fig. 1. ERDA/ARG organization.

Objectives

- Check the LLL operational procedures and guides for adequacy in accordance with existing ERDA plans. Additionally, the exercise presented an opportunity to interface with DOD elements (EOD) under simulated accident conditions.
- Test the effectiveness of the LLL Police Communications Center and LLL Emergency Dispatcher (Fire Department) to initiate proper communications procedures which enabled the prompt activation of the LLL/SLL components of the ARG and other support organizations requested by the SSA.
- Test the response readiness of the LLL/SLL components of the ERDA/ARG, including the HOT SPOT equipment.
- Conduct a serviceability check under emergency field conditions of the instrumentation and stored equipment on the mobile counting laboratory (Trailer 113) and mobile decontamination facility (Trailer 114).
- Permit an evaluation of the effectiveness of the LLL Atmospheric Release Advisory Capability to support ARG field operations.

Exercise Control and Limitations

Alert personnel and members of the LLL/SLL ARG components with primary duties involving contact with facilities other than LLL were advised prior to the exercise to simulate their inputs (i.e., make no actual contact with any person or agency outside LLL). Inputs of information and/or requests to outside agencies, etc., were made to umpire personnel at Laboratory extension 3974 or 3854.

Personnel participating in the succession of telephone calls necessary to accomplish team activation were instructed to first advise the person contacted that "THIS IS AN EXERCISE," and thereafter requested response in accordance with preplanned procedures. Each person was requested to indicate to the person contacted that the exercise was limited to LLL and SLL participation only.

ALERT personnel and ARG Team members were expected to respond according to the guides set forth in the LLL ALERT Procedure.

Travel packets were checked and issued (simulated) by Business Services at the ALERT Center, Room 170, Building 111.

HOT SPOT Team members responsible for the activation of Trailers 113 and 114 were required to complete all preparations necessary for departure of Travis Air Force Base. When the preparations were completed, selected team members were instructed to transport both trailers to an off-site simulated accident area, Building 836, Site 300. Maps were provided.

HOT SPOT Team members responsible for setting up Trailers 113 and 114 were required to do so upon arrival at the simulated accident site. Use of portable generators was required. Contaminated samples were provided and appropriate analysis was made. A check for serviceability was made of vehicular apparatus, service equipment and specialized instruments.

ARG members were required to use transportation modes consistent with what would be used in an actual emergency.

The exercise umpire group controlled the course of the exercise by providing information to the players from time to time. The Senior Exercise Umpire terminated the exercise when test objectives were completed. All umpire check lists and exercise critique lists were collected and collated by the Senior Umpire.

A critique of the operation was held at 1315 hours, September 24, 1975, in Room 170, Building 111.

A final report was provided to the LLL Associate Director for Nuclear Explosives and the LLL Plant Manager 30 days after completion of the exercise.

PLANNED SCHEDULE OF EVENTS

TIME	EVENT	PERSONNEL
0730	Initiate exercise. Call made to Police Communications Center by George Mackanic.	Police Communications Center personnel.
0735	SSA identified; put in contact with ERDA representative (simulated) played by G. Mackanic.	SSA
0745	SSA tells Police Communications Center to (1) activate HOT SPOT Team, SLL representative, ARAC; (2) activate ALERT Center, identify key personnel to meet SSA there ASAP.	SSA, Police Communications Center, Health Physics, Weapons Designer, Field Coordinator, SLL representative, Business Services, ARAC.
0830	Army EOD Team at Site 300 starts response to accident situation.	34th EOD Team and Umpires.
0830-0900	Assemble HOT SPOT key personnel; brief on accident; coordinate operations.	SSA/ALERT Center Coordinator.
0930	Dispatch HOT SPOT initial and follow-on team to Site 300.	SSA, SHP, Weapons Designer, AF and F (SLL representative), etc.
1030	(1) Initial HOT SPOT Team arrives on-site Bldg. 836, Site 300 and is briefed by Army on-scene Commander and ERDA on-scene coordinator (2) Weapons Design Engineer and Arming, Fusing and Firing Specialists begin operations with Army EOD Team.	
1045	Follow-on HOT SPOT Team with trailers arrive at Building 836 and set up for field operations.	

1200-1300	Lunch at Site 300 for exercise personnel. Rotate operational crews.	
1300-1530	Site Operations • Health Physics (HOT SPOT) • EOD Operations (LLL/SLL) • Senior Scientific Advisor	All field personnel.
1530	Terminate exercise.	All field personnel.
1530-1630	Secure equipment and return exercise personnel to Livermore.	

NOTE: Critique of the Exercise HSX-75 will be in Room 170, Building 111 at 1315 on the day following the exercise.

1315	Opening remarks.	
1330-1400	Review of the exercise*	
	• Initial operation	
	(1) Communications	SSA will moderate.
	(2) ALERT Center	
	• Field operations	Field SSA will moderate.
	(1) Command and coordination	
	(2) Health Physics operations	
	(3) EOD operations	

1530-1545 LLL Management observations.

---

* Senior Scientific Advisor will moderate with input from the senior representative from each major working group (i.e., Weapons Design, Senior Health Physics, AF and F (SLL), appropriate umpire personnel).

Scenario

Simulated Location: Army Ordinance Depot
Actual Location: Site 300
Time: 0630 hours, 23 September 1975
Winds: Actual at Site 300

Problem:

Two W-70 warheads arrived at an Army depot (Site 300) during the early morning hours. They were taken immediately to the storage bunker adjoining Building 836. Two forklift crews met the weapons transporter and started unloading operations. The first W-70 (Weapon A) was removed from the transporter and set to one side of the entrance to the bunker. The second forklift immediately proceeded to remove the second weapon (Weapon B). As Weapon B was lifted from the transporter the forklift hydraulic mechanism failed, dropping the weapon container against the gas tank of the transporter. The gas tank exploded in flames. The resultant fire caused the high explosive to partially burn and to detonate low-order. The smoke cloud, which contained fissile material, was carried downwind and off the military reservation.

Firefighters at the Army depot were immediately dispatched to the scene and contained the fire, finally putting it out after about 30 minutes. Firefighters removed the bodies of four workers killed in the blast. Five other persons were taken to the base dispensary. (No action was required of HOT SPOT Team members).

The Army's 34th EOD detachment located at the depot immediately moved into the accident site and cordoned off the danger area. They were dressed out in full anti-contamination gear. Their first task was to clear a path through the unexploded high explosive to Weapon A which still remained by the bunker entrance. The container was crushed to some extent by the low-order detonation of Weapon B, but the degree of damage to Weapon A was unknown at this time.

The depot Commander immediately notified his Sector Commander by telephone that a Broken Arrow had occurred at the installation. The Sector Commander, in accordance with the Sixth Army Nuclear Accident/Incident Control Plan, informed the Headquarters, Sixth Army, at the Presidio of San Francisco, and requested assistance. This request was passed through military channels to the Joint Chiefs of Staff and

thence to the ERDA Emergency Operations Center (EOC). Simultaneous calls went from the EOC to JNACC and to the LLL Police Communications Center.

MESSAGE 1. The text of the message transmitted to the LLL Police Communications Center is as follows:

THIS IS AN LLL HOT SPOT EXERCISE. I repeat. THIS IS AN LLL HOT SPOT EXERCISE. A "Broken Arrow" has occurred at an Army depot. Please put me in contact immediately with a Senior Scientific Advisor. This is a simulated emergency."

MESSAGE 2.* Message from the ERDA EOC to the Senior Scientific Advisor.

"THIS IS AN LLL HOT SPOT EXERCISE. I repeat. THIS IS AN LLL HOT SPOT EXERCISE."

For administrative purposes, this exercise has been prepared to test the response of the LLL and Sandia Laboratory Component of the ERDA Accident Response Group, and is limited to LLL and SLL personnel *only*. *You are not to involve any* person or agency outside of LLL and SLL. To make any simulated outside calls, contact Umpire Control at the Laboratory, Ext. 3974. These administrative instructions are also being given to the Police Communications Center and the Emergency Dispatcher.

The exercise message is: "I am calling from the ERDA EOC. The JCS has just informed us that a Broken Arrow has occurred at an Army depot. We believe this involves a W-70 or several W-70's. We are attempting to get more information. It appears to be a pretty bad scene. General Bratton has asked us to alert you so that you can get the HOT SPOT Team ready. We or JNACC will pass more detailed information to you as soon as it is received."

MESSAGE 3. To be used by the Emergency Dispatcher in alerting HOT SPOT Team members and ARAC personnel.

RADIO PAGE

"THIS IS TO ADVISE YOU THAT AN LLL HOT SPOT EXERCISE HAS BEEN CALLED.

---

* The caller should present enough information and establish the urgency such that the Senior Scientific Advisor will immediately contact the Police Communications Center to:

1. Activate the ALERT Center, Room 170, Building 111.
2. Contact key people to meet in the ALERT Center.
3. Call the Emergency Dispatcher at the Fire Department to start activation of the HOT SPOT Team and the ARAC.

THIS IS A HOT SPOT EXERCISE. Please report immediately to your ALERT station. Do not contact persons outside of LLL or SLL. Respond as you would in an actual incident. Thank you."

TELEPHONE

Same as above.

MESSAGE 4. Call from the Police Communications Center to ALERT Committee members.

RADIO PAGE

"THIS IS TO ADVISE YOU THAT AN LLL HOT SPOT EXERCISE HAS BEEN CALLED. THIS IS A HOT SPOT EXERCISE. The Senior Scientific Advisor has asked that you report immediately to the ALERT Center, Room 170, Building 111 at the Laboratory. Do not contact persons outside of LLL or SLL. This is an exercise. Thank you."

TELEPHONE

Same as above.

MESSAGE 5. Call from General Bratton in the EOC to LLL, SSA (to be called to the SSA in the ALERT Center).

EXERCISE MESSAGE

"Say Phil, we have some additional information regarding that Broken Arrow. One of the W-70's was involved in a fire which caused an explosion. The base Fire Department put out the fire; however, we can presume that some of the fissile material was carried downwind in the smoke cloud. It may have gone off the reservation. Can your ARAC people help us on that? Take a worse case on the parameters. The Army EOD is trying to get a second weapon which is apparently damaged. Hopefully they will have established some radiological control on the area, or we'll have the entire base contaminated. There were some casualties, apparently three or four people killed, a half dozen or so have been taken to the base dispensary.

I have JNACC checking out the airlift from Travis to the accident site for you. They'll be giving you a call before long. How long would it take you to drive up there? Perhaps you can get a chopper from the Presidio to pick up your advance party. When will they be ready? When will your HOT SPOT mobile equipment be ready? They could start for Sacramento as soon as they're ready and if we can get airlift they can go right in at Travis. I think this will be the case, if not, they're that much further along. EXERCISE OUT."

MESSAGE 6. JNACC to SSA in ALERT Center.

EXERCISE MESSAGE

"This is Dave Foster at JNACC. I've got a tail number for you on a C-141: No. 94526. They're at Travis now, and will depart as soon as you arrive. An escort will meet you at the gate. Your contact is Col. Brown, Ext. 3974. Please give him and us your ETA at Travis as soon as known. Walt White is on his way to the accident site by commercial air. He has been designated the ERDA Coordinator. EXERCISE OUT."

Alert Center Operations

When the ALERT Center is activated and the key personnel are present, the Senior Scientific Advisor can develop his plan and brief the key members of his group on the operation and receive recommendations from them. These discussions should include:

- Health Physics problem associated with the planned fissile material in the W-70.
- The plans of the W-70 for the weapons designer to take with him. Special tools or equipment required.
- Transportation to the site via Travis, airlift or actual road march. The necessity for police escort. Check with the Sixth Army Accident/Incident Control Center (NAICC) for chopper to airlift advance party to the accident site.
- Business Services check and issue of the travel packets.
- Designation of the Field Senior Scientific Advisor and advance party members.
- Request for information as to the name of the military base commander, ERDA on-scene coordinator; rendezvous location and arrival instructions.
- Strip maps and identification of routes.
- Communications requirements from the Laboratory to the accident site.

HOT SPOT Team Organization

The Senior Health Physicist will be in charge of the Hazards Control Department's component of the HOT SPOT Team in the field. When alerted, he will report to Room 1508, Building 253, unless otherwise instructed, and set up his command post. He will then call the SSA of the status of his team mobilization efforts and receive any instructions.

As team members arrive, he will select the personnel to accompany him to the field. Those in charge of the mobile laboratory and decontamination units will check the condition of the units for deployment. To insure safety when deploying, there is a short check list in the Hazards Control HOT SPOT Book which should be completed.

Arrangements should be made to obtain two LLL professional truck drivers to drive the trucks. These arrangements should be coordinated through the ALERT Center. One team member will be assigned to accompany each truck. Other HOT SPOT Team members can be transported by Government vehicles. Travel packets should be obtained for personnel deploying with the team.

Site 300 Operation

The advance party from LLL arrives at the Army Depot (Site 300) by helicopter (automobile) at approximately 1030 hours. Members of this team include as a minimum the Senior Scientific Advisor, a Senior Health Physicist, a Weapons Designer, and an Army Fusing and Firing Specialist (SLL). Contact is immediately made with the Depot Commander and the ERDA On-scene Coordinator. They are briefed by the CO of the 34th EOD detachment regarding the situation.

The situation has stabilized considerably. An exclusion area has been established around the contaminated area. The suspect areas off-site have been sealed off by the Highway Patrol and Military Police. A Hot Line has been established upwind at the gate to the fenced-in area in which the bunker is located. Only the Depot Commander can authorize limited access beyond the fenced area. Radio communication is being maintained with EOD personnel in the exclusion area. EOD personnel are experiencing some difficulty in rendering safe the damaged weapon. Assistance is requested from the LLL Weapons Designer and the SLL Arming Fusing and Firing Specialist. These individuals dress out and proceed into the exclusion area. Pathways have been cleared through the unexploded H.E. to the damaged weapon.

The Depot Commander requests advice from the SSA and SHP on fixing the contamination temporarily. Also, the Commander requests advice on handling the patients at the base dispensary to avoid further contamination. However, the SHP is not required to go to the dispensary. The SHP discusses an appropriate location for the Decon facility and the

Counting Laboratory. It appears that the parking area in front of Building 836 is adequate for space and upwind of any anticipated problem. Water is available in the parking lot for the Decon Trailer, at a suitable location next to the Hot Line. Electrical power will have to be run from the generator truck until power is restored to the area.

When the HOT SPOT Team arrives, they will place the vehicles and trailers as directed by the SHP and set up for operations. Their decon set-up should be completely integrated into the Hot Line operation established by the Army.

Team members will be dispatched to take soil samples. The data obtained from analysis of the samples should be compared/correlated with the ARAC information which is forthcoming from Livermore. When this information is received, recommendations will be made by the SSA to the ERDA Coordinator and Depot Commander regarding the significance of the levels as they affect health and safety.

The Depot Commander should solicit information and advice regarding the reduction of the exclusion area, protection equipment required in the exclusion area, cleanup processes necessary to restore the site area (asphalt and soil) to background radiation levels, and decon of equipment in the area. Advice should also be sought about releasing the area sealed by the Highway Patrol. Coordination will be required with ERDA for the shipment of weapons components recovered to some other locations; also shipment of the damaged weapon for renovation or disassembly. Arrangements will have to be made for disposition of contaminated soil, asphalt and water.

When enough information has been developed or action has been taken by the HOT SPOT Team members to make a judgment that the accident-related problems have been resolved or are sufficiently understood to permit a realistic resolution, the exercise will be terminated by the Senior Exercise Umpire. Upon termination, the equipment will be secured in the trailers and the HOT SPOT Team and mobile equipment will be returned to Livermore.

VRS/gw/sg/gw

Appendix A
Operational Safety Procedure

LAWRENCE LIVERMORE LABORATORY

Operational Safety Procedure

Effective: 9/15/75

No. 836-750915

Expires: 10/1/75

TITLE: HOT SPOT Exercise - 1975 (HSX-75)

Acct. No.:

INTRODUCTION:

Reason for Issue: Site 300 Procedure 121 requires that an OSP be written when fissile material is used on-site (i.e., Pu, Oy, etc.)

Hazards Analysis: < 1 gram of Pu-239 < 1 gram of Oy will be mixed with soil to provide realistic samples for analysis at the exercise site. Should the material be spilled it will contaminate a small area of the exercise site. Personnel in the exercise will be equipped with respirators so there are no health problems - only the inconvenience of cleanup. However, all samples will be double encapsulated in plastic. The samples will then be placed in metal sample containers at specific locations on the ground. Samples will be in SCOPE a controlled area at all times. At no time will the samples be opened at Site 300.

Location: Bldg. Bldg.836 outside area and Bldg. 822

Range of work authorized: Have samples made at Building 332, transported to Site 300 by Materials Management, used at the exercise site for counting and analyses during the exercise. At the completion of the exercise the samples will be returned to Bldg. 332 at Livermore.

RESPONSIBILITIES:

M. H. Chew is responsible for the safety of this operation and observance of all Laboratory safety guides; his alternate is R. T. Trolan

MATERIAL CONTROLS:

Material	Type	Amount	Storage	Ser. No, Drawing No.
Pu-239 in soil		< 1 gm	B-822 (overnight)	
Oy in soil		< 1 gm	B-822 (overnight)	

Received from: Bldg. 332 Maximum amount at site of operation: < 2 gms Removed to: Site 300

Criticality Safety: The unit described is assigned a Type N/A Criticality Hazard (Ref.

OPERATING & PERSONNEL CONTROLS

1. Samples will be made up in Bldg. 332 and doubly encapsulated.
2. Samples will be picked up at Bldg. 332 and transported to Site 300 by Materials Management the day prior to the exercise.
3. The Site 300 Health & Safety Tech will receive and swipe the samples prior to releasing the samples to the Umpire Group Health Physicist.
4. The samples will be placed at appropriate exercise locations by the Umpire Health Physicist.
5. Samples will be in a controlled area or in the custody of a Health Physicist throughout the duration of the exercise.
6. At the completion of the exercise, the samples will be returned by the Umpire Health Physicist to the Site 300 Process Area Coordinator for movement back to Bldg. 332 by Materials Management.

Distribution:

R. Trolan
M. Chew
J. Dittig
R. Guarienti (2)
J. Olsen
J. Tinney
C. L. Meadors
R. K. Mullins
W. C. Conner
W. M. Dougan

ORIGINATOR R. T. Trolan

R. Guarienti

J. F. Tinney

J. L. Olsen, Plant Manager

L. 2424 Rev. 10-73)

Appendix B
Photographs and Site Map

Fig. B-1. "Staged" vehicle accident and fire.

Fig. B-2. Initial response — Site Fire Department.

Fig. B-3. EOD prepares for entry into area.

Fig. B-4. EOD desensitizing high explosives (mock).

Fig. B-5. Initial briefing of the HOT SPOT Team.

Fig. B-6. EOD and HOT SPOT advisors conferring.

Fig. B-7. Radiation survey team.

Fig. B-8. HOT SPOT mobile laboratory and decontamination unit.

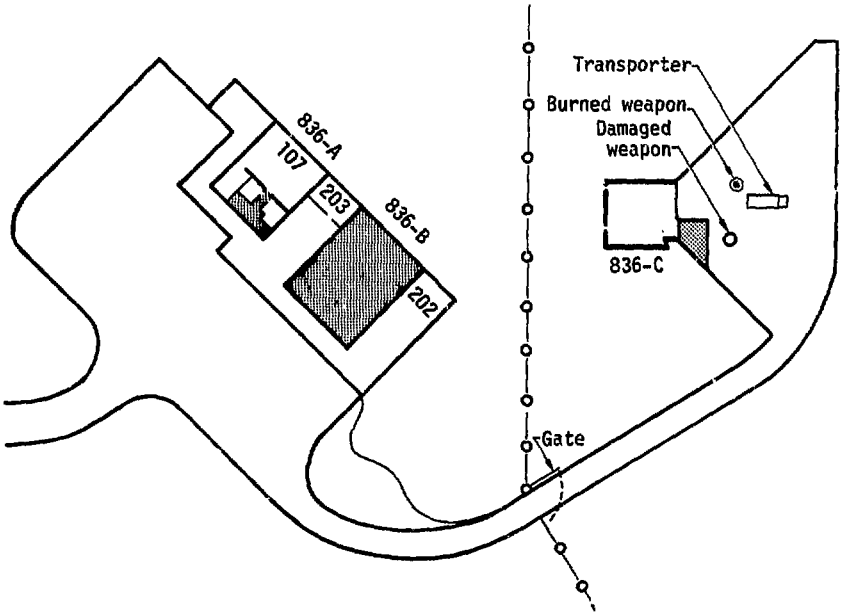

Fig. B-9. Site map.

Appendix C
HOT SPOT Equipment

In accordance with agreements between the ERDA and the DOD, LLL maintains a "HOT SPOT" team of specialists on continuous alert to provide assistance to the DOD in accidents involving nuclear weapons. The Hazards Control portion of this team consists of Senior Health Physicists, Criticality Specialists, Radiation Counting Specialists, and Electronic Specialists. A wide variety of equipment is kept in constant readiness to provide the necessary tools to the team in the field to find, identify, and control radioactive contamination at an accident scene. All of the equipment is kept in two trucks and two trailers which make up the HOT SPOT Mobile Laboratory (Fig. C-1).

The HOT SPOT Mobile Laboratory is designed to be a completely self-operating unit, requiring only replenishment of fuel and water supplies. The Generator Truck carries the equipment to provide heating, cooling, ventilation and electrical power to the other units; the truck also tows a Counting Trailer. The Counting Trailer is a rather completely equipped radiation counting and

Fig. C-1. HOT SPOT Mobile Laboratory.

analysis laboratory. Installed in it is the equipment necessary to do alpha, beta and gamma counting. The major systems consist of a multi-channel analyzer with a 75-X 75-mm NaI crystal detector in a shield, a gas flow proportional counter and a G-M gross counting system. The Water Truck carries a 946-litre water supply; it also tows a trailer which is used primarily for personnel decontamination. The Decon Trailer is equipped with a water heater, shower and sink to clean up team members who have been working at the accident scene. Personnel monitoring instruments are available to determine the degree of contamination both before and after cleanup. Supplies of fresh protective clothing and equipment are stored near the exit door.

The Water Truck also provides a storage area and issue point for a wide array of portable survey instruments, air samplers, and other health and safety equipment. Pre-packaged (boxes and suitcases) monitoring instruments are also stored in the Water Truck. These consist of tritium monitors, SPARK units (Special Purpose Accident Response Kit) and a urinalysis kit. Each of these packages can be hand-carried by individual Health Physicists to an accident scene if the complete mobile lab is not required.

The Mobile Laboratory was conceived with versatility and ease of movement as a design goal. It can travel over the highways; the four units all fit in one Air Force C-141 transport aircraft (Fig. C-2); the units can be forklifted and can be slung from helicopters; and the generator and air-conditioning system can be unbolted from the truck body and operated independently of the truck.

In summary, the Hazards Control HOT SPOT Team is ready to move to an accident scene within one hour of notification. The response can be tailored to fit the circumstances of the accident — it ranges all the way from one individual with a suitcase of specialized instruments to the entire Hazards Control Team with the complete Mobile Laboratory. Although designed primarily to assist the DOD in nuclear weapon accidents, the Hazards Control HOT SPOT response capability could be made available for any accident involving the dispersal of radioactivity.

Fig. C-2. Mobile Laboratory being loaded into C-141 transport plane.

A physical description of the Mobile Laboratory is as follows:

	Dimensions (m)			Shipping volume (m^3)	Loaded weight (kg)
	Length	Width	Height		
Generator Truck with generator, a.c. unit	7.0	2.4	2.6	43.7	6,812
Water Truck	6.3	2.4	2.6	39.3	5,206
Counting Trailer #113	3.6	2.4	2.7	23.3	3,438
Decon Trailer #114	3.6	2.4	2.7	23.3	2,376
Totals				129.6	17,832

Generator and a.c. unit Motor – generator:	40-kW, 208-V, 3-phase, 60Hz – Diesel with 0.34 m^3 fuel tank.
Air conditioner:	14.1-kW cooling, 17.6-kW heating at an air flow of 0.28 m^3/s
Water Supply Tank:	0.95 m^3
Water Heater:	0.15 m^3 heated per hour @ 43°C.

Appendix D
Atmospheric Release Advisory Capability (ARAC)

ATMOSPHERIC RELEASE ADVISORY CAPABILITY (ARAC): DEVELOPMENT AND PLANS FOR IMPLEMENTATION

Abstract

The Atmospheric Release Advisory Capability (ARAC) is an ERDA-sponsored service planned for nuclear facilities which require a means of real-time prediction of the extent of health hazards that may result from a release of radionuclides or other toxic materials. Since 1973 when the ARAC concept was initiated, a joint feasibility study has been conducted by Lawrence Livermore Laboratory and Savannah River Laboratory, and a prototype component of the system has been built and placed in operation. During the next three years plans are to implement the ARAC service for certain ERDA nuclear facilities. This report is written to provide a brief description of the ARAC concept, to discuss the progress to date, to outline future plans for developing the system, and to provide potential users with the benefits, requirements, and costs involved in using the ARAC service.

I. Introduction

Facilities that handle radioactive materials have a paramount obligation for the protection of both their operating personnel and the public at large. In spite of a remarkable overall record of safety, the nuclear industry faces a great challenge in minimizing potential damage which could result from nuclear accidents and incidents. It must be recogn.zed that the advent of nuclear materials introduced new forms of hazard subject to technical controversy and often misunderstood by the layman. An inherent fear of the effects of radioactivity tends to exist on the part of the public, and special care is necessary to avoid undue jeopardy to the potential national asset which nuclear energy represents. Continuation of a favorable nuclear safety record depends not only on strict adherence to standards and regulations, but also on extra effort at the local level to foresee any potential occurrences and to plan emergency actions.

Although the growing nuclear power industry on the whole is engaging this problem, the ERDA nuclear sites (research and production facilities) have found a special responsibility in this regard. Because they have been participants in the initial pioneering effort in the field and agents for an enormous part of the overall handling of nuclear materials for the nation, they have always given special emphasis to safety and accident prevention. Federal direction and assistance in matters of nuclear safety are available; nevertheless, the safety aspects of nuclear material handling must ultimately rest upon the diligent effort applied at each facility.

In the execution of this responsibility the ERDA nuclear sites are typically faced with a number of questions such as the following:

- What health hazards to operating personnel and the public would result in the event of a nuclear accident or incident?
- More specifically, how fast and to what extent will a release of radioactive materials diffuse under a particular set of circumstances and weather conditions?
- What kind of predictive information can be derived in order to permit adequate decisions in an emergency?
- How can routine releases of radioactive materials be planned so as to minimize potential impact on the surrounding environment?

ERDA is in the process of establishing a means of assisting the management at ERDA nuclear sites in responding to these types of questions. Under the cognizance of the DBER program, LLL has developed a centralized service to provide ERDA nuclear sites with real-time predictions of the consequences of an atmospheric release of radioactive materials. This service is called Atmospheric Release Advisory Capability (ARAC).[1]

II. Purpose of ARAC

The chief purpose of ARAC is to provide responsible site officials with estimates of the effects of atmospheric releases of hazardous materials as rapidly and accurately as possible. ARAC would develop a series of advisories concerning emergency or routine atmospheric releases to assist the site in its planning. At the heart of the ARAC concept are the numerical models that provide real-time regional assessments based upon input data from the site. These models vary in complexity from a single-trajectory model to an interfaced set of advanced regional transport and diffusion models covering the distance range of ~10-100 km. The models, combined with other state-of-the-art technology for dose conversion and data handling and communication, permit a greatly improved but economical means for predicting the effects of releases of toxic materials of any sort.

While the primary function of ARAC is to assist a site in emergency response, there are additional more routine uses intended for this service. Some examples are:

- Calculate and maintain an inventory of radioactivity in the source.
- Maintain an updated inventory of routine releases and their location in the environment.
- Calculate doses from routine operations.
- Perform sensitivity studies to ascertain changes in pathway drives that determine the biological impact possible from changes in site operations and in site location for projected facilities.

For a particular ERDA site, the ARAC concept would offer the following advantages:

- Predictive capability based on a local automated system. The ARAC site

equipment would provide the means for locally applying atmospheric modeling techniques for close-in distances (~5 km).

- Links with advanced state-of-the-art predictive capability. The ARAC central facility would provide the results of newly developed regional modeling techniques and dose conversion data in real time. Access to large-scale computer systems and modern efficient data handling would permit countermeasure planning based on information products not readily available at an individual site.

- Emergency backup links. In the event of an accidental release, countermeasure planning could also be conducted away from the local site. Graphic display of data at several remote locations would permit coordination and alternative options.

- Minimal costs. The centralized basis of ARAC would permit economies not practical for individual sites.

When implemented, the ARAC would support the present ERDA role for assistance to operating nuclear sites in several important ways. These include, but are not limited to, the following:

- The quality of information and radiological advisories from ERDA would be improved due to the availability of real-time data and regional information.

- The predicted off-site radiological effects would include transient regional transport processes.

- Any off-site countermeasures and postemergency cleanup operations would have a basis for iterative improvement as actual radiological information is received.

- ARAC would serve as a focal point to develop future improvements in the assistance and advisories provided by ERDA.

Appendix E
Personnel List

HSX-75

PERSONNEL LIST

1. PLAYERS

Philip E. Coyle	-	Senior Scientific Advisor
Joseph F. Tinney	-	ERDA Hdq. Rep.
Lawrence G. Minnich	-	Army Depot Commander (DNA/LLL, LTC)
Charles Veith	-	Atmospheric Release Advisory Capability
David S. Myers	-	Senior Health Physicist
Delbert F. Cruff	-	Stockpile Weapon Designer
Ronald Martinell	-	Arming, Fusing and Firing (Sandia)
William Hartman	-	Business Services
David Leary	-	Security
Ross L. Wilson	-	Coordinator
John Clatworthy	-	Coordinator
Wade Patterson	-	Health Physicist - HOT SPOT Team
Jordan Powell	-	Health Physicist - HOT SPOT Team
Timothy Madden	-	Health and Safety Tech - HOT SPOT Team
Carl Sundbeck	-	Health and Safety Tech - HOT SPOT Team
Larry Anderson	-	Mobile Laboratory - HOT SPOT Team
Thomas Jenkins	-	Mobile Laboratory - HOT SPOT Team
Thomas Jones	-	Arming, Fusing and Firing (Sandia)
Frank Murar	-	Arming, Fusing and Firing (Sandia)
Kendall R. Peterson	-	Atmospheric Release Advisory Capability
John E. Hogan	-	548th EODC (Capt)
John E. McCray	-	34th EOD (Capt)
Dennis C. Campbell	-	34th EOD (Sfc)
George R. Perry	-	34th EOD (Ssg)
James R. Watford	-	34th EOD (Ssg)
Darrel L. Perry	-	34th EOD (Sp-5)
Z. E. MacBain	-	LLL Fire Department

2. UMPIRES

Joseph F. Tinney*	-	Senior Umpire
Nathan D. Benedict	-	EOD Umpire
Colin Campbell	-	EOD Umpire

* Dual Role - Player/Umpire

Melton H. Chew	-	Mobile Laboratory/Health Physics Umpire
George Mackanic	-	Control Umpire
Rice T. Trolan	-	HOT SPOT Team Umpire
John E. Hogan*	-	EOD Umpire

3. SUPPORT

Ricahrd P. Guarienti	-	Safety Support Team Leader - Site 300
Clarence S. Myers	-	Asst. Chief LLL Fire Department
James A. Loftis	-	Health and Safety Technician
Joseph Magana	-	Chemistry
John Walden	-	Chemistry
Jim Evers	-	Chemistry
Raymond Gunnich	-	Chemistry
William Thayer	-	Chemistry
Wayne Conner	-	Site 300, W-Division Coordinator
Cecil Spencer	-	Site 300, Building 836
Richard Servas	-	Tech. Info. Dept. (Photo)
James Caywood	-	Tech. Info. Dept. (Photo)
Howard Alford	-	Tech. Info. Dept. (Photo)
Hans Benhard	-	Tech. Info. Dept. (Photo)

4. OFFICIAL VISITORS

Otho V. Kinsley, LTC	-	DNA/LLL
Kenneth C. Zhan, LTC	-	DNA/LLL
Manley K. Wu	-	ERDA/SAN Office
Donald E. Bivings	-	Hdq. 6th Army, Presidio San Francisco
Howard Stinson	-	ERDA/SAN Office
Mack Viars	-	G-3/DPT, Fort Ord, California
William E. Trent, LTC	-	Fort Ord, California
Louis H. Caruso, MAJ	-	Chemical Office, Fort Ord, California
Stephen H. French, MAJ	-	Hdq. 6th Army, Presidio of San Francisco
John B. Culver, LCDR	-	Naval Weapons Station, Concord, California
James A. Peattie, CWOZ	-	Naval Weapons Station, Concord, California
Paul C. Kinnery, CWO3	-	Naval Weapons Station, Concord, California

Appendix F
Chronology of Events

CHRONOLOGY OF EVENTS

HSX-75

TIME	EVENT
0730	Exercise initiated by G. Mackanic. Call made to J. Tomlinson in the Police Communications Center (Message 1).
0735	Ross Wilson briefed the Emergency Dispatcher at the Fire Department regarding HOT SPOT Team call out (i.e., use of Message 3).
0736	G. Mackanic received call from LLL Senior Scientific Advisor (Phil Coyle). Mackanic delivered Message 2. Clarification discussion followed. Call completed at 0740.
0741	Emergency Dispatcher (Debbie Joseph) received call from the Police Communications Center to activate the HOT SPOT Team. (Myers, Patterson, Clatworthy and Beason responded on the telephone to the first call made over the radio page system — telephone follow-up started).
0753	Ross Wilson reported to the ALERT Center.
0755	Wade Patterson (Acting Senior Health Physicist) advised the ALERT Center that he was at the Laboratory and requested instructions. He was advised to remain at Building 253 for the present.
0800	Emergency Dispatcher called the ALERT Center and advised that telephone follow-up with HOT SPOT Team difficult; team members enroute to work.
0803	ALERT Center attempted to locate Senior Scientific Advisor to advise that Center was operational (radio page used).
0806	ALERT Center advised by J. Clatworthy that organization of the HOT SPOT Team was proceeding. ALERT Center requested David Myers, Senior Health Physicist, to report to the Center.
0815	Senior Scientific Advisor (SSA) contacted at the Police Communications Center and advised that the ALERT Center was operational. SSA talked to Senior Health Physicist and advised contact with ARAC to get estimate of downwind radiation levels. SSA advised ALERT Center to contact Arming, Fusing and Firing Specialist at Sandia (Message 4).

TIME	EVENT
0816	Transportation Motor Pool Drivers, N. Steele and W. Burtenhouse, arrived at Hazards Control (Building 253) to drive HOT SPOT trucks to Site 300. Trailers ready to depart.
0830	All members of the ALERT staff were assembled in the ALERT Center to be briefed by P. Coyle (SSA). Members present: C. Veith and K. Peterson (ARAC)., R. Wilson and J. Clatworthy (Field Coord.) D. Myers and W. Patterson (Health Physics), D. Cruff (Stockpiled Weapon Design), F. Murar, T. Jones, and R. Martinell (AF&F/SLL), W. Hartman (Business Services) and David Leary (Security).
0836	ERDA EOC (G. Mackanic) advised SSA on details of the accident (Message 5).
0850	Message 5A called from Presidio San Francisco (G. Mackanic) to SSA that helicopter support was available to transport initial team and requesting further instructions.
0855	Message 6 from JNACC (G. Mackanic) to SSA that C-141 available to transport HOT SPOT trailers from Travis AFB to Reno, Nevada.
0913	SSA called Presidio San Francisco (G. Mackanic) to advise helicopter to pick up initial team at Livermore Airport at 0945 hours.
0915	SSA called Col. Brown at Travis AFB referencing the JNACC arrangements. Coyle stated that LLL HOT SPOT trucks and trailers would depart Livermore at 0930 hours and arrive Travis at 1030 hours. ETD from Travis of C-141 was 1100 hours.
0927	SSA called Col. Hawlk, CO at the Army Depot, to provide him with details of LLL capabilities and travel arrangements.
0930	HOT SPOT trucks and trailers departed LLL for Travis AFB (actually will go to Site 300).
0933	SSA placed a call to General Bratton at DMA to advise him of LLL response status and ETA's of LLL components.
0950	Advance team consisting of P. Coyle (SSA), D. Cruff (Weapon Design), R. Martinell (SLL/AF&F), J. Clatworthy (Field Coordinator) and J. Tinney (ERDA representative) departed LLL for the accident site.

TIME	EVENT
1040	Initial team arrived on site.
1043	Initial team briefed by the military commander, Maj. Gen. Minnich.
1055	HOT SPOT trucks and trailers arrived on site.
1115	Trailers 113 and 114 were operational.
1130	Health Physics personnel dressed out and entered exclusion area to take soil samples (W. Patterson, T. Madden).
1135	Counting equipment in the mobile lab checked out; electronics okay.
1150	Fire Department personnel completed decontamination of personnel and equipment. Released from the exercise.
1200	EOD action on the damaged weapon at the decision stage; D. Cruff advising.
1230	Health Physics personnel returned with samples for laboratory analysis.
1305	EOD operations completed. Warhead returned to shipping container and prepared for shipment to rework facility.
1320	Visitors arrived and were briefed.
1430	Laboratory analysis provided indication of Health Physics problems. Health Physics Group advised General Minnich on the problems associated with contamination.
1530	Exercise terminated.

Appendix G
Critique Comments

CRITIQUE COMMENTS: ARMY ON-SCENE COMMANDER

A. GENERAL COMMENTS.

1. Downwind contamination is the major problem area to emerge from the HSX. The Sixth Army Nuclear Accident/Incident Control Plan (NAICP) was used as the basis for simulating military reactions in the accident scenario. The plan has no provision for off-site contamination. If the contamination is great enough downwind to constitute a health problem, then several steps must be taken:

a. Gather all available meteorological data and cloud information; calculate most probable area of contamination; decide on safety factors; decide on "affected" area of concern.

b. Evacuate the area if the cloud hasn't passed.

c. Monitor the area.

d. Monitor personnel.

e. Control access to and from the area.

f. Decontaminate:

(1) Personnel.

(2) Personal and real property.

These operations can require many personnel and much equipment, and the affected area can cover hundreds of square kilometers. The affected area in this problem was only 40 square kilometers, due to special constraints of the problem. However, estimates made in the absence of the particularized information of the exercise will define a much larger area. As a consequence, military planners should commit large numbers of security personnel. They will, in addition, be required to isolate the contaminated area around the accident site and to control classified materials in and around the site/CP over a period of many days.

2. The major subset of problems associated with off-post downwind contamination is jurisdiction. The military cannot take the actions described above (except under martial law) without, at the least, the concurrence of local and state officials. Speaking from an ignorance of what agreements are in effect, I can only emphasize that such agreements should exist; the incumbents should confer; the agreements should be made known (the HSX participants didn't know what they might be).

3. Clearances:

a. I regard cross-agency security clearances as potential stumbling blocks in the path of progress. They are supremely important, and I do not wish these comments to reduce our caution.

b. In the case where ERDA is supporting DOD, most ERDA participants will have the requisite clearances. Affirming those clearances to DOD is the obstacle I foresee to getting ERDA people on-site and functioning. Unfortunately, DOD doesn't recognize ERDA badges, and teletype links may not be available. I don't know what procedures are established, and feel that this area should be reviewed by JNACC.

c. In those cases where DOD supports ERDA, the mass of DOD participants will not be cleared for Restricted Data (nor even for material corresponding to Confidential or Secret), and the on-site control of materials and information may well bog down the operation. Again, JNACC should review.

d. The wheels of security clearance grind exceedingly slow. Again, the importance of security is paramount, but in the general case, provision must be made (ahead of time, in a nonemergency environment) for greasing the wheels when an emergency occurs.

4. Prepared PIO releases in USASIX NAICP (15 Nov 73 edition) do not cover the situation of an on-post accident with off-site contamination.

5. I suggest that the Nuclear Accident Incident Control Officer (NAICO) be made responsible for formulating and circulating an emergency safety procedure for the site during control operations. A second accident or incident during control and cleanup would be extremely disruptive and knowledge of hazards and corrective actions by personnel on-scene would ameliorate the disruptive effects.

6. Recommend that the On-Scene Commander be directed to provide for (in concert with ERDA) the disposition of contaminated materials.

7. I feel, as a result of this exercise, that the primary functions of the On-Scene Commander should correspond to the actions of a triage officer in a medical emergency. Life-threatening situations should receive first priority; consideration of lesser threats to life (such as Pu contamination after cloud passage) should be deferred until the accident situation is stabilized. Outside pressures for information or action should be firmly resisted and priorities established. The ARG staff in this exercise very smoothly led me to do these things (as the umpires had hoped).

8. The 34th EOD team was superb. LLL personnel were visibly (and volubly) impressed with their expertise and professionalism. The exercise served a valuable purpose in exposing LLL to their procedures and capabilities and provided the Laboratory a valuable insight into how they can best interface with EOD in an actual emergency. By the same token, EOD personnel had their first opportunity to talk to the designers of the weapons upon which they work and (for this team, at least) to realize the breadth of assistance available to them if they need it. For this reason alone, future joint exercises should be encouraged.

B. LABORATORY OPERATIONS

1. It is very important that the On-Scene Commander (I'll call him the NAICO for shorthand purposes) be impressed with the willingness of the ARG to help him solve his problem. Consequently, SSAs should be firmly impressed (and retrained if necessary) with the necessity of exuding an aura of confidence, helpfulness, and competence as they arrive on-scene. This was done in the HSX. As a related point, the ARG should be organized so that the minimum number of personnel physically address the NAICO. The recommendation serves two purposes:

a. The SSA/ERDA Rep should be <u>the</u> experts to whom the NAICO turns, and internal disagreements within the ARG are not the NAICO's concern.

b. NAICO has a span-of-control problem already.

2. The advance party should probably depart as soon as assembled. Their generalized expertise is more than is available on-site, and they can contribute to the solution of the problem without detailed knowledge prior to their arrival. SHP's advice on the off-site contamination hazard was most valuable. For instance, I tried to push the ARG staff into recommending a declaration of martial law, but cooler heads prevailed, and I was thwarted.

3. A possible shortcoming of the exercise was in my dual role as NAICO/Umpire. Knowing as much about the problem as I did, I perhaps led the ARG into consideration of problems that another NAICO might not have brought up. As a positive recommendation for future exercises, suggest that a military type be brought on board as a NAICO player with no prior knowledge.

4. The message about plume height was passed to me, but didn't reach ARAC because nobody asked me about eyewitness accounts, or if further information was available.

5. Because of the large number of individual vehicles located at Site 300, it didn't look much like an accident site, but rather like an exercise site. Better control of vehicles and personnel for future problems will add more realism.

6. The time pressure which we introduced into the problem was unrealistic. However, it partially compensated for the pressure from outside agencies (JNACC, ERDA, etc.), which would have been present in a real situation. One of the most important things the NAICO/ARG can do is to set priorities for their action items and take care of the right things first. I was very impressed by the smooth way that priorities were established.

7. I suggest that ARG staff should have prepared ahead of time several generalized contingency plans with fill-in blanks for the following items:

a. Emergency operating safety procedure (per Tinney).

b. Disposition of contaminated materials and debris.

c. Disposition of contaminated classified items.

d. ARG chain-of-command.

8. Clearances and Security:

a. I regard this area as a potential stumbling block in the path of progress. It is supremely important, and I do not wish these comments to detract from that importance.

b. In the case where ERDA is supporting DOD, most ERDA participants will have the requisite clearances. Affirming those clearances to DOD is the obstacle I foresee to getting ERDA people on-site and functioning. Unfortunately, DOD doesn't recognize ERDA badges, and teletype links may not be available. I don't know what procedures are established, and feel that this area should be reviewed by JNACC.

c. In those cases where DOD supports ERDA, the mass of DOD participants will not be cleared for Restricted Data (nor even for material corresponding to Confidential or Secret), and the on-site control of materials and information may well bog down the operation. Again, JNACC should review.

d. The wheels of security clearance grind exceedingly slow. Again, the importance of security is paramount, but in the general case, provision must be made (ahead of time, in a nonemergency environment) for greasing the wheels when an emergency occurs.

CRITIQUE COMMENTS: WEAPONS DESIGN ENGINEER

My participation in the alert exercise started at 0745, Tuesday, September 23, 1975, by a phone call from the LLL Police Communications Center. My instructions were to "call Phil Coyle on X4211" which I did immediately. During the conversation with Phil, my radio page signaled and gave a message that I didn't understand as Phil was talking at the time. The reception was clear enough to understand if I had not been disturbed by the conversation on the telephone.

Phil told me what he knew and told me to call him back when the Alert Communications Center in Building 111 was in operation. At 0820, I called Phil at the Police Communications Center where he had gone and told him the Alert Communications Center was open.

When I arrived at the Alert Communications Center, I asked Betty Davis to get out the microfilm reel on the W-70 and put it on the viewer. No further use was made of the microfilm, and it was returned to the repository after the advance party left the Center for Site 300.

During the discussions in the Communications Center, it was decided that I was the only available weapon designer, and would participate in the exercise in that capacity. I then went back to my office to find a substitute to act for me in the Communications Center while I was in transit to the scene of the accident. The first qualified person I could locate was a former W-70 weapons design engineer, Bill Bachelder; however, Bill is not on the HOT SPOT roster and would not have been able to travel with the same convenience that a HOT SPOT member would; i.e., if the accident were out of the CONUS.

I took a briefcase with the classified HOT SPOT file on the W-70 to Site 300.

I was in the party that was briefed by General Minnich on the accident and what had been done to that time. During the briefing, a statement was made that the EOD captain wanted to consult with the weapon designers and as we were leaving for the bunker, an Army man stated to the General that they were preparing the weapon for a rendering-safe procedure and asked permission to start the safing procedures. I said that we would like to survey the situation before safing was authorized and the General agreed, but pointed out that the decision to safe or not to safe rested with him — not us.

We simulated "dressing out" for work associated with a damaged nuclear warhead and examined the warhead that was involved in the accident. We, the EOD captain and the weapon designers, agreed to proceed with the EOD procedures and cut open the warhead's aluminum skin to ascertain the condition of the components in the damaged area. After this was done, we again agreed to immobilize the damaged components and to prepare the warhead for shipment.

This concluded my participation in the exercise. I have a few thoughts on the operation and will attempt to describe them here.

First, I think the whole exercise went very well. The parts played by the participants were sincere and realistic from the "General" on down to the rad safe monitors. In my role as a weapon designer, I feel that we rushed a little too fast. In a real situation, I would prefer to sit down with the EOD captain and discuss every detail that he had experienced up to the time of my arrival. I would have spent more time looking at the EOD manual and the engineering drawings that we had in our possession. Since the warhead had been moved some distance from the accident location, there was really no need to work as fast as possible to prepare it for shipment.

Another comment: I have never worked with an EOD team before and was pleasantly surprised to find them very competent and cooperative. They were very well trained and made very good use of some fairly crude tools. They in turn said that they had never worked with weapon designers before and appreciated our cooperative attitude.

CRITIQUE COMMENTS: SENIOR HEALTH PHYSICIST

In general, I felt the exercise was very useful for the Hazards Control members of the ALERT Team. A major benefit was that team members thoroughly reviewed procedures and equipment prior to the exercise. There are a few specific comments that I would like to make, some of which might contribute to future exercises. These comments also reflect input from W. Patterson and J. Powell.

1. In our view, the overall Hazards Control response was excellent, and we have no comments or suggestions for improving that.

2. Initially, there was some confusion regarding the information that ARAC gave us. The problem stemmed from a misunderstanding of the units on some of the data that they generated. This confusion has been resolved in discussions with Ken Peterson.

3. The exercise emphasized the importance of pre-planning the prompt actions that any installation must take if they are to effectively prevent exposure to individuals downwind from the passage of a cloud. By the time we were able to supply them with suggested areas of evacuation and traffic control, it would have been too late to actively implement our suggestions. As I mentioned in the critique, I feel it would be useful if such installations, perhaps based on information supplied by ARAC, would have on hand tentative evacuation or notification procedures in the event of serious accidents.

4. As I also mentioned in the critique, the scenar o forced us to rearrange our priorities. In the real situation our first priority would not have been to charge in and map out the areas of contamination, but rather to make sure that victims and areas outside the known contaminated area were handled and monitored appropriately.

Also, interacting with state or federal agencies regarding necessary off-site actions to control and assess exposure and to reduce the spread of contamination would be of primary importance. Perhaps some of these health physics considerations could be handled in some form of classroom exercise where the Health Physicists were presented a series of problems on paper, about which they had to make decisions and recommendations.

5. I think it would be useful to coordinate the next exercise with a real military exercise, perhaps one of those at Fort Ord.

CRITIQUE COMMENTS: WEAPONS UMPIRE

As an umpire, I observed the EOD portion of the HOT SPOT Exercise which included actions performed by an Army EOD team and LLL/SLL HOT SPOT team members in response to a hypothetical accident situation.

Due to a necessarily short schedule, some short cuts were necessary and certain actions, by their nature time-consuming, were "talked through to completion" with the umpires concurrence.

It became evident early in the exercise that this EOD team was very knowledgeable concerning the weapons involved as several inaccuracies of construction and violations of existing military safety rules were immediately noted and commented upon.

Clean up and desensitizing of scattered high explosive (in this case, mock) was accomplished to the point that a total sweep of the area was required

which would have involved excessive time and people. At this point, this activity was terminated by umpire decision.

All decisions regarding actions to be performed on the weapon by the EOD team, including the decision that further technical advice was required, were correct and well thought through.

After the arrival of the LLL weapons engineer and the Sandia fusing and firing engineer, actions requiring x-ray and special tools (bore-scope) were decided upon, and were assumed accomplished but indeterminate by the umpire.

Cutting into the weapon was actually accomplished, and subsequent decisions regarding immobilization of components and preparation for shipment were made after which the exercise was terminated.

Having participated in real accident situations, I was able to make comparisions and found that even though staged and foreshortened, this portion of the exercise had a "real" feel about it and was a valid check of the EOD team as well as its interactions with the Laboratory team members, all of whom acted in a knowledgeable, professional manner.

CRITIQUE COMMENTS: HEALTH PHYSICS UMPIRE

In order to develop a meaningful evaluation of the health physics operations associated with the burned nuclear weapon, it was necessary to develop some physical aids. The ground deposition of plutonium was represented by a pattern of wooden stakes placed at various locations downwind from the accident site. Each stake was labeled with readings in counts per minute. The readings approximated actual count rates on a PRM-5 with a FIDLER probe set to measure the 17-keV photon from ^{239}Pu or the 60-keV photon from ^{241}Am. In addition, soil samples were prepared for sixteen locations using a Pu-Oy mix. Each doubly encapsulated soil sample represented the contaminated soil collected in a 100 cm^2 area 2 cm deep.

When the Senior Health Physicist arrived with the initial HOT SPOT Team, he was briefed on the accident and the physical aids which were emplaced to assist him in assessing the radiological problems. Earlier, personnel from the 34th EOD had made a cursory survey of the immediate accident site. This information was also made available to the Senior Health Physicist. Finally, the LLL Atmospheric Release Advisory Capability provided a projected

pattern of hazardous material which included surface deposition, as well as air concentrations up to 100 km downwind.

When the main HOT SPOT Team arrived, the Senior Health Physicist instructed his group in the following:

- Proper personnel protection to be used in the exclusion area.
- Type of ground survey to be made with the FIDLER instruments in order to get a contour of the ground deposition of fissile material (see Fig. G-1).
- Analysis to be made of the soil samples in the Mobile Laboratory to develop a definitive evaluation of hazardous levels of Pu.

As the exercise progressed and the radiation problems were evaluated, the Senior Health Physicist made recommendations to the Senior Scientific Advisor regarding the on-site problems for control and cleanup of the contamination. This was based on the surface deposition contour map developed by the team. Additionally, he was able to use the ARAC fallout plot and provide advice regarding the maximum off-site hazard to the general population.

The HOT SPOT Mobile Laboratory equipment operated effectively in counting the soil samples. However, it was noted that the counting equipment should be configured to count samples of higher radioactivity levels. It appears that samples greater than 10 mg of Pu were overloading the counting capability. The results of the sample counting were within a factor of 2 of the radioactivity in each sample.

Periodic updates of the ARAC plots would have been useful at the exercise site.

In general, the actions and recommendations made by the health physics participants were appropriate for the information made available.

The Army EOD personnel which I observed adhered to good radiological safety procedures. Personnel protection was good. More current radiation instrumentation would have been useful to them.

CRITIQUE COMMENTS: FIELD COORDINATOR

1. Comment: It would appear highly advantageous to be able to maintain in the ALERT Operations Center, certain important elements of information concerning an accident/incident which necessitates an ALERT response. This would provide continuity in the event certain key people have to leave the ALERT Center, afford readily available information for response to inquiries, and provide an almost instantaneous briefing for new arrivals to the ALERT Center.

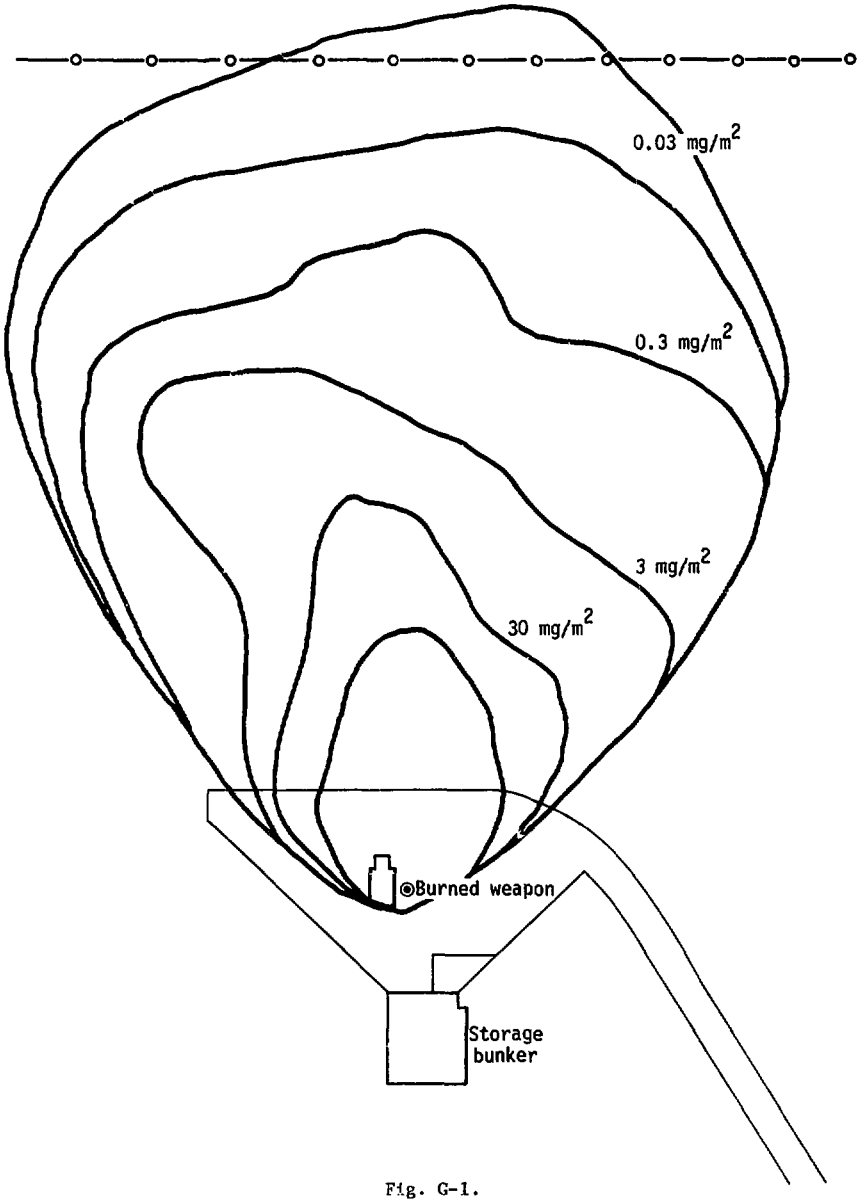

Fig. G-1.

Recommendation: Provide status boards to be mounted on one of the walls of the ALERT Operations Center, which would provide a place to record essential accident/incident related data. Boards should have a key and/or format which outlines essential information, and should be covered in plastic or lucite so information can be written and then changed, updated, or removed as necessary.

2. Comment: It would appear that the Field Coordinator could be required to temporarily leave the close proximity of the accident/incident scene in order to coordinate some aspect of the field operations. In this circumstance, communications with the Senior Scientific Advisor and/or HOT SPOT/Warm Spot Team Leader would be essential.

Recommendation: Two or three 2-way radios should be provided for the Field Coordinator's use. These radios should be on a different frequency than the HOT SPOT and/or Warm Spot Team radios.