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Tactical Improvement Package

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TACTICAL IMPROVEMENT PACKAGE

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ABSTRACT

The Tactical Improvement and Security Force Evaluation Program, which demonstrates the feasibility of using the Engagement Simulation System (ESS) at licensee nuclear facilities, requested by the Nuclear Regulatory Commission, is described. Background information on the ESS and observations on its use, based on exercises at four licensee facilities, are provided. The information required by the licensee to utilize the ESS for security officer training is presented in the form of a Tactical Improvement Package (TIP). Two Instructor's Guides (an expanded and an abbreviated version) are included as aids to interested users. A video tape that complements the text is available on loan from the NRC.

EXECUTIVE SUMMARY

The Engagement Simulation System (ESS) provides the capability to realistically simulate engagement conditions between armed adversaries utilizing laser transmitter equipped weapons and detector equipped players. ESS has been successfully used by Sandia National Laboratories (SNL) personnel within the Department of Energy (DOE) community for security officer training. The Nuclear Regulatory Commission (NRC) expressed interest in the applicability of ESS to commercial nuclear facilities security officer training. The means by which information on the use of ESS could be provided to commercial nuclear facilities was also of interest. As a result, the Tactical Improvement and Security Force Evaluation Program was initiated.

The program had two objectives:

1. SNL was to develop a package of information, the Tactical Improvement Package (TIP), that would provide a licensee who wanted to use the ESS (without outside assistance) with the necessary information.
2. SNL was to undertake a series of site visits to selected licensee facilities for the purpose of demonstrating and conducting ESS exercises using licensee security personnel.

The visited sites were to provide information that would assist SNL in the development of the TIP and to provide data on licensee acceptance of the ESS. It should be mentioned that the TIP was to be developed under the assumption that the equipment would be available to the licensee. It should also be emphasized that the system exercises conducted during the visits were not used to evaluate the licensee facility or its security officers.

Four licensee facilities were visited during this program. In general, the visits lasted 5 days. Normally, 8 exercises were held each day with approximately 20 participants involved in each exercise. Participants and observers were, with few exceptions, favorably impressed with the ESS. Its value for response force training was clearly recognized. The security force management and training staffs at the facilities appreciated the opportunity for their personnel to use the equipment.

This report documents the Tactical Improvement and Security Force Evaluation Program. The main text of the report provides an overall view of the program and the ESS exercises. General observations on licensee reaction to the ESS and the possible effects of future use of ESS by licensees are provided. Appendix A presents the TIP. A videotape attachment to Appendix A completes the package. The text and the content of the video tape are complementary; both are necessary to complete the TIP.

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Introduction

Physical security requirements at commercial nuclear facilities have increased over the last few years. These new requirements have affected not only the hardware associated with a physical security system but also the composition and capabilities of the security force. Members of the security force are required to be in better physical condition and to be better trained than had previously been necessary. Furthermore, this training is performance oriented, and training effectiveness is to be ascertained by evaluation of performance of required job-related tasks. For most of the tasks associated with the functions of the security officer, this type of training and evaluation is rather straightforward; however, evaluating security officer response to an emergency is more difficult. Individual skills such as shooting accuracy can be taught, but skills such as those involving judgment and leadership abilities, which are affected by the interplay of response team members in the dynamic environment of an engagement with armed adversaries, could not, until recently, be realistically simulated. However, with the development of the Multiple Integrated Laser Engagement System (MILES), an enhanced capability for engagement simulation is possible.

MILES, which was developed by Xerox Electro-Optical Systems (EOS) for the U.S. Army, consists of a combination of laser transmitter equipment for weapons and laser detector equipment for participants which functions in a manner very similar to actual weaponry (see Figure 1). Hence, MILES can be used to simulate more realistic engagement conditions between opposing forces than has previously been possible.

The weapon laser transmitter includes an optically safe, battery-operated gallium arsenide laser diode capable of emitting pulses of coded infrared laser energy to simulate the effects of live ammunition. The pulsed laser beam becomes the laser "bullets."

The laser transmitter is attached to a weapon equipped with a blank-fire adapter (see Figure 2). The transmitter does not affect normal weapon aiming, has minimal effect on weapon balance, is easily removed from the weapon, and can be reinstalled with alignment repeatability. The acoustic report from fired blank ammunition activates a microphone inside the laser transmitter, which consequently sends a pulsed laser beam along the line of fire. If the message contained in the pulsed laser beam is correctly received by sensors located on the torso harness and head array worn by each participant, an audio alarm is sounded, indicating either a near-miss or a hit, i.e., neutralization. The alarm is located on the left shoulder of the torso harness

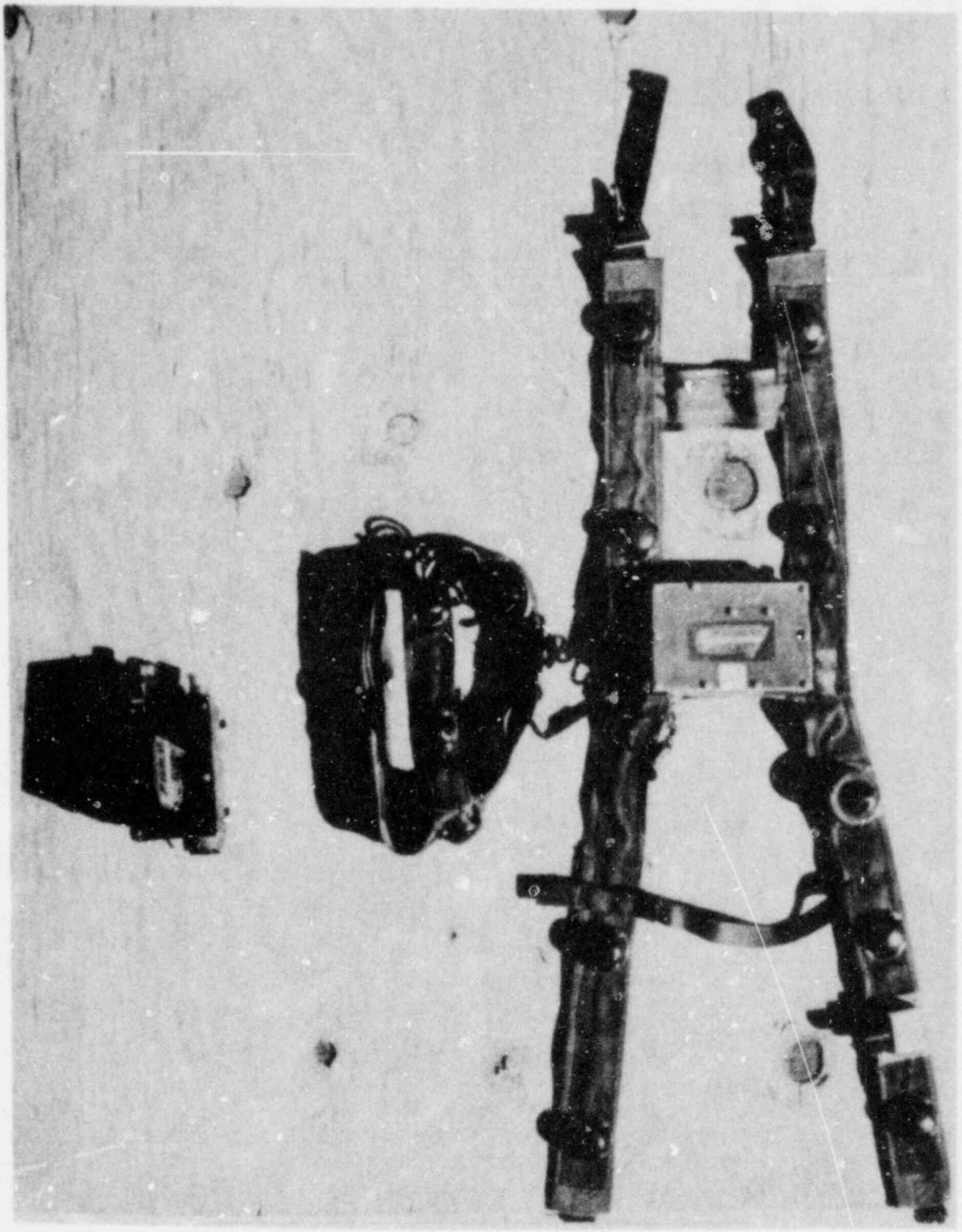

Figure 1. Laser Transmitter, Head Array, and Harness Equipment

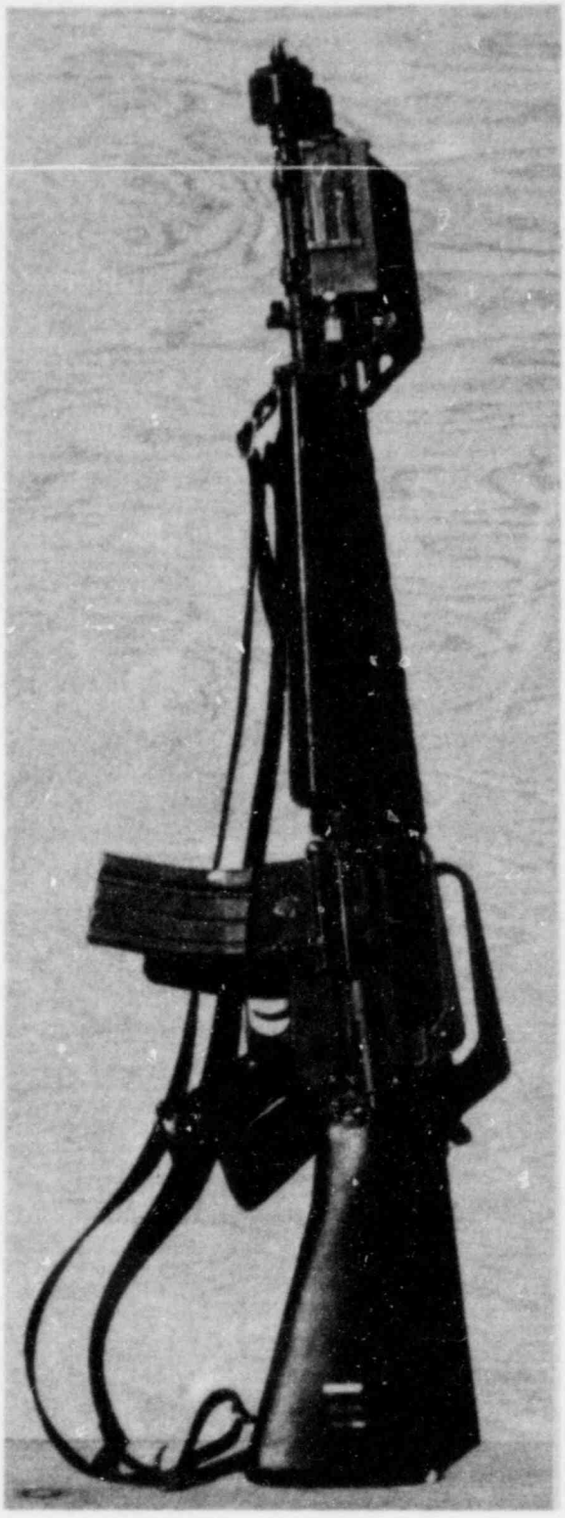

Figure 2. Weapon Equipped with Laser Transmitter and Blank-Fire Adapter

near the wearer's ear. The aural alarm associated with a near-miss consists of a series of several tones. This alarm allows the individual to take appropriate evasive action to prevent being neutralized. If a participant is neutralized by a direct hit, the alarm sounds a continuous tone. To silence the alarm, the individual must then remove a yellow key located in the rear of the weapon transmitter, which results in transmitter disablement, and insert the key into a receptacle on the harness. Once the alarm is silenced by insertion of the weapon key, the key cannot be removed without causing the continuous tone to recur, thus effectively preventing the neutralized player from further participation in the exercise.

The Security Forces Experimentation and Evaluation Division of Sandia National Laboratories (SNL) has been involved with MILES for approximately 3 years. During this period, while the MILES equipment was being used under SNL direction by Department of Energy (DOE) transportation couriers and DOE contractor security personnel, SNL continued to make improvements and modifications to the production-line product available from Xerox. As a result of these modifications, the new designation of Engagement Simulation System (ESS) is being utilized.

An ESS activity involves a man/machine system that permits engagements between adversaries to be simulated with a realism not previously possible in small-forces war gaming. Human factors are most easily and accurately incorporated into a simulation by human involvement in roles as nearly identical as possible to those assumed in actual combat; the simulation system approach allows an attack against a facility to be planned and carried out as it would occur in real life, except the weapons effects are simulated. Experience with this capability strongly suggests that individual participant behavioral strengths and weaknesses quickly become apparent.

It is important to remember that simulations are models of real engagements. Questions as to the validity of the model and the reliability of predictions based on it must be considered. For example, are the behavior patterns established by the participants during a simulation representative of the patterns that would be exhibited during a real engagement? These questions will probably never be formally resolved due to the nature of the functions being modeled.

In addition to using the ESS for security officer training, the possibility of using it to test the physical security system at a facility has recently been given increasing consideration. The total security system at a facility includes hardware components, security officers, procedures, and supervisory personnel. Evaluation of the total system would demonstrate whether or not the physical security subsystems that have been determined to perform adequately as individual subsystems also function appropriately in the total system. To ensure that security and safety criteria are met, the planning and controls required for such evaluations must be extensive. To date, little use has been made of the ESS for such exercises; thus, very little experience has been gained regarding operational considerations.

It was recognized that the relationship between the DOE and its contractors is somewhat different than that between the Nuclear Regulatory Commission (NRC) and the licensee. Therefore, it was felt appropriate to test the acceptance of the ESS by NRC licensees to see if their reactions were similar to those of the DOE contractors. Accordingly, a Tactical Improvement and Security Force Evaluation Program to evaluate the effectiveness of the ESS at NRC licensee facilities was instituted.

Engagement Simulation System Background

Objectives -- The objective of the ESS activity within the DOE has been to develop a system primarily to train armed personnel and/or to evaluate (to some degree) the relative effectiveness of armed personnel contributions to transportation, facility, or other security systems in response to various threats and scenarios in the small-force engagement. The ESS can also prove valuable in evaluating proposed changes to these security systems.

The activity involves development of a system made up of dedicated and portable equipment which can be utilized at various locations. The key elements of the system are (1) laser-equipped weapons and body-worn detectors, (2) video instrumentation to record participant contribution, (3) communications, (4) vehicles to transport or facilities to store the equipment, and (5) a trained staff for technical and logistical support. Both a dedicated and portable range capability have been initially developed and are being utilized by the DOE. SNL has adopted a loaner program to provide DOE security organizations with equipment on an annual 3-month loan basis. This program allows the organizations to accomplish training at the time most convenient for them, considering personnel availability; technical and logistical support to DOE contractor facilities is also provided as requested.

The engagement system capability can be employed in training that utilizes various scenarios and can also be used, to some extent, to examine the effectiveness of partial or total security systems. Personnel, vehicles, guard towers, etc., can be instrumented so that realistic attacks can be staged. Detection systems and access denial can be simulated with a reasonable degree of realism. Strengths and weaknesses in supporting systems will often surface, and some information about the total system effectiveness will result.

Experience -- SNL has been applying the engagement simulation concept since 1978. Sixteen DOE facilities have utilized the equipment in familiarization, response, and advanced training exercises. The equipment has been utilized at four NRC licensee facilities during this program to develop a Tactical Improvement Package (TIP). Participating Department of Defense (DOD) organizations have included the U.S. Navy, Marine Corps, and Air Force, as well as various National Guard and Reserve units. Equipment support has been provided to the

Federal Bureau of Investigation, Department of State protective agents, and several state and local law enforcement agencies. In all, slightly over 7,000 personnel charged with security responsibilities have benefited from the program.

Equipment Upgrades -- The capability of simulating small-force engagements is in its infancy stage. Nevertheless, enormous possibilities now exist with the availability of the laser-equipped weapon. A significant DOE research and development (R&D) effort is anticipated to improve and expand system realism and improve participant instrumentation for better data collection.

MILES was designed for training in which military tactics are emphasized. Within the DOE, different tactics are being developed for use by security forces. Consequently, several modifications have been made to MILES to better support DOE training approaches. Among the changes are (1) the addition of a Mylar transmitter insert to improve close-in (<30 feet) hit characteristics, (2) an adjustable five-detector, soft-cap head array in lieu of a military helmet array, (3) additional resistance to radiofrequency (RF) interference, (4) the ability to remotely reset a participant with a controller gun, and (5) player-key power turn-off. This modified MILES system is referred to as the Engagement Simulation System (ESS).

Among the identified future upgrades planned by SNL for the ESS are (1) more effective personnel-worn detector arrays to acknowledge "wounds" and provide more complete body coverage, (2) the capability to simulate area fire weapons such as the 40-mm grenade, (3) a probability-of-kill more in line with the best available data, (4) the capability for more efficient weapon boresighting, (5) a no-key system, (6) body-worn instrumentation, including equipment for recording, player pairings when firing, timing, human factors (e.g., stress), and (7) a real-time readout of player status to aid in exercise administration.

DOE facility training personnel have reported that current force-on-force training is not always practical because it requires reasonably large numbers of people, often involves overtime pay, and sometimes does not involve all participants. Consequently, an additional upgrade to the system involves radio-controlled, laser-sensitive pop-up targets, as shown in Figure 3. Typically, six pop-up targets would be placed along a course so that different shooting situations are confronted as the participant progresses through the course. The targets would automatically rise at sensing the proximity of the participant. The participant must then identify whether the erected target is friend or foe. If a friend, a no-shoot decision is appropriate. If a foe, the participant must either neutralize the target or take cover since, after an adjustable delay, the target will "shoot back" at the participant with a wide-beam, on-board transmitter until the target is neutralized. This approach allows individualized or small-group training under stress similar to engagement simulation yet may be more practical to employ.

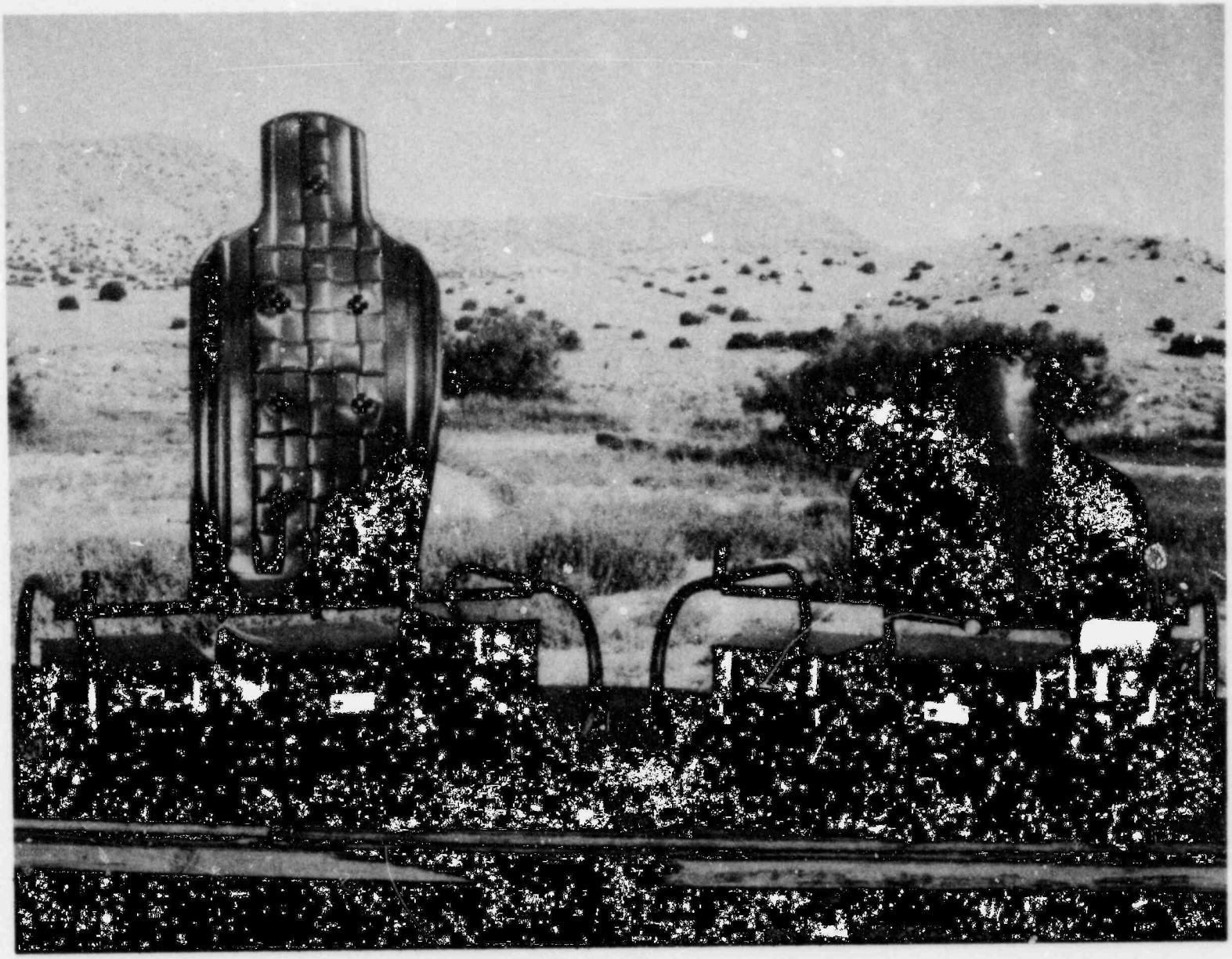

Figure 3. Laser-Sensitive Pop-Up Targets

Physical Protection System Requirements

Physical protection systems for facilities are often categorized into elements of detection/assessment, communication, response, and delay. The response element consists primarily of the facility's security officers. In this capacity, the security officers are charged with the task of intercepting and confronting an adversary, delaying the adversary's actions, and possibly neutralizing the adversary. Security officers require highly specialized training in order to develop tactical capabilities to meet potential threats. This training should include periodic exercises that realistically simulate adversary scenarios. Such exercises are intended to keep security personnel alert and prepared for potential threat conditions and to offset the natural tendency of security personnel to concentrate upon the routine activities of their jobs.

Philosophical Background

A good training program should be both relevant and realistic. It should also be flexible and easily implemented. Finally, it should include a provision for prompt and effective feedback to all participants. The TIP has been developed with all of these factors in mind.

Relevance and Realism -- The training program should be relevant to the mission of the security force at a facility and should include response training for appropriate threats such as theft of material, radiological sabotage, armed intrusion, penetration, and facility takeover, any of which may incorporate various levels of violence. The training should be realistic in terms of the weapons and equipment likely to be used by adversaries as well as standard weapons issued to security personnel, the numbers of adversaries anticipated as participants in various scenarios, and the probable tactics employed by adversaries.

Ease of Implementation -- In order for a training program to be enthusiastically accepted and energetically implemented and to survive in the present-day arena of "few dollars for training," it must not place significant additional demands upon the already austere training budget and available manpower. A successful program must be easily implemented at the user level. Ease of implementation means minimal additional requirements of time, money, and personnel possessing special talents and qualifications. The proposed ESS tactical training program has been specifically designed to be readily implemented and managed by existing facility security force supervisory and training personnel. The training program must be sensitive to the facility's constraints of time and money and tempo of operations and to the human and material resources available at the facility.

Provisions for Participant Feedback -- Diagnostic feedback is provided in the training program by the participants during the After-Action-Review (AAR), which is conducted following each exercise.

Summative feedback could be obtained from sources such as questionnaires and structured interviews that address the validity of the overall training program. This information could be used to update the perceived role of the security officers, to improve tactical roles or procedures, to modify subject matter or method of instruction required, and to assess the impact of the training upon the security force readiness, organization, and equipment.

Purpose of the Training Program

The purpose of the Tactical Improvement and Security Force Evaluation Program and the TIP that has been developed is to provide the information necessary to allow the Engagement Simulation System to be used by security personnel for tactical training. With the development of the ESS, tactical field training and exercises can be conducted in both a realistic and safe manner previously unattainable. ESS equipment is attached to the issue weaponry normally utilized by the trainee. For all practical purposes, the weapon functions normally and "feels" normal; blank ammunition provides sound and recoil similar to that of actual service ammunition. Participants are "hit" and neutralized with an optical (laser) message. Behavorial characteristics are realistically represented.

It is the realism and immediate feedback of the ESS that provide the foundation for the proposed training approach. The system capability provides a basis that can integrate the skills being taught to security personnel into the response patterns needed during an armed engagement. The information required to institute a security force training program using the ESS is provided in the TIP (see Appendix A).

Engagement Simulation System Exercises

Arrangements -- On 10 March 1981, a meeting was held between NRC and SNL representatives, at which time seven licensee facilities were selected as possible candidates for participation in the Tactical Improvement and Security Force Evaluation Program. The following facilities were contacted regarding their participation in the program:

1. Babcock & Wilcox, Lynchburg, Virginia,
2. United Nuclear Corporation, Norwich, Connecticut,
3. Baltimore Gas & Electric Company (Calvert Cliffs reactor), Lusby, Maryland,
4. Boston Edison Co. (Pilgrim reactor), Plymouth, Massachusetts,
5. Detroit Edison Co. (Fermi II reactor), Monroe, Michigan,
6. Duke Power Co. (McGuire reactor), Cornelius, North Carolina, and
7. Southern California Edison and San Diego Gas and Electric Co. (San Onofre reactor), San Clemente, California.

Two additional facilities, Rochester Gas & Electric Corporation (R. E. Ginna reactor) in Ontario, New York, and Virginia Electric and Power Co. (North Anna reactor) in Mineral, Virginia, later requested that they be allowed to participate.

Each of the preceding licensee facilities was contacted and provided with a brief explanation of the proposed program and ESS equipment. Firm dates were set for SNL representatives to visit each facility. During these visits, video-tape presentations and ESS hardware were used to explain the program to the licensee personnel and to demonstrate the equipment. In most cases, exercise sites were chosen and details were resolved sufficiently to eliminate the need for a second visit before the scheduled exercise period. Of the original facilities, only one (United Nuclear Corporation) declined to host the ESS exercises. The NRC later narrowed the list of participants to four: Southern California Edison and San Diego Gas and Electric (San Onofre), Detroit Edison (Fermi II), Boston Edison (Pilgrim), and Virginia Electric and Power (North Anna).

SNL's contribution to the ESS activities consisted of providing the following: (1) ESS laser detector equipment to be worn by personnel and laser transmitter equipped weapons corresponding to the weapons available at the specific facility site, (2) ammunition with specially modified magazines and blank-fire adapters designed to enhance safety, (3) radios for each team with separate frequencies for private team communication, (4) ear protection for individuals, (5) a Test Director to act as principal exercise conductor and communicator, (6) technical support for equipment maintenance, (7) assistance in participant preparation, (8) tactical consultation, and (9) video documentation and still photography. (The support equipment is shown in Figure 4.) SNL also offered to assist licensees in designing the exercises and conducting the AAR.

The contribution provided by the host facility consisted of the following: (1) a safe exercise area, (2) scheduling of participants for each exercise, (3) electrical power and parking for the SNL field trailer, (4) a briefing/debriefing area, (5) two part-time personnel for logistical support, (6) gate passes and badges for the SNL support team, (7) beverages for participants, and (8) first-aid attendants.

Exercises -- The daytime and nighttime exercise activities at the four licensee facilities visited (Southern California Edison, Detroit Edison, Boston Edison, and Virginia Power and Electric) were conducted essentially as follows:

- Visits were of 5-day duration
- Eight exercises were conducted daily. On some days, four of the exercises were during the nighttime
- 20 players participated in each exercise
- 45 exercises were conducted at each facility
- 90 security officers participated at each facility

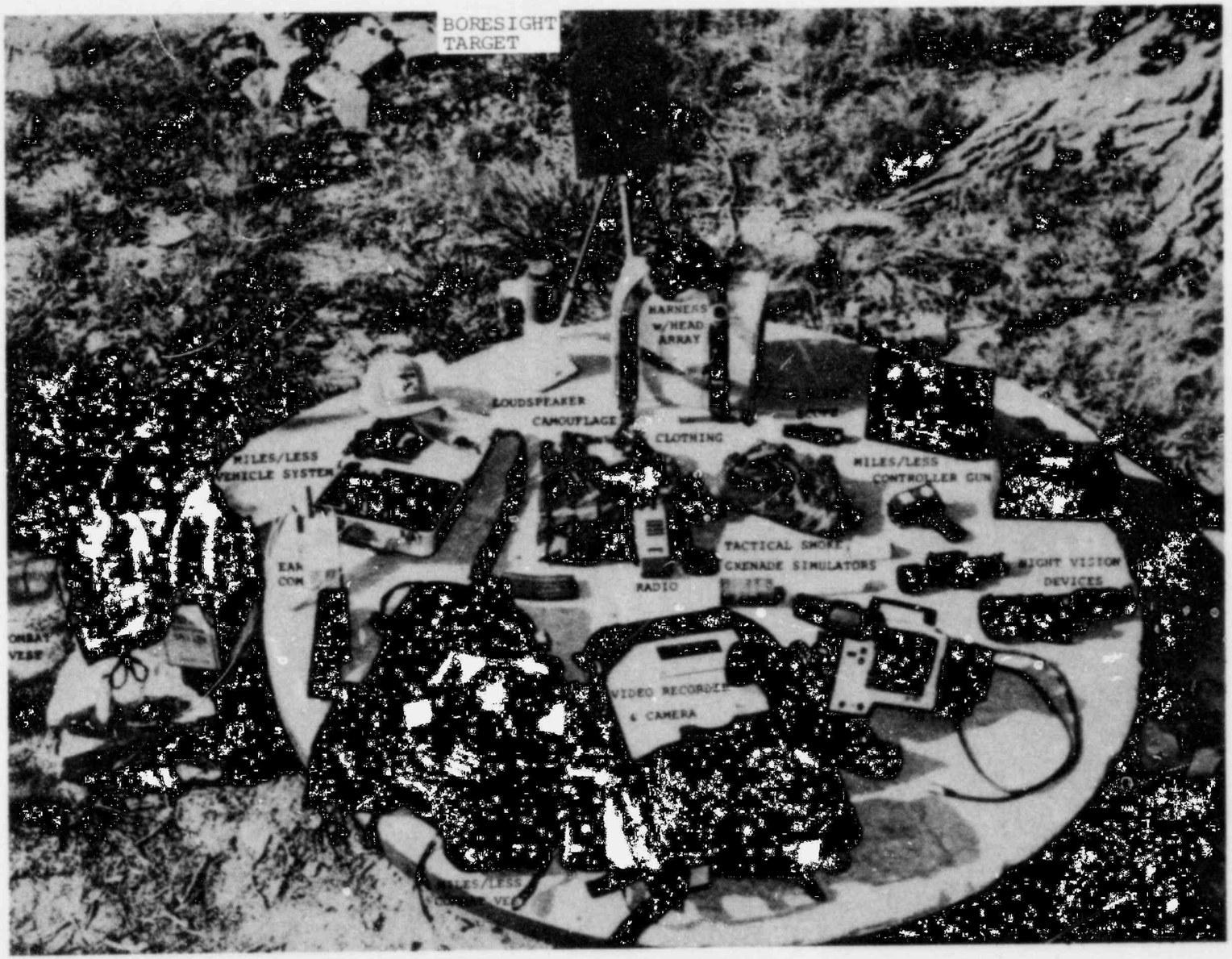

Figure 4. Support Equipment

Over the 3-month exercise period, a total of 595 participants were introduced to the ESS equipment. This total is as follows:

- 375 nuclear security officers
- 200 members of local law enforcement and FBI agencies
- 20 U.S. Marine Corps personnel

The exercise areas at the four facilities included

1. A mock combat village (at Camp Pendleton, California),
2. Large open fields in which portable plywood buildings or trailers had been placed (Figure 5),
3. Construction areas containing multiple small buildings, and
4. Warehouse storage areas.

All the exercise areas used were found to be adequate and provided an effective arena for the ESS demonstrations.

Concerns

Hardware Availability -- Engagement simulation equipment in an unmodified version can be purchased from Xerox Electro-Optical Systems (EOS) in Pasadena, California. Recent purchase prices were reported to be approximately $1,500 for a rifle transmitter, approximately $1,400 for a personnel-worn detector system, and approximately $1,200 for a controller gun. A considerable amount of support equipment is also required. Equipment maintenance is available from EOS; the cost is unknown but would undoubtedly be related to usage.

Because of the hardware and maintenance requirements stated above, it may be impractical for each licensee to purchase and maintain its own equipment. A more cost-effective approach might be to suggest that the procurement involve a consortium of several licensees who share in the initial hardware costs, maintenance, and usage. Another approach might be to involve a third party (e.g., in industry) to provide the required equipment and necessary support. The advantages and disadvantages of these possibilities are not fully understood. In the meantime, a readily available equipment source has not been identified.

Publicity -- The ESS exercises at the four licensee facilities received, for the most part, favorable publicity, which can be credited to advance preparations on the part of the facilities. Since the exercises are fairly noisy and have a high profile, each user should be prepared for a variety of media coverage and capitalize on it whenever possible. It is important to convey that facility advanced preparation enhances public safety rather than reducing it.

Safety -- To date, with over 7,000 participants involved, exercises employing ESS equipment have resulted in three broken limbs and approximately half a dozen minor lost-time accidents. Potential users

Figure 5. Plywood Building

should prepare for this eventuality. Perhaps of more concern, electrocardiograms on participants indicate that maximum heart rates (based on participant age) are reached during the exercises. Consequently, the cardiovascular condition of the participants should be carefully considered before they are allowed to take part in the exercises.

Validity -- The ESS exercises are simulations of real engagements. The participants are not in mortal danger during the simulation as they would be in an actual engagement. The effect of this disparity on behavior and performance is not known. In addition, marksmanship is not the same for laser beams as it is for live ammunition. Laser beams travel in a direct line at the speed of light, while live bullets follow trajectories which require aiming adjustments for long range or moving targets. Thus, a different sight picture is required. Conclusions based solely on the results of simulations must be carefully considered.

General Observations

All personnel, including members of the management staff, at the facilities visited agreed that ESS equipment could enhance the effectiveness of their facility's training program and undoubtedly prove to be a valuable asset in the future. They also agreed that the ESS equipment could be an important tool in a security evaluation program.

Improved morale and confidence on the part of participants were visible benefits of the ESS exercises and were clearly evident at the conclusion of the exercise day. SNL provided distinctive baseball hats and group photographs (Figure 6) and issued ESS equipment participation certificates (Figure 7), which instilled a sense of accomplishment and pride.

The ESS team from SNL was enthusiastically received by the training staff and management personnel at each facility. Logistic support required by SNL at the facilities was provided in a professional, positive manner. Feedback from participants and observers during the exercise period was, in general, extremely favorable.

Results of Licensee Questionnaires

To obtain data concerning the licensees' acceptance of ESS and the licensees' perception of the utility of ESS to their training program, a questionnaire (shown in Appendix C) was developed and sent to the participating licensees. It was suggested that supervisory and training personnel who observed the exercises complete the questionnaire. Questionnaires were returned by personnel at 3 of the 4 licensees visited for a total of 26 individual responses.

The data gathered from the questionnaires were very positive with regard to the use of laser technology for training and to its effectiveness. There was a greater diversity of opinion regarding who should operate licensing facilities and training teams. The majority

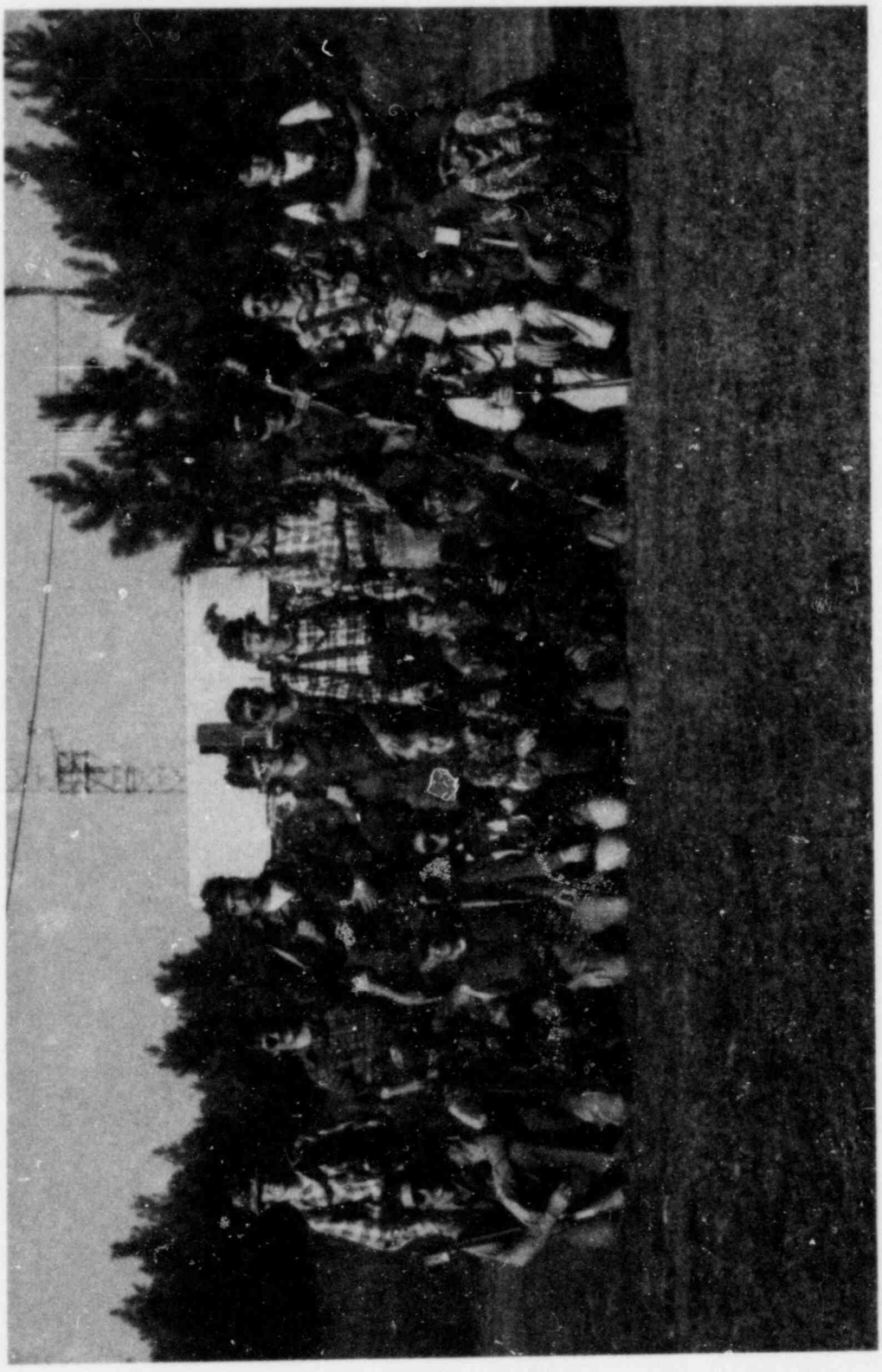

Figure 6. Group Photograph

Certificate

SECURITY FORCES EXPERIMENTATION & EVALUATION

This is to certify that

has participated in Simulated Tactical Engagement Exercises using the Multiple Integrated Laser Engagement System sponsored by the Sandia National Laboratories "SFEE" Division. Albuquerque, New Mexico.

_____ _____
date

_____ _____
date

Figure 7. Certificate of Participation

of responses favored licensee operation and control. Regional training facilities were thought feasible. The questionnaire delineated five issues of concern if laser technology were used for exercises within the protected area. They were

1. Maintaining normal security,
2. Possible injury to participants,
3. Disruption of normal operations,
4. Possible media attention, and
5. Reaction of nonparticipating employees.

The majority of the respondents thought the first two issues did not constitute a problem. The remaining three issues were considered significant enough, by a majority of the respondents, to influence management attitude.

The final question dealt with possible areas of concern in using laser technology. The results were quite varied. Cost was clearly the primary concern, followed by concerns about liability and safety. The rest of the concerns listed above were all mentioned but could not be ordered because of the response variability.

Conclusions

The Tactical Improvement and Security Force Evaluation Program had two objectives

1. SNL was to develop a package of information, TIP, that would provide a licensee who wanted to use the ESS (without outside assistance) with the necessary information.
2. SNL was to undertake a series of site visits to selected licensee facilities for the purpose of demonstrating and conducting ESS exercises using licensee security personnel.

The site visits demonstrated the feasibility of licensee use of the ESS equipment. The positive response by licensee training staff, security supervisors, and exercise participants would seem to indicate that use of such equipment would have strong positive effects on licensee physical security response capability. However, it should be noted that the sites visited consisted of a small, self-selected sample of the total licensee community, and, consequently, generalized observations or evaluations based on the exercises should be made cautiously.

ESS activity can provide, perhaps for the first time, relatively realistic force-on-force combat simulation. These simulations emphasize security personnel strengths and weaknesses in (1) tactics, (2) communications, (3) physical abilities, (4) morale, (5) leadership, (6) motivation and (7) marksmanship. Training can be conducted at any location and specifically tailored to deal with unique situations and problems. With proper coordination, exercises can be conducted during working hours, in and around potential high-risk targets. Tactical response to a hostile situation can be evaluated to demonstrate and improve capabilities and define areas which need additional emphasis.

APPENDIX A

Tactical Improvement Package (TIP)

CONTENTS

INTRODUCTION

The Tactical Improvement Package (TIP) is designed for use in conjunction with training exercises in which Engagement Simulation System (ESS) equipment is being used. The textual information contained in this appendix is to be used in conjunction with a video-tape attachment; together text and video tape fully document the TIP.

The premise of the TIP is that at least one member of the user's Training Management Staff has received prior instruction in the use of ESS equipment or has previously participated in ESS training exercises. The information contained in the TIP, when used in conjunction with the attached video-tape presentation, is intended as an aid for the effective use and the conduct of training exercises utilizing the ESS equipment. However, after a thorough review of the TIP and the video tape, personnel who have not met the preceding past-exposure criterion may possibly be able to conduct effective exercises.

The TIP is divided into two parts: Part 1 contains the expanded explanatory text; Part 2 contains both an expanded and an abbreviated Instructor's Guide. The format and flow of events depicted in these Instructor's Guides were based on experience gained from ESS exercises conducted at NRC licensee facilities as part of the Tactical Improvement and Security Force Evaluation Program. This format, if followed, should provide the basis for effective exercises.

TACTICAL IMPROVEMENT PACKAGE (TIP)

PART 1: EXPANDED EXPLANATION

CONTENTS

ILLUSTRATIONS

General Briefing

The general briefing on Engagement Simulation System (ESS) exercises sets the stage and the atmosphere for the exercise. If the briefing is conducted in a professional, controlled manner with the rules of the exercise and its objectives clearly stated, the participants will understand that lines of communication and authority have been established. If a positive, controlled atmosphere is not established at this initial contact, then the desired learning outcome or the training objectives will be much more difficult to attain. A passive or even negative attitude on the part of the participants may develop before the actual exercise begins if they receive the impression that the training exercise is only being conducted to "fill a square" on the training board.

When possible, the general briefing should be conducted in a classroom or similar setting. At a minimum, the area selected should provide protection from the elements, be well-lighted, and have a seating capacity large enough to comfortably accommodate all participants and the members of the training staff who will be conducting the exercise. Tables for equipment demonstration purposes and a blackboard or similar item which can be used to describe graphically the exercise area and its boundaries should be provided.

The following system equipment should be described at this time:

1. Detector harness and head array (Figure A-1, right),
2. Weapons equipped with blank-fire adapter and laser transmitter (Figure A-1, left),
3. Controller gun, and
4. Special blanks-only magazines (Figure A-2).

General Description of Engagement Simulation System Equipment

The Engagement Simulation System is a battery-powered laser transmitter and detector system designed around a family of weapons which allows realistic engagement simulation without the hazards of live ammunition. The weapon laser transmitter shown in Figure A-1 (left) includes an optically safe, battery-operated gallium arsenide laser diode capable of emitting pulses of coded infrared laser energy to simulate the effects of live ammunition. The pulsed laser beam becomes the laser "bullets."

The laser transmitter is attached to a weapon equipped with a blank-fire adapter (Figure A-3). The transmitter does not affect normal weapon aiming, has minimal effect on weapon balance, is easily removed from the weapon, and can be reinstalled with alignment repeatability. The acoustic report from fired blank ammunition activates a microphone inside the laser transmitter, which consequently sends a pulsed laser beam along the line of fire. If the message contained in the pulsed laser beam is correctly received by sensors located on the torso harness and head array worn by each participant (Figure A-1, right), an audio alarm is sounded, indicating either a near-miss or a

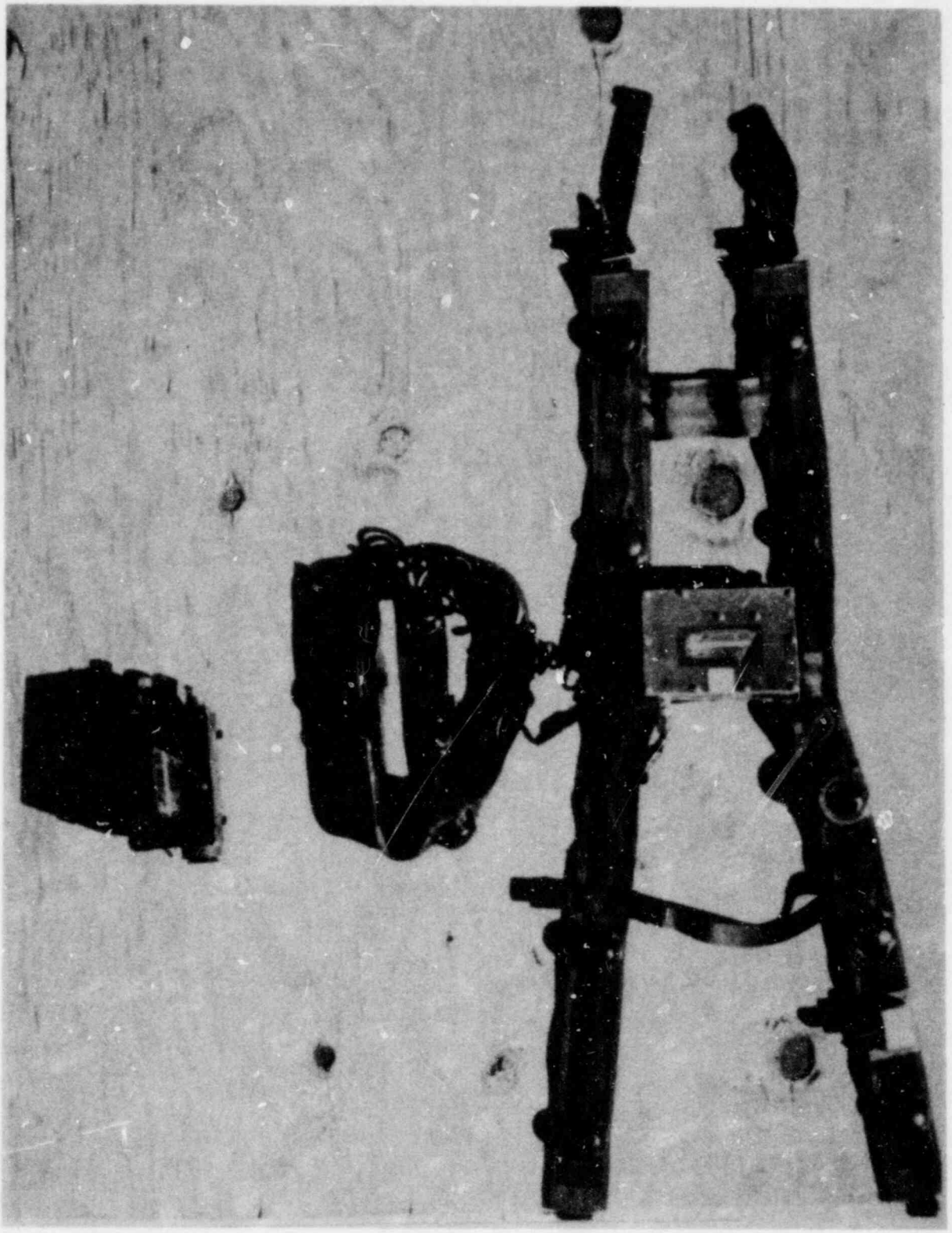

Figure A-1. Laser Transmitter, Head Array, and Harness Equipment

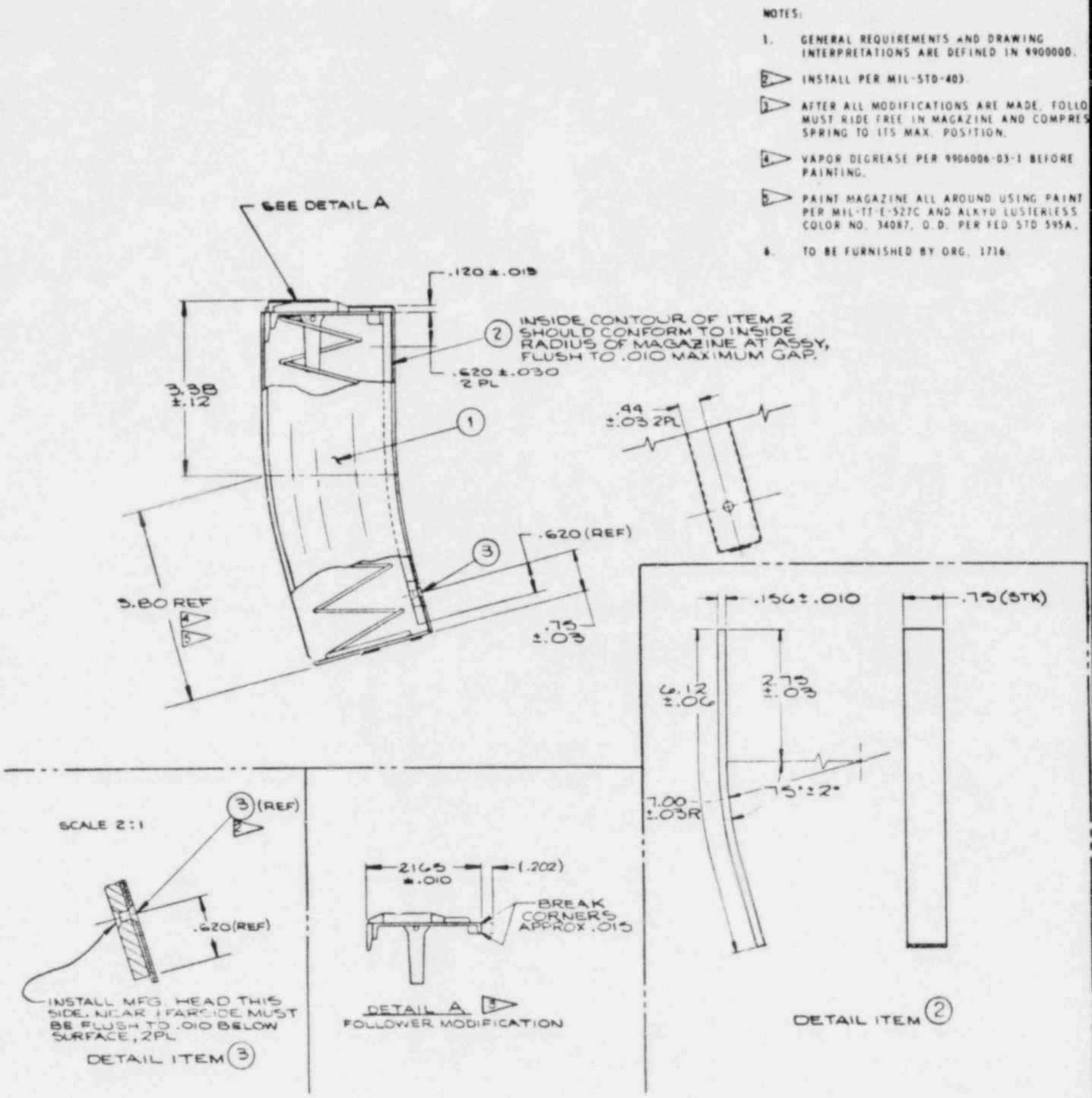

Figure A-2. Blanks-Only Magazine

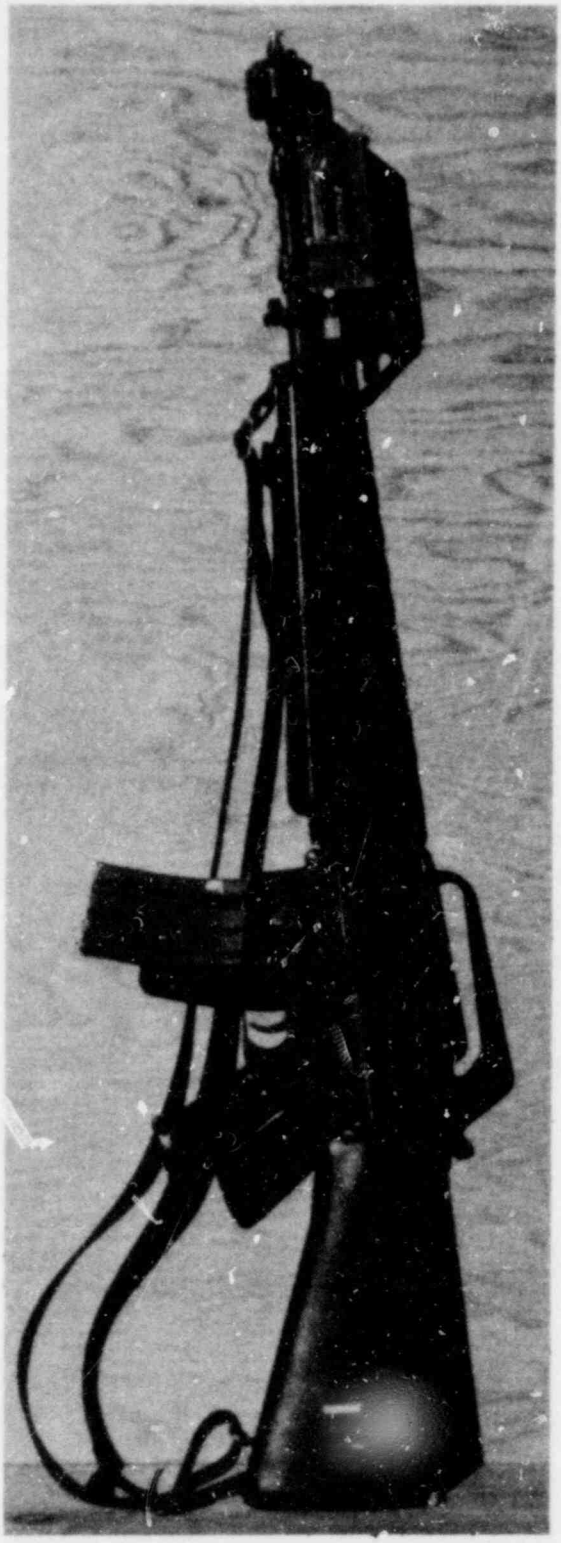

Figure A-3. Weapon Equipped with Laser Transmitter and Blank-Fire Adapter

hit, i.e., neutralization. The alarm is located on the left shoulder of the torso harness near the wearer's ear. The aural alarm associated with a near-miss consists of a series of several tones. This alarm allows the individual to take appropriate evasive action to prevent being neutralized. If a participant is neutralized by a direct hit, the alarm sounds a continuous tone. To silence the alarm, the individual must then remove a yellow key located in the rear of the weapon transmitter, which results in transmitter disablement, and insert the key into a receptacle on the harness. Once the alarm is silenced by insertion of the weapon key, the key cannot be removed without causing the continuous tone to recur, thus effectively preventing the neutralized player from further participating in the exercise unless the system is reset by an umpire.

The laser engagement simulation concept has been applied to a family of weapons, as shown in Figure A-4.

MILES Technical Description

The Multiple Integrated Laser Engagement System (MILES) is a Pulse-Code-Modulation (PCM) optical communication system in which the communication medium is the atmosphere. It consists of a laser transmitter and detector system that operates in a manner similar to the ESS equipment. MILES differs from conventional communication systems in that the interpretation of the transmitted message must, as closely as practical, simulate the weapon characteristics, such as round dispersion patterns and probability-of-kill as a function of range. A single tube laser transmitter scheme (Figure A-5) which sends both "hit" and "near-miss" messages is used for all weapons. With the initiation of blank fire, an 11-bit kill code message is transmitted four times. Upon completion of the four kill messages, an 11-bit, near-miss code is transmitted up to 128 times. The near-miss beam from the transmitter has a higher power than the kill beam and therefore produces a larger effective beam diameter over an extended range. This, plus the larger number of messages, greatly increases the probability of near-miss signal detection.

The optical receiver worn by the participant is comprised of silicon solar cell photodiodes (detectors) and an amplifier. The photodiodes convert incident optical energy in the channel to electrical signals. The output of the optical receiver is analyzed by a threshold comparator which detects the presence of signals above a predetermined level. The output is conditioned for sampling by a decoder. The decoder continuously looks for a valid hit or near-miss word pattern; when such a pattern is detected, the appropriate logic is applied and the user is signalled. An equipped player is shown in Figure A-6.

The laser transmitter and detector concept is being developed for a hierarchy of weapons, as shown in Figure A-4; some have unique "word" patterns which allow the "target" detector electronics to recognize and react to the lethality of the particular weapon. The entire system is designed so that the probability-of-kill given a hit

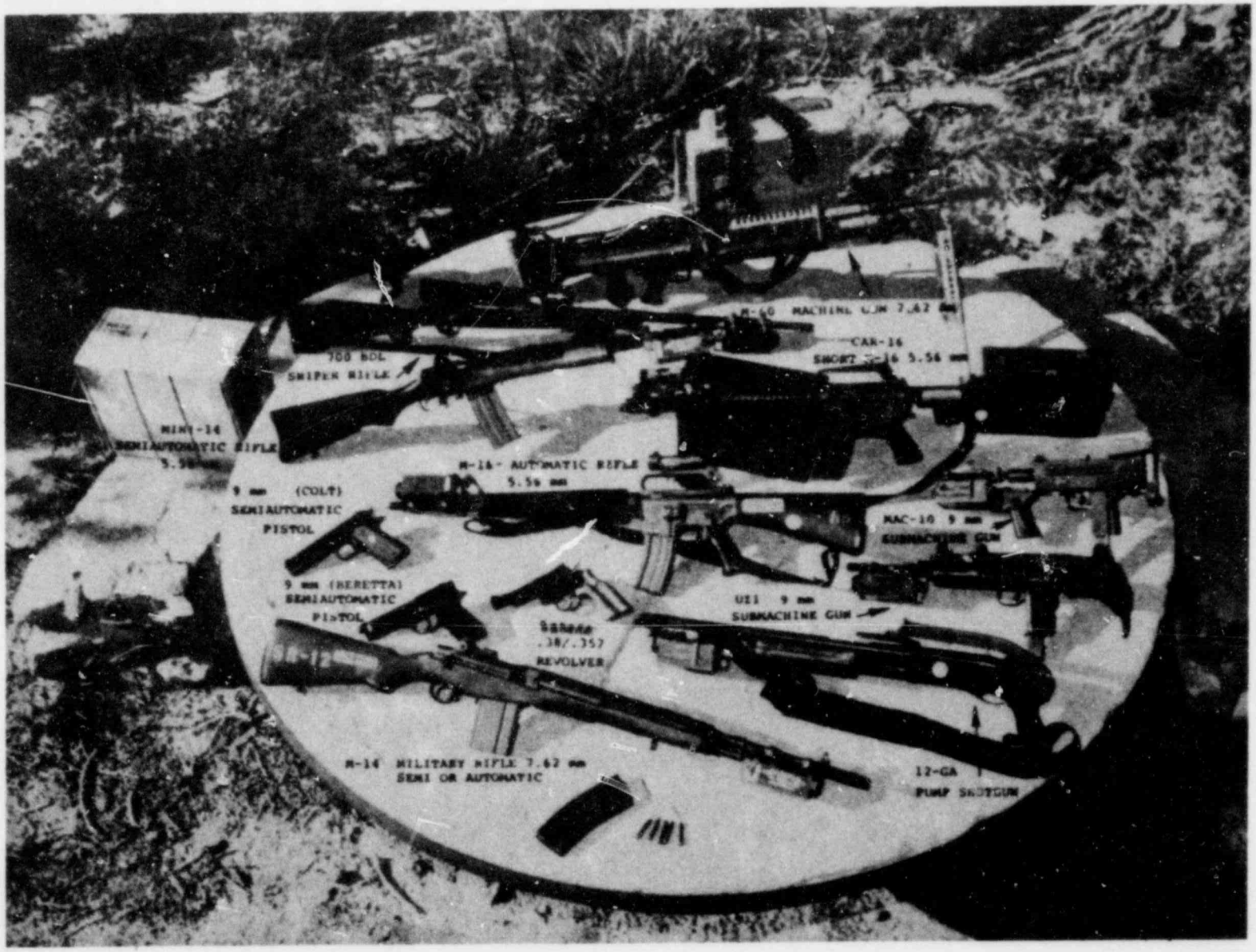

Figure A-4. Weapons

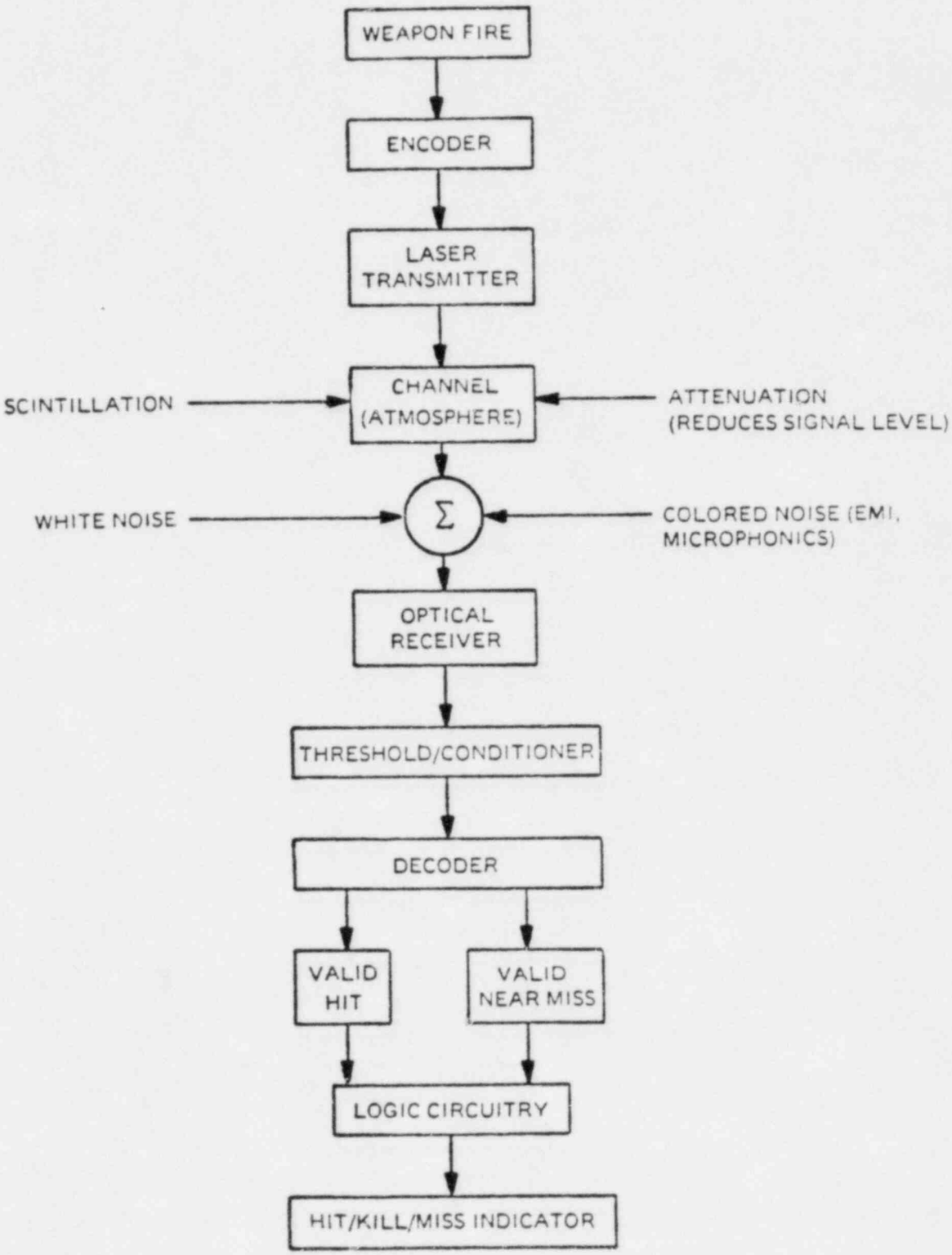

Figure A-5. Laser Transmitter Block Diagram

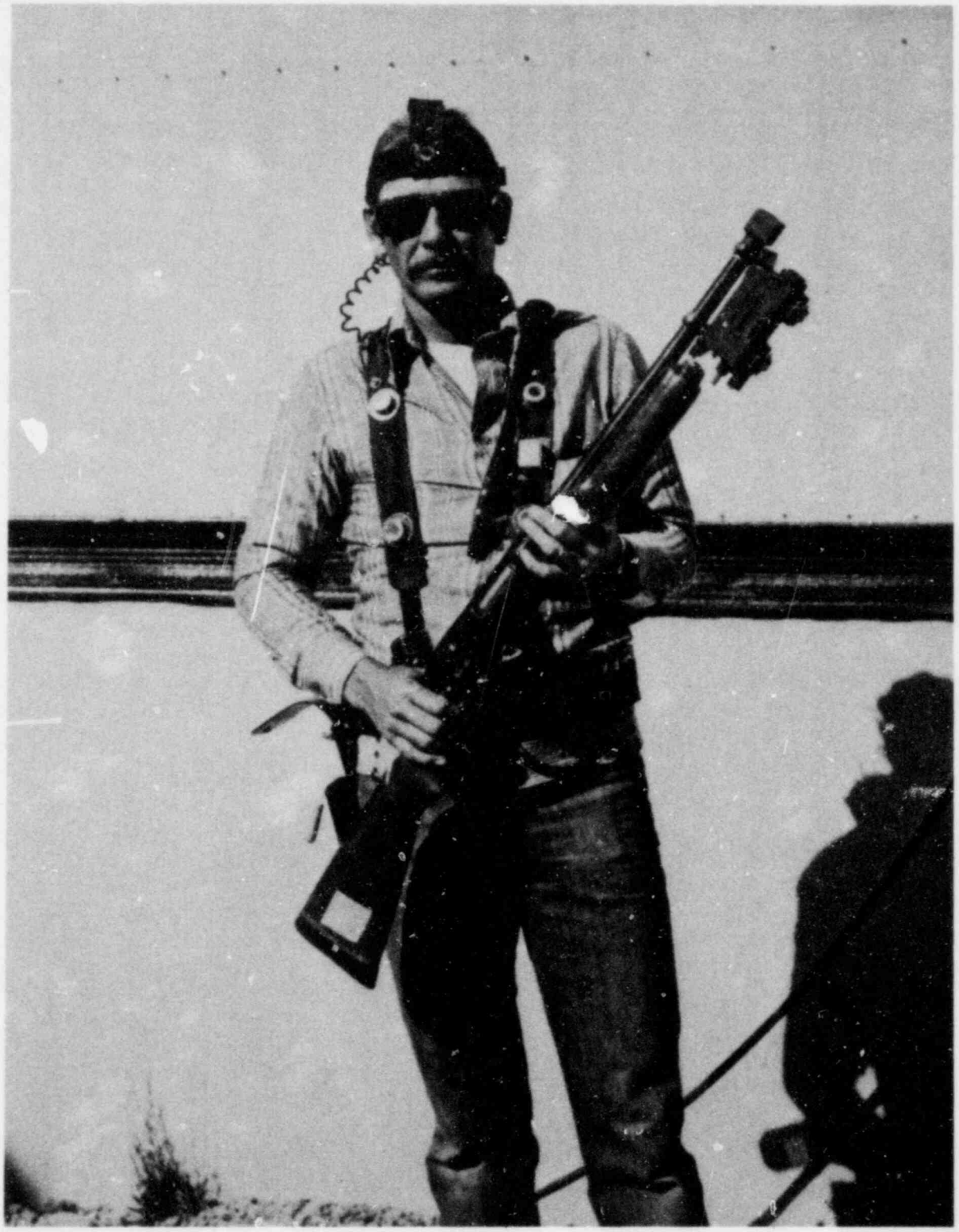

Figure A-6. Participant with Harness

closely approximates the weapon firing live rounds. This allows the shooter's abilities to influence engagement outcome.

Exercise Development

The scenarios selected for the ESS exercise should be representative of missions assigned to security personnel at the subject facility. The scenario or exercise must be designed to achieve the desired learning outcome or evaluation criteria.

Training classes of 6 to 20 participants are typical for each training period. When students arrive at the designated area, they should be briefed on the upcoming activities with regard to safety procedures, ESS equipment, the exercise scenario, tactical considerations, etc. After equipment has been issued and boresighting accomplished, the exercise is conducted. The exercise is immediately followed by the After-Action-Review (AAR).

It is important that the participant understand the objectives of the exercise, the rules of engagement, and any constraints. Due to individual experience, background, or tactical situation development, it is not possible to anticipate or direct the exact movements or tactics of the participants; therefore, as long as the basic premise of the exercise is followed, the exercise should be allowed to continue as "free play."

Maximum training effectiveness is achieved by the participants when multiple, short exercises are conducted. Three or four, 30- to 45-minute scenarios with an obtainable tactical objective will allow both the participant and the training staff to identify and correct deficiencies immediately following each exercise.

The Test Director, evaluator, and umpires should be in a position to observe the exercises. At a minimum, the Test Director and evaluator should monitor the operational radio channels of all participants for safety purposes.

ESS activity involves a man/machine system that permits engagements between adversaries with a realism not previously possible in small-forces war gaming. Since human factors are most easily and accurately incorporated into a simulation by human involvement in roles as nearly identical to those assumed in actual combat, the ESS approach allows an attack against facilities to be planned and carried out as it might occur in real life, except the weapons effects are simulated. Experience with this capability strongly suggests that the major individual participant behavioral strengths and weaknesses quickly become evident.

Areas in which ESS exercises have been shown to have beneficial effects are described below:

- Marksmanship and Weapon Skills -- The simulated probability-of-kill of the ESS is sufficiently representative to reward the good marksman in a realistic manner. Additionally, problems with weapon reloading, jamming, handling, sighting, etc., are essentially identical to actual combat situations in which real bullets are utilized.

- Shooting Decisions -- Simulated engagements require that participants make realistic decisions concerning acquisition, identification, and neutralization of the correct target. In addition, behavior which increases the probability of neutralizing a target must be balanced against the increased probability of detection by the adversary due to increased exposure, etc.

- Observation and Perception -- Simulated engagements require that participants be alert to and understand the conditions and situations to which they must respond.

- Communications -- Proper and improper use of communications become evident very quickly in simulated engagement conditions, and the importance of radios, hand signals, and voice communications are automatically emphasized.

- Cover and Concealment -- Typically, a participant's desire to "live" leads to a greater appreciation of the benefits of cover and concealment, while still contributing to the team effort.

- Tactics -- The consequences of good and bad tactics are experienced by participants through the simulated engagements. This learning-through-experience training is believed to be an extremely effective process.

- Leadership -- The effectiveness of appointed leaders becomes evident during the course of the engagement. Often, if the original leader is neutralized, a replacement leader surfaces from the surviving team members.

- Confidence and Morale -- Participants seem to acquire a new confidence in their own and their colleagues' abilities. Often they accomplish tactical and physical tasks that they previously didn't believe within their capabilities. Thus far, an important boost in morale has been observed.

- Competition -- The realism and challenge of the simulated engagements seem to instill a desire on the part of each team to do better than previous teams have done. This healthy effect results in maximum participant motivation and contribution.

- Complementing Systems -- The realistic combat conditions provided by ESS equipment allows other security system elements, such as access denial, alarms, guard towers, and vehicles to be tested in a more realistic manner.

Tactical Considerations

An important part of any training exercise is developing good tactical capabilities. The ESS exercises provide an excellent opportunity for security officers to exercise their tactical skills under simulated hostile situations. Although it is not possible to anticipate or direct exact movements or tactics to be employed in the exercises, it may be helpful for the Test Director to suggest that team leaders develop a broad tactical strategy and to briefly outline some tactical considerations for participants. These might include

1. Tactical communications,
2. Information collection and reporting,
3. Cover and concealment, and
4. Command and control.

If the security force at the subject facility has developed its own set of tactical responses for hostile situations, participants should be encouraged to make use of these tactics to demonstrate their strengths and weaknesses in execution and to take advantage of this training opportunity to refine their skills.

Tactical Communications -- Communications is a necessary part of any exercise, regardless of the primary purpose of the exercise, and is vital to its successful completion. In general, security personnel must be able to communicate by various methods in order to achieve the flexibility needed to operate effectively. Proper and improper use of communications become evident very quickly in simulated engagement conditions and the importance of radios, hand and arm signals, etc., are automatically emphasized. The ESS exercises provide an opportunity for personnel to increase their proficiency in the use of communications equipment and in procedures established for various methods of communication.

The various methods of communication commonly in use include (1) radio, (2) telephone, (3) hand and arm signals, (4) whistles, (5) pyrotechnics, (6) voice, (7) messenger, and (8) flashlight signals. Each of these is briefly examined below. Well-balanced communications training can be accomplished during exercises by selectively restricting various communications methods, forcing participants to rely upon the remaining methods. For example, radios can be taken away from participants during all or part of an exercise, which will force the participants to utilize other methods of communication.

The Test Director should briefly review all forms of communication, emphasizing the advantages and disadvantages of each method:

- Radio -- In tactical situations, the use of the radio requires circuit discipline on the part of the participants, i.e., transmissions should be clear, concise, and pertinent to the situation. Authentication codes to verify messages greatly improve communications reliability.

Advantages to using radio communications include

1. A broad range, which allows wide dissemination of information,
2. Mobility, and
3. Ease of operation.

The primary disadvantage of radio communications is the potential for security breaches. A team member may overhear opposing team members using their radios, thus learning call signs, strategy plans, or team member positions. In addition, a participant may gain access to an opposing team member's radio that has been either lost or stolen, thus allowing the opposing team member to intercept important messages or to broadcast misleading information. Other disadvantages include the possibility of jamming and the unreliability of battery power.

NOTE

If radio communications are used, participants should be advised not to divulge information which may be helpful to potential adversaries, such as a participant's specific position or important strategic plans.

- Telephone -- Telephone communications are another possible option. The advantages of telephone communications include

  1. Security (difficult for adversaries to tap),
  2. Reliability (not dependent upon battery power), and
  3. Ease of operation.

  The disadvantages of telephone communications include

  1. Lack of mobility, and
  2. Limited information dissemination.

- Hand and Arm Signals -- If the security force at a facility has a system of hand and arm signals, these may be used for communication. These signals should be briefly reviewed before the exercise. Developing a simple system of hand and arm signals for use during the exercises is also a possibility.

  Hand and arm signals can be extremely effective as long as all team members know what they mean and visibility is good. The disadvantage of hand and arm signals is that usage is limited to the daytime or to illuminated areas during nighttime. In addition, a signalling team member must expose himself/herself to view.

- Whistles -- A series of whistles can be used as a simple source of communications. Team members should be briefed on and practice the whistle signals to be used before the exercise commences. The advantage to whistles is their audibility

and the fact that participants can remain concealed while signalling. However, whistle signals are not a dependable method of communication. Their use is limited to long and short blasts or simple combinations of the two. For example, one short blast could mean "commence attack," one long blast could mean "use gas," etc. The number of various signals that participants can be expected to remember is also a limiting factor. This is complicated by the fact that it is difficult to determine the difference between long and short whistle blasts.

- Pyrotechnics -- The use of different colored smoke as a signal for a particular movement or tactic can be effective. The advantage of this type of communication is that the smoke can also be used by a team to obscure their movements from the opposing team. If released in the area of activity of the opposing team, the smoke will obscure the opposing team's vision while allowing them to be observed.

  The disadvantages of smoke signals are that

  1. Dissipation periods vary a great deal,
  2. In enclosed areas, smoke may hinder the movements of the friendly team,
  3. In open areas, wind may carry the smoke in the wrong direction or dissipate it too rapidly.

- Voice -- Voice communications are often the easiest to use. Vocal signals are easy to understand, rapid and complete, and can be used at most times, except in a covert situation when concealment or surprise is a factor. In an overt situation, the participant's presence is known and direct voice communications can be very effective.

- Messenger -- The use of a messenger can be an effective means of communication in certain situations. Messages to be relayed should be kept simple since, in a stress situation, the messenger may add or detract from the message. The primary disadvantages of using a messenger are that it is slower than most other communication methods and, in a tactical situation, there is the risk that the messenger will be neutralized and the message will never be received.

- Flashlight -- Flashlight signals, like whistle signals, are limited by the number of signals that can be remembered. Also, it is often difficult to determine the difference between long and short signals. In a covert situation, flashlight signals will reveal the position of the signaller.

When developing a strategy for ESS engagements, team leaders should keep in mind the strengths and weakness of the various methods of communication available and their suitability for the ESS exercises.

Information Collecting and Reporting -- Information collecting and reporting are also an important part of security force tactics. Simulated engagements require that participants be alert to and understand the conditions and situations to which they must respond. Good observation and reporting techniques are required for success in any "armed" encounter. Therefore, it is vital that critical information be passed up and down and laterally among team members. In the initial phase of a tactical situation, it is also essential that the actual or potential threat to supervisory or command and control personnel be accurately gauged. This knowledge will assist team leaders to initiate the proper course of action and could make the difference between the success or failure of certain tactics. Target acquisition, target destruction, and friendly casualties are examples of important events about which information should be communicated at the earliest opportunity. Failure to collect and report this type of information will greatly detract from a team's tactical ability.

In tactical situations, important information must be reported quickly, completely, and accurately. Following a set routine helps to ensure that no important information is omitted. A memory aid used by the military for complete reporting is the word "salute."

S - Size. How may adversaries are there?
A - Activity. What are they doing?
L - Location. Where are they?
U - You. What is your location and position?
T - Time, when applicable.
E - Equipment. What do they have with them?

Another memory aid which can be used to assure complete reporting is the five "W's." By answering the questions, "who, what, where, when and why (or how)?" a complete report can be given. It does not matter in what sequence the questions are answered.

It is also important in information gathering to be able to describe opposing team members observed during an incident since the observer may lose sight of the person and should be able to describe him/her sufficiently for another team member to identify. A trained observer should first note the general characteristics of the subject being observed; this includes age, sex, race, weight, height, and complexion. Then, if appropriate, more specific characteristics should be noted, including color of hair and eyes, teeth, marks or scars, and mannerisms. Finally, changeable characteristics, such as glasses, hair style, and clothing, can be noted. This approach will produce a good subject description. To become an accurate observer, it is important to be as exact as possible. An accurate observer reports everything that he/she sees or hears, while leaving out personal opinions and conclusions.

It is important that information be collected quickly and reported accurately. This is often difficult to do under stress. The ESS provides the security officer with an excellent opportunity to practice these skills.

Cover and Concealment -- Cover and concealment can be the key to survival in a hostile situation. Typically, a participant's desire to "live" leads to an appreciation of the benefits of cover and concealment. Participants should understand the basic difference between cover and concealment and good examples of each.

Cover is protection from weapon fire and includes

1. Earth embankments,
2. Heavy equipment,
3. Vehicle engine blocks, and
4. Concrete walls.

Concealment is protection from observation. Examples include

1. Shrubbery,
2. Tall grass,
3. Dark shadows,
4. Buildings, and
5. Darkness (does not provide concealment if opponents are equipped with night-vision devices.)

NOTE

Participants should be aware that objects that provide cover against laser "bullets," such as plywood buildings, would not provide adequate cover against live ammunition.

A simple exercise using ESS equipment can be used to demonstrate the efficacy of cover and concealment. Instruct the participants to move from one designated point to another point using a route of their own choosing, remaining under cover as much as possible and, when cover is not available, making maximum use of concealment. Marksmen can be placed at selected potential adversary positions to fire at participants when they are exposed. Remember, however, that ESS laser beams will not penetrate objects that are easily penetrated by live rounds, e.g., dense foliage, fences, and cardboard. Hence, concealment is often identical to cover for ESS equipment. It is important that participants be aware of this fact to avoid gaining a false sense of security through the use of ESS equipment.

Command and Control -- ESS exercises should provide training experience in all areas of command and control. Training which exercises the command and control functions should confirm the adequacy of the subject facility's contingency plans.

The normal chain of command and control extends from the central alarm station, to the on-scene commander, through the team leaders, to each individual security officer. Communications is the key to a successful operation. Information pertinent to the situation changes rapidly and must flow smoothly up and down the lines of communication. The perceived role of the security officer is to contain, isolate, delay, and, under certain circumstances, neutralize the adversary. To

accomplish this goal, a system of cordon operations should be implemented. All of these capabilities can be demonstrated during the ESS exercises.

The basic elements of a cordon are the inner perimeter, the outer perimeter, and the command post.

- Inner Perimeter -- The inner perimeter is usually formed by security personnel first arriving on the scene in a crisis situation. The size and shape of the cordon depends upon the location of the adversary and upon the immediate area surrounding the location. The primary purpose of the cordon is to contain. Personnel should be positioned to provide good cover with good observation. Communication with the on-scene team leader (command post) is essential. All areas must be covered. Personnel must know how to observe, how to report, and what actions are required under a variety of possible situations.

- Outer Perimeter -- The outer perimeter serves two purposes: isolation and additional containment. The outer perimeter keeps unauthorized persons out of a cordoned area and serves as a back-up to the inner perimeter. There may be more than one outer perimeter, depending upon resources available and the specific situation.

- Command Post -- The command post is established to permit the on-scene commander to supervise and control the cordon operations. The command post is usually located on or near the innermost outer cordon in a relatively protected location that is appropriate as a rendezvous point for arriving security personnel.

- Suggested Field Exercises -- Field exercises in cordon operations training can be divided into two distinct phases: planning and implementation.

  Planning. Personnel should be divided into teams of two to six individuals each (including both supervisory and rank and file personnel, if possible). Assign each team one or more locations that may be likely adversary positions. Require each team to plan a cordon operation for the locations assigned. Plans should include the location of the perimeters, specific positions for personnel on the perimeters, personnel requirements, equipment requirements, including positions for heavy weapons or vehicles, command post and rendezvous area locations, evacuation plans for personnel in cordoned and surrounding areas, and intelligence information on the opposing force.

  This exercise should yield two major results: (1) all participants will gain a thorough knowledge of the physical aspects of establishing a cordon and (2) the exercise will provide the facility with information that can be used to update contingency plans for this aspect of the facility's security.

Implementation. Performance skills are not learned unless they are practiced. In other words, the use of only classroom-type activity is insufficient for tactical training. To complete the training in cordon operations, security personnel should conduct simulated cordon exercises. The use of the ESS adds significant realism to the exercises, especially for personnel forming the inner cordon. For example, several designated "adversaries" may be placed in a likely location--a location for which contingency plans have been made. Then, the designated "on-scene commander" begins the cordon operation. The exercise continues until all elements of the cordon are fully established. If possible, some "civilian workers" that can be evacuated from the area should be included. This exercise can accomplish several objectives. First, it gives the rank and file security personnel experience in forming cordons and simultaneously demonstrates their individual tactical expertise, especially if participants are using ESS equipment. Second, it gives supervisory personnel experience in directing a cordon operation and in dealing with the problems that arise. Third, it provides an excellent "shakedown" of the facility's contingency plans with regard to personnel, communications, tactics, and equipment. Fourth, it gives facility personnel an opportunity to interact with the reserve force and/or local law enforcement agencies that are to render assistance in crisis situations. Once the cordon has been established, the exercise can be expanded, if desired, into such tactics as negotiating with adversaries who have hostages, assaulting the adversary position, etc.

Upon completion of exercises of this nature, the security officer and management personnel should better understand the command and control function and the concept of cordon operations.

Concerns

The Tactical Improvement and Security Force Evaluation Program using ESS equipment is still undergoing development. As with any simulation program of this type, inadequacies in simulating the hardware and the differences in human behavior in gaming versus actual engagement situations result in discrepancies. Some problem areas which have been identified are

- Marksmanship -- The laser pulses travel in a direct line at the speed of light and do not simulate a realistic bullet trajectory. Without this "bullet drop," the required sight picture for an ESS hit (aim dead on) is not representative of the real rifle/bullet requirement for long-range or moving targets. Additionally, in some target postures (such as standing broadside with all detectors showing), a participant is easier to hit using the ESS equipment than would be the case with a real, live bullet.

- Realism -- Although the ESS equipment provides the most realistic engagement conditions developed to date, participants

still may perform differently than they would if real, live bullets were being used. Some participants have indicated that they would react more conservatively in an actual engagement. This conforms with available literature on suppressive effects during combat. An additional example of lack of realism is that cover which would be adequate during an ESS engagement to block laser beams would not necessarily provide adequate cover against live ammunition in a real engagement.

- Morale -- On occasion, when worst-case scenarios are employed, the outcome can be discouraging to participants if the security system of which they are a part fails overwhelmingly. Training officers should be alert to this possible outcome when selecting scenarios.

- Safety -- Participation in simulated engagements can be both physically and emotionally strenuous. Personnel with medical restrictions should be screened so that medical problems are not aggravated.

Exercise Area

Site Selection -- The site selected as the exercise area should be one which will enhance the desired learning outcome or will be conducive to the evaluation criteria. The area selected and its physical attributes should be representative of the area of responsibility of the participants. Emphasis should not be placed on open-field combat-type scenarios if the participants' primary area of responsibility is restricted to areas which contain only buildings, parking lots, etc.

Training management personnel should attempt to use existing facilities when conducting the exercise. However, if this is not feasible, the following information is provided on choosing and preparing an exercise site:

- A large, open, sandy or grass-covered area should be selected. Place two or more plywood or metal buildings in the center of the area. The buildings should have windows or doors which face in all four directions. Old construction buildings or trailers will suffice (see Figure A-7).

- An outer perimeter can be provided by 55-gallon drums placed at a distance of 25 to 50 meters from the buildings at intervals of between 15 and 30 meters. These drums will represent barriers or obstacles and will also provide some cover for the participants (see Figure A-8).

- Barriers or obstacles can also be constructed from 3/4-inch plywood (see Figure A-9). These barricades or obstacles are excellent tools for evaluating tactical movement around and through open doorways, buildings, and windows. They also provide an opportunity for assessment of weapon firing around barricades. These items, if fabricated, could and should become a permanent part of the facilities' training aids.

Figure A-7. Building and Participant

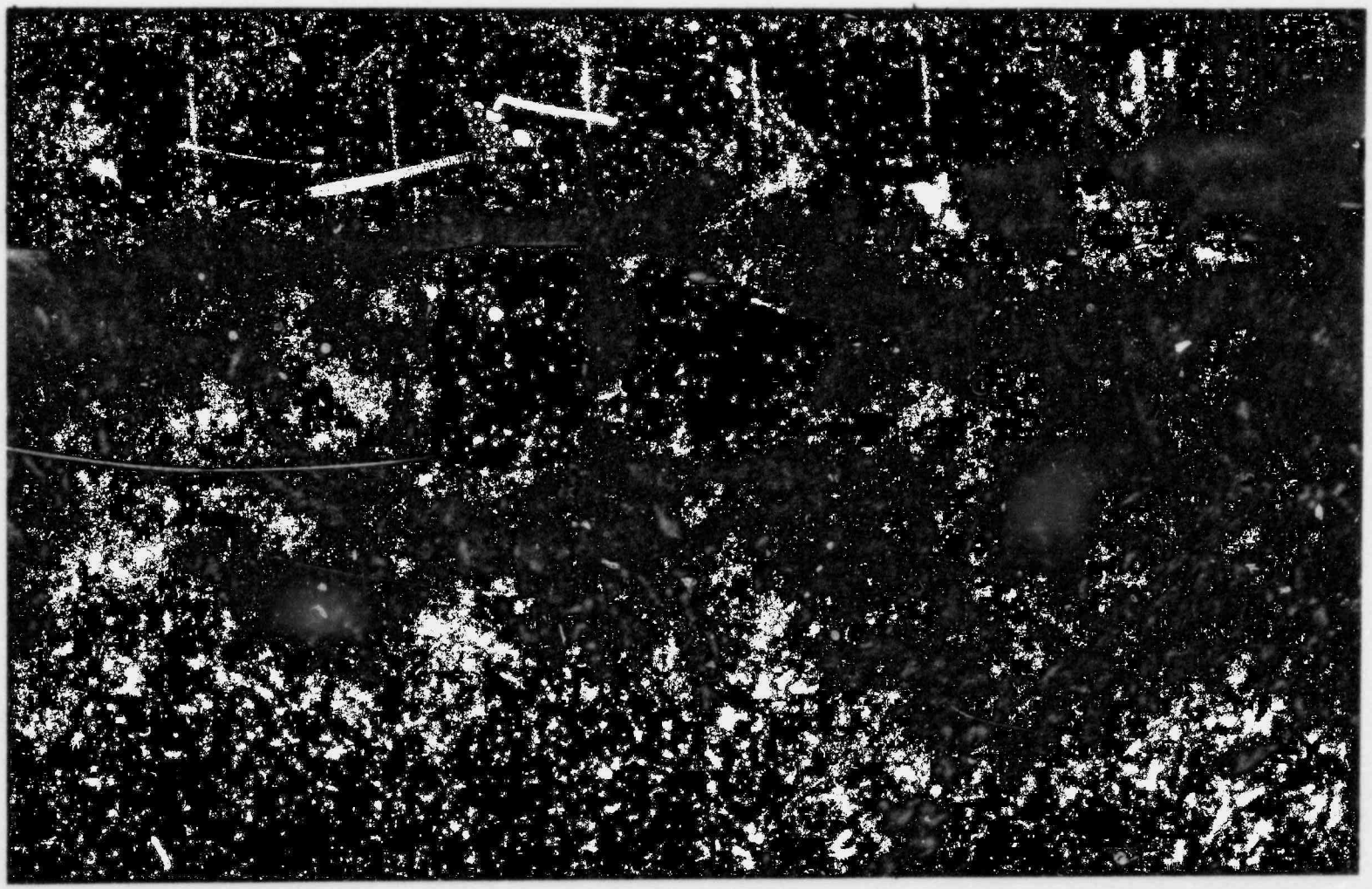

Figure A-8. 55-Gallon Drum

Figure A-9. Plywood Obstacle

Test Director Requirements and Responsibilities

Requirements -- The Test Director must be thoroughly familiar with the requirements of the ESS exercise training procedure. The Test Director should also be familiar with the exercise site and have a complete understanding of the equipment to be used and the details of the exercises to be conducted.

Responsibilities -- No exercises may be conducted without the presence and approval of the Test Director. The Test Director is responsible for exercise safety and for enforcing the training procedure and has the authority to halt operations whenever, in his/her judgment, unsafe conditions are present. The Test Director will signal for an exercise to be halted by giving a long, continuous blast on a siren or other previously agreed-upon signal. All participants must immediately cease all activities upon hearing the Test Director's signal.

The Test Director functions as the principal communicator prior to conduct of the exercises and controls access to the exercise site at all times. The Test Director also monitors the operational channels of all participants' radios at all times. Any participant who wants an exercise halted for safety reasons may communicate immediately and directly with the Test Director via his/her radio.

Umpire Requirements and Responsibilities

Requirements -- The umpire should be thoroughly familiar with the training procedure and the exercise site and should have a complete understanding of the equipment to be used and the details of the exercises being conducted. At least one umpire must be present before an exercise can be conducted. Additional umpires may be assigned at the discretion of the Test Director.

Responsibilities -- The umpire works directly with and reports to the Test Director and must maintain radio contact with the Test Director at all times. Part of the umpire's duties are to assist the Test Director in maintaining "safe" operating conditions at all times.

The specific duties of the umpire include, but are not limited to, the following:

1. Ascertain that all participants in view are observing correct and safe procedures,
2. When a vehicle is being utilized as part of a scenario, turn off the engine if the participant fails to do so and set the parking brake,
3. Notify the Test Director immediately of any unsafe conditions, and
4. Stop any hand-to-hand engagements by participants.

Evaluator Requirements and Responsibilities

Requirements -- The evaluator must be familiar with the exercise site and have an understanding of the equipment in use. The evaluator must have a total understanding of the desired learning outcome to be measured or the evaluation criteria. This requires that the evaluator be someone who has the technical expertise to properly evaluate the exercise. The evaluator must keep foremost in mind what the desired learning outcome or evaluation criteria are to be, what goal was accomplished, and how participant performance during the exercise could have been improved.

Responsibilities -- The specific duties of the evaluator include, but are not limited to,

1. Assessment of team planning. Did the plan fail or succeed and why? Was an alternate plan discussed?
2. Assessment of tactical maneuvers such as (a) use of cover and concealment, (b) firing around obstacles, (c) team movement with cover fire, (d) use of the radio for intelligence gathering, (e) use of the radio for passing of pertinent information, (f) reactions of the team members when fired upon, (g) team and backup team leader assignment, and (h) use or lack of call signs or team designations.
3. Conduct of the AAR with the Test Director.

Support Personnel

A number of variables will determine what support personnel are required. The sophistication of the exercise, the number of players, and the physical location of the exercise area relative to unsafe areas all play a major role in determining the support requirements.

At a minimum, in addition to the Test Director, umpire, and the evaluator, the following support is required:

1. Medical and fire protection personnel on the scene or readily available,
2. Personnel to provide water, food, soft drinks, coffee, etc.,
3. Qualified personnel to issue ESS equipment, radios, weapons, blank ammunition, and magazines,
4. Qualified personnel to check equipment, reset ESS harnesses, and issue blank ammunition at the exercise area if multiple scenarios are conducted,
5. Transportation support if the exercise area and the equipment storage area are physically separated,
6. Personnel to accept turn-in of equipment, and
7. Weapons and equipment cleaning personnel.

Many of the initial tasks indicated above can be accomplished by the Test Director, umpire, and evaluator before the exercise commences. However, for situations in which multiple exercises are being conducted, these personnel will not have sufficient time to accomplish supporting tasks between scenarios.

Team Members or Participants

Each participant should be in reasonably good health and physical condition to withstand the demands of the exercise. Participants may be required to act both in a defender and adversary role. The teams do not necessarily have to be divided equally. A scenario could very well be one in which 5 adversaries attempt to penetrate a secure area which is defended by 10 security officers.

Participation of local law enforcement agencies in the exercises, whenever possible, is both recommended and encouraged. In addition to providing a broader range of tactical techniques, these outside agencies will typically appreciate the opportunity which can potentially improve interfaces.

Indemnification

The host facility may find it advisable to have members of outside agencies who are participating in an exercise sign an indemnification that releases the facility from liability due to injuries. A sample indemnification is provided in Appendix B.

Boresight Procedures

Prior to weapons issue and the arrival of the players, members of the Training Management Staff should provide initial boresight alignment of the weapons that will be used in the exercise.

The SNL-developed boresight target (shown at the top of Figure A-10) is equipped with five sensors, which respond to the pulsed laser beam from the ESS laser transmitter and report the hit via a radio signal. (See also "User's Guide" on Video Tape.)

To prepare the boresight target,

1. An MX series Motorola radio is placed in the receptacle on the back of the boresight target and the electrical connection completed,
2. A 9-volt battery is placed in the compartment located on the back of the boresight target,
3. The radio is turned on, and
4. A second radio on the same frequency is placed at the firing line and the radio is turned on.

The system is now ready for operation. Target "hits" and near-misses" will be audibly reported to the shooter.

Dry Fire Zeroing Procedure -- The dry fire zeroing procedure consists of the following steps (see "User's Guide" on Video Tape):

1. Install the laser transmitter on the weapon,
2. Install a 9-volt battery in the transmitter,
3. Turn the yellow key to the "ON" position,

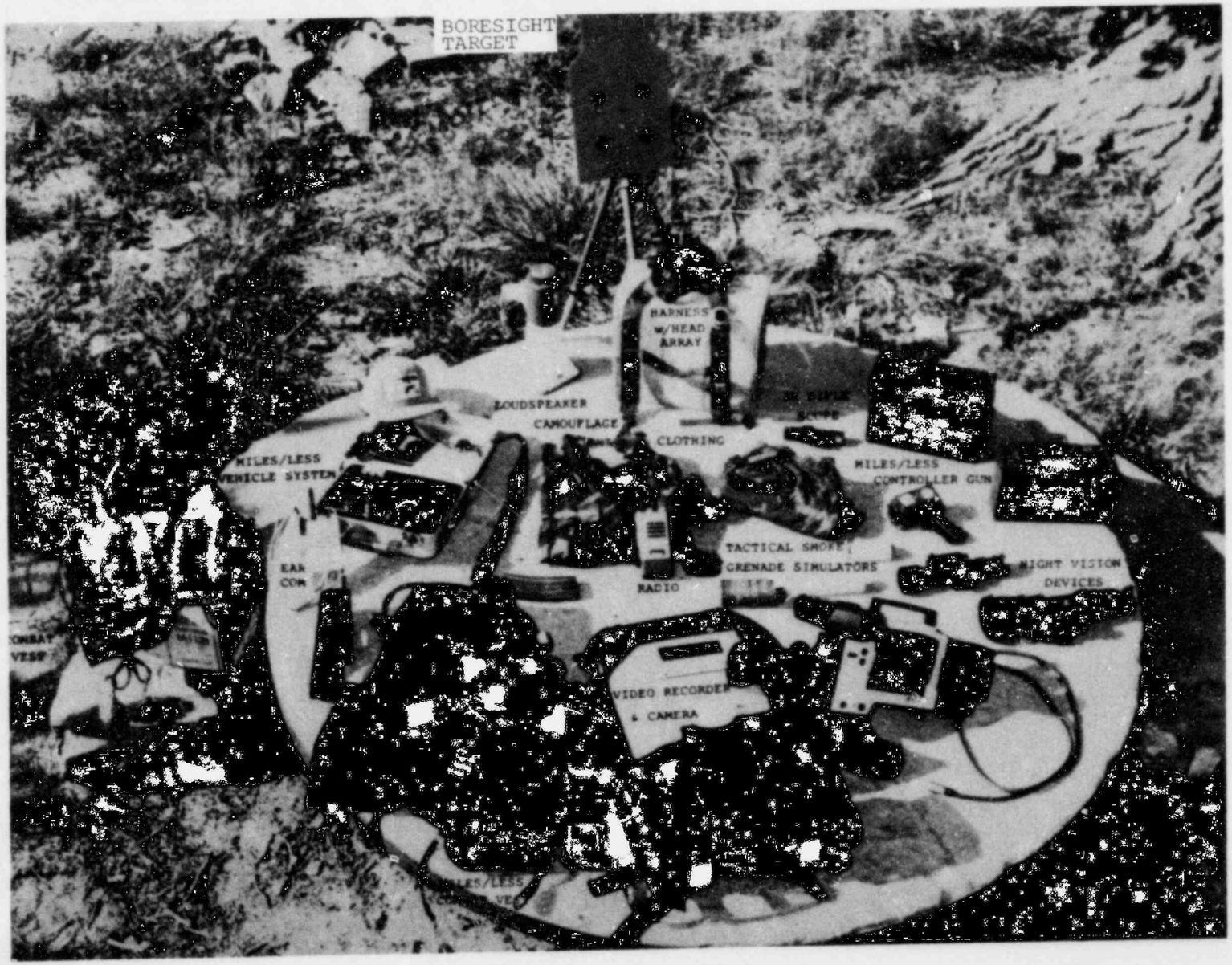

Figure A-10. Support Equipment

4. Install the dry fire cable connection in the receptacle on the transmitter,
5. Depress the dry fire cable microswitch (when the microswitch is depressed, the light-emitting diode (LED) on the transmitter should illuminate; this indicates that the laser transmitter is functioning properly),

NOTE

If the LED does not illuminate (a) check the battery, (b) move the yellow key to the OFF position, wait 5 seconds, and turn it back to ON, and (c) check the dry fire cable connection.

6. Align the weapon's sights with the boresight,
7. Depress the dry fire cable microswitch and sweep the sight picture across then up and down the boresight target.

NOTE

A steady tone on the radio indicates a hit. An intermittent tone indicates a near-miss.

8. Make sight adjustments, if required.

To ensure total operation of the transmitter, fire one or more blank rounds at the boresight target. If the sight picture is correct, a "hit" (kill) should be recorded. This procedure ensures that the laser transmitter microphone is functional. To obtain an operational check of the boresight target, the controller gun is used to fire a "hit" message at the boresight target; the resulting steady tone indicates a "hit" (kill) on the radio. (See "User's Guide" on Video Tape.)

When the SNL boresight target is not available for boresighting, the following procedure may be used to boresight the exercise weapons.

1. Place a personnel-worn detector harness assembly downrange on a post, fence, etc., at the desired sighting distance. The harness should be positioned so that either the chest or back detectors are exposed as the target.
2. Station an observer equipped with a radio and a "green key" near the harness and have the shooter fire his/her weapon at the target. An aural alarm on the harness indicates a "near miss" or "kill." The observer reports the results back to the firing line by radio.
3. If required, the shooter can make sight adjustments and repeat the firing sequence.

NOTE

The harness must be reset with the "green key" each time a "kill" signal is received.

Blank Fire Zeroing Procedure -- It is important that each participant fire his/her individual weapon at the boresight target. This will convince the participant that the system is operational and that the weapon is accurate.

NOTE

Do not allow the participants to load their weapons until they are on the firing line.

Steps in the blank-fire procedure are listed below:

1. Instruct the participant to move to the firing line,
2. Have the participant load his/her weapon,
3. Check to see that the yellow key is in the transmitter and is turned to the ON position,
4. Remind the participant to use the correct sight picture and trigger control,
5. Allow the participant to fire four or five rounds (the radio tone will indicate "hits" or "near misses"),
6. Align sights if required, and
7. Have the participant clear the weapon and move the safety/selector lever to the "SAFE" position prior to departing from the firing line.

This procedure should be conducted for all participants.

General Safety Concerns

The Test Director is responsible for the overall control and safety of the exercise. The Test Director is also responsible for both pre- and post-exercise briefings to further ensure the safe participation of all team members.

Live Ammunition -- Under no circumstances is a team member permitted to have live ammunition in his/her possession. Live ammunition is permitted at a scenario location under only one condition, as follows: If an exercise scenario is to be conducted at an operational facility where armed security officers are normally present and necessary, these officers will be armed with live ammunition. The members of the normal security force must be aware of the planned exercise and must be completely familiar with the exercise scenario. The umpire shall advise the armed security officers as to the nature of any unusual happening, i.e., exercise-related or nonexercise-related, that may occur in order to prevent their involvement in the exercise. Under no circumstances are the ESS-equipped team members to have live ammunition.

Weapon Handling -- In some cases, the weapons used in the scenarios are functional weapons capable of firing a live round under certain circumstances. Therefore, all weapons used in the exercise should be treated at all times as if they were loaded with live ammunition. The weapons should not be loaded and charged until just prior to the start of an exercise scenario or boresighting operation. At

the end of the scenario, participants should move the safety/selector lever to the "SAFE" position. To clear the weapon, the magazine is removed from the weapon and the bolt retracted (or the chamber opened) and the chambered round is removed. Weapons should be carried with the bolt retracted, or the chamber open, and the safety/selector lever in the "SAFE" position.

At the conclusion of a scenario, the excess blank ammunition should not be indiscriminately expended, e.g., by firing at another exercise participant.

CAUTION

All weapons, whether unloaded or loaded with blank ammunition, should be treated as if they were loaded with live ammunition.

Weapons should be carried with the muzzle pointing up when not being used during an actual exercise.

Hazards -- The hazards inherent in conducting ESS exercises are basically of three general types: mechanical, physical, and physiological.

Mechanical hazards are primarily associated with personnel exiting vehicles and maneuvering around and under vehicles, buildings, and other structures. Also, moving vehicles may present a special hazard.

Physical hazards involve maneuvering over rough terrain. Participants may be likely to sprain an ankle, fall, and/or suffer minor cuts and abrasions. In some locations, rattlesnakes and/or insects may be an additional hazard.

The physiological hazards are primarily noise from the weapon blank rounds and the physical stress associated with combat-type field maneuvers. The ESS equipment may be regarded as a Class 1 American National Standards Institute laser, which poses no ocular hazard during normal use. Special precautions at close ranges are appropriate.

Protection from Mechanical Hazards -- To protect personnel from identified mechanical hazards, the following requirements are imposed:

1. Vehicles shall not exceed predetermined safe speed limits at any time.
2. Personnel operating vehicles as a part of a test scenario shall not approach other vehicles or persons in an unsafe manner. (Sufficient braking time must be allowed.)
3. No personnel shall be permitted to exit from a moving vehicle.
4. Prior to exiting from a stopped vehicle, the driver of the vehicle shall ascertain that the vehicle's engine has been turned off and that the parking brake is set.
5. Personnel shall not engage in hand-to-hand combat simulation under any circumstances.

6. Twelve-inch-high boots equipped with nonslip soles, heavy-duty trousers, and long-sleeved shirts are recommended.

Protection from Physical Hazards -- To minimize physical hazards, the following precautions will be observed:

1. Areas with volatile materials or gases present will be cleared or placed off limits to the participants.
2. Efforts will be made to minimize the debris in the exercise area.
3. When possible, the exercise area will be selected to avoid rocky or graveled terrain.

Protection from Physiological Hazards -- To minimize identified physiological hazards, the following precautions will be observed:

1. Although the invisible laser pulses generated by ESS are considered to pose no ocular hazards, deliberate "shooting" at other participants during nonexercise periods is prohibited.
2. Hearing and eye protection are required.
3. Salt tablets and drinking liquids will be provided on-site for all participants immediately following each exercise.

NOTE

The SNL medical department recommends that each individual 35 years of age or older be subjected to a stress EKG prior to participation in the exercises.

Engagement Simulation System Equipped Weapons Safety

Shotguns -- The ESS transmitter has been adapted to fit a Remington M870 12-gauge shotgun. A special SNL barrel insert has been devised that allows only the special shotgun blank round to chamber.

Shotgun Safety Precautions -- The following precautions should be followed when the Remington M870 12-gauge shotgun is used in ESS exercises:

1. No live 12-gauge shotgun ammunition will be allowed at the exercise site. The team leaders will ensure that only blank ammunition is issued to the team members.
2. Each shotgun should be inspected by the team member it is assigned to as well as by the team leader to assure that the special barrel insert, if used, is in place prior to the start of each exercise.
3. Each shotgun should always be handled as if it were loaded with a live round. Loaded or unloaded, the weapon should not be pointed at any person during casual handling.
4. The shotgun should not be loaded and charged until just prior to the exercise scenario except for the purpose of boresighting the weapon.

5. Immediately after each exercise or boresighting, the weapon should be unloaded and the chamber opened to eject the remaining round. Except during an exercise, the weapon will always be carried unloaded with the chamber open.

M-16/AR-15/Mini 14 Rifles -- The ESS equipment was originally designed to operate with an M-16 rifle, although an AR-15 or Mini 14 rifle can be readily substituted without any major adjustments. The principal difference between the M-16 and the AR-15 or Mini 14 rifles is the fully automatic capability of the M-16 rifle. The rifles used in the engagement exercises are functional rifles initially capable of chambering a 5.56-mm live round under certain conditions. Special modified magazines that will not accept a live round should be used during the exercises (Figure A-2). The magazines that SNL uses are identified by a special color coding applied to the lower half of the magazine. In addition, for the rifles to function correctly with blank ammunition, a blank-fire adapter must be attached to the muzzle end of the rifle barrel. An SNL-developed "in-barrel" blank-fire adapter has been designed to enhance the acoustics and the recoil of the rifle. An "in-barrel" blank adapter that prevents the chambering of a live round is currently under development.

M-16/AR-15/Mini 14 Safety Precautions -- The following precautions should be followed when the M-16, AR-15, or Mini 14 rifles are used in the ESS exercises:

1. No live 5.56-mm ammunition will be allowed at the exercise site.
2. Each team member will personally inspect every magazine that he/she expects to use during each exercise to ensure that the magazine has been modified to accept only blank rounds.
3. Each team member will personally load and inspect every magazine of blank ammunition he/she expects to use during each exercise scenario to ensure that only blank ammunition has been loaded.
4. Each team leader will inspect every magazine that his/her team takes to the exercise site. The team leader will use a flashlight to illuminate the inside front of each magazine and ensure that no live rounds have been inserted.
5. Each rifle should always be handled as if it were loaded with live ammunition. Loaded or unloaded, the weapons should not be pointed at any person during casual handling.
6. The magazine should not be inserted into the rifle and the rifle charged until just prior to the start of the exercise scenario except for the purpose of boresighting the rifle. After the end of the exercise or boresighting, the magazine should be removed from the weapon and the bolt retracted to eject the remaining round. Except during an actual exercise, the weapon will always be carried unloaded with the bolt retracted.
7. Hearing protection is required by the participant when the M-16, AR-15, or Mini 14 rifle is fired. The only exception to this rule is when the participant wears a communications earpiece.

M18/M8 Smoke-Producing Grenades Safety

The M18 and the AN-M8 Smoke-HC grenades are chemical-burning grenades fitted with a percussion-ignited, 2-second delay fuse. The fuse ignites a starting mixture which, in turn, ignites the filler material. The burning filler material creates sufficient pressure to blow free the tape that covers the gas ports, allowing the chemical smoke agent to escape. The M18 grenade will produce a dense, colored smoke for 50 to 90 seconds. The M8 grenade will produce a dense, white smoke for 105 to 150 seconds. To operate, hold the grenade in the throwing hand using hand pressure to retain the safety lever in position. With the other hand, pull the safety pin free and discard it. Throw the grenade at the intended target. Release of the applied hand pressure allows the safety lever to fly away from the grenade body, causing the fuse to ignite.

M18/M8 Smoke Grenade Safety Precautions -- The following safety precautions should be observed by participants when smoke grenades are used:

1. Personnel deploying the smoke grenade should not remove the safety pin until just prior to throwing the grenade. If the grenade is not thrown and the safety lever is still in place, the safety pin can be replaced.
2. The smoke generated by these grenades is considered toxic. Personnel deploying these devices shall pay careful attention to wind direction and personnel exposure. Appropriate respiratory protection shall be worn when entering, running through, or being enveloped by the smoke from these devices.
3. These grenades generate considerable heat and can readily start fires. Personnel intending to use these devices shall be familiar with the standard fire prevention precautions and shall not deploy the devices during high winds.
4. A designated observer will keep an accounting of each grenade deployed and will be responsible for assuring that all devices intended to explode do in fact explode.
5. In the case of a dud or misfired grenade, the device shall be left in place for a minimum of 1 hour, and a guard shall assure that no personnel approach closer than 15 yards to the misfired grenade. After 1 hour has elapsed, a designated person, equipped with leather gloves, a full-face shield and ear protectors, shall place the device in an explosive carrying case. The device shall remain in the explosive carrying case until it can be destroyed by qualified personnel in an approved manner.

The After-Action-Review (AAR)

An essential element of every engagement simulation exercise is a review of the tactical situation by all participants after completion of the exercise. During this review, an attempt is made to reconstruct the training exercise in detail so that all aspects of the participant/team performance may be examined. During this review, good tactical decisions and techniques are highlighted and reinforced; mistakes are identified and discussed.

An AAR begins at the conclusion of each tactical training exercise. First, team leaders briefly state their intended mission and scheme of maneuver or defensive deployment. The AAR controller then guides a discussion of the problem in which each engagement is carefully reconstructed. Beginning with the first casualty which occurred during the exercise, individual participants or crews involved in the engagement explain exactly what happened. The AAR controller enters the discussion only to assist individuals in their analysis and to reinforce teaching points.

It should be evident that the AAR in engagement simulation is not the familiar critique which normally follows a conventional training exercise. Everyone is encouraged to speak if he/she has information to contribute. It is the responsibility of the AAR controller to draw as much information as possible from the group.

Purpose of the AAR -- Engagement simulation exercises provide two-sided, free-play scenarios in which the damage and casualties inflicted by weapons are determined objectively. The ability to accurately assess casualties allows leaders to learn advanced combat skills and gain invaluable experience in making tactical decisions. Much of this learning is attained through "discovery." Discovery occurs as a person reacts against a thinking enemy capable of countering unfriendly moves.

The AAR was specifically developed to support engagement simulation training in order to

1. Improve the accuracy and degree of detail of information available to the trainer and the participating unit,
2. Reinforce learning, and
3. Increase motivation.

Accuracy and Detail of Information Available -- In conventional tactical exercises, trainers evaluate the learning effort through personal observation. The primary drawback to this evaluation method is the inability of trainers to gather enough information on an exercise to make valid judgments. The usual number of observers is insufficient to see or record all aspects of a complex and swiftly moving exercise. In addition, a degree of bias inevitably enters into this evaluation. This bias is not necessarily directed toward one unit or the other but may be due to the evaluator's inaccurate perception or selective expertise concerning various doctrinal principles applicable to the exercise.

Through the use of the AAR, it is possible to reconstruct, in detail, the movement and actions of each individual participant since every exercise participant is present for the review and is encouraged to contribute to the discussion. Therefore, information concerning positioning, reaction of individuals, and even intent behind operational decisions may be conclusively determined. This technique provides a more complete picture of the exercise for training diagnosis.

Reinforcement of Learning -- The principle that individuals learn skills most effectively by performing them is only true if the learning exercise is conducted correctly. Deciding how well an exercise has been conducted requires observation and feedback for the learner. The AAR fulfills these requirements in a realistic environment. Malfunctioning weapons, incomplete planning, poor camouflage, and other mechanical weaknesses that affect the outcome will surface in the review.

Another advantage of the AAR is the opportunity to objectively determine the relative importance of common tasks. Because time is a scarce commodity, whether or not a mission is accomplished will depend to some extent upon a leader's or individual's ability to establish priorities. Providing participants with an understanding of the relative importance of tasks is a major objective of the AAR.

By far the most difficult aspect in evaluating training progress is determining the effectiveness of tactical decisions. Many factors such as opponent dispositions, communications, and terrain affect a leader's choice of options. In the AAR, it is possible to analyze the available information and to determine the reasons for individual decisions. It can also be difficult to separate poor decisions from poor execution. A leader must consider not only what should be done but what his team is capable of doing. The AAR will not completely solve this problem; however, it provides better information on which to base evaluations.

Equipped with the facts provided in the AAR, the evaluator can emphasize and reinforce successful performance. When decisions or execution is poor, probable causes can quickly be determined and alternative solutions recommended.

Increased Motivation -- Enthusiastic acceptance of engagement simulation by the individual is a necessary characteristic of this training. While the exercise itself is challenging, motivation is strongly stimulated in the AAR. Individuals who do well are recognized in the presence of their peers, and each participant is convinced that his best performance is vital for success.

Time and Place -- The AAR should be conducted as soon as is practical after the termination of an exercise. Every participant must be present for the review; this rule should never be relaxed. Any absentee misses out on valuable tactical knowledge, and the remainder of the group is denied the benefit of the individual's input. Any delay of the AAR will only compound the problem of assembling these personnel.

Where the review is held and the conditions under which it is conducted impact heavily on the amount of learning which results. Two alternatives typically are available: a temporary field location or a prepared site. Of the two, the prepared site is preferable; the seating capacity should be sufficient to comfortably accommodate all participants and training staff members, and a means of displaying diagrams of the area which can be used by individuals in marking their

routes should be provided. Use of a plastic overlay allows the diagrams to be erased and reused for the next exercise or further training.

Conduct of the AAR -- If a prepared site is to be used for the AAR, it should be set up in advance. Upon termination of the engagement, all personnel are directed to the site selected for the AAR. Any control problems encountered in the exercise should be resolved before the AAR. Arguments about control procedures should never disrupt the AAR.

Participants are assembled and seated. Team leaders for the opposing forces begin the review by briefly stating their mission and how their elements were deployed prior to initial opponent contact. Events beyond this point should not be described by the team leaders because their perceptions may be inaccurate and waste time. The AAR controller may want to question team leaders. Answers to these questions should establish how effectively the original plan was communicated to team members.

The AAR controller should ask the individuals or teams to explain what happened in their encounters. Initially, it is important to establish what actions were taken by the opposing forces. Then, through questioning, the AAR controller will identify mistakes or reinforce good planning and execution. The AAR controller's role is that of a facilitator. He/she should enter the discussion only to emphasize a tactical lesson or to prompt an individual to think. The controller's responsibilities include

1. Initiating and sustaining the review,
2. Prompting participants to describe what happened in their own terms,
3. Directing the review so that the important tactical lessons will surface, and
4. Ensuring that alternative courses of action are identified and explored.

The AAR controller should keep in mind several events which occurred during each exercise to help structure the AAR. The event structure is usually sequential, although the relative importance of each event will vary based on the individual situation. The AAR controller should use these characteristics in framing his/her questions to ensure that a complete picture of each contact emerges. It is also helpful for the participants themselves to be aware of these characteristics to guide an individual's discussion.

Control -- Every participant in the exercise should always have a clear idea of what he/she is supposed to be doing in relation to his/her team. Control is difficult to maintain as a unit begins to react to opponent contact resulting in casualties and loss of primary communications. If this occurs, individuals and units begin to function independently with reduced security and little chance of accomplishing the original mission. Means by which control was maintained or, alternatively, lack of control and its result should be pointed out during the AAR.

Target Acquisition -- Detection of the opponent at maximum range is an important skill that can be developed in training. Therefore, determining who sighted a target and how is a point which should always be highlighted in the AAR.

Communications -- A principle often violated is the importance of passing critical information up, down, and laterally among team members. Target acquisition, target destruction, and friendly casualties are examples of events about which information should be communicated at the earliest opportunity. Failure to transmit this information will reduce a team's effective, sustained reaction to the opponent once contact is initiated. The timely reporting of essential facts often differentiates good teams from poor ones.

Conclusions -- The AAR controller should be aware of a possible pitfall in the AAR. While engagement simulation provides an unprecedented ability to objectively determine the success of a specific exercise, it can easily lead to false conclusions about the performance in that exercise. Remember that success (mission accomplishment) is not always the product of good execution, just as failure is not invariably the result of poor execution.

Casualties may occur in any engagement when an individual or unit commits a tactical error. This is particularly true in initial training exercises, which are frequently characterized by mistakes on both sides. However, as engagement simulation training progresses, individuals and units become extremely proficient in their combat tasks. Once this level has been reached, casualties may result from exceptionally effective execution of tactical skills. It is then possible for the results in a given situation to be attributed to either good execution on the part of one team, poor execution on the part of the other, or a combination of the two. Failure to recognize these subtle distinctions reduces the effectiveness of the AAR.

Using mission accomplishment as the only criterion for the evaluation of tactical decisions can be as dangerous as omitting them. For example, suppose the leader of a unit, in a movement to contact, quickly deploys his force across a large open area to occupy a piece of key terrain. This excellent position allows him to subsequently defeat the opposing force. In a superficial evaluation, the AAR controller might conclude the AAR by reinforcing the leader's decision and the unit's aggressive movement; however, the analysis would not be complete without a discussion of the risk that accompanied the decision. The unit probably sacrificed security to gain speed. In the example situation, the decision resulted in success. On another day, with slightly different terrain and a different enemy, the unit might have been destroyed crossing the open area. A good AAR should ensure that all participants are aware that no "doctrinal" solutions always work. Every decision involves trade-offs. The goal in tactical training, then, is to provide leaders with an understanding of risks coupled with a knowledge of what has been successful or unsuccessful in similar situations. With this experience, it is felt that more effective decisions will be made.

The AAR is an essential and integral part of engagement simulation training. The philosophy and mechanics of this technique must be understood to ensure that learning is maximized in each exercise. To do this, the trainer must heavily emphasize the planning and execution of the review. When the AAR is conducted properly, many benefits can and will accrue.

TACTICAL IMPROVEMENT PACKAGE

PART 2: INSTRUCTOR'S GUIDES

CONTENTS

TACTICAL IMPROVEMENT PACKAGE

EXPANDED INSTRUCTOR'S GUIDE

The information contained in this "Expanded Instructor's Guide" is provided to assist training management personnel at a facility in conducting tactical improvement and security force evaluation exercises utilizing Engagement Simulation System (ESS) equipment. It is intended and designed as a guide only. Individual facilities, due to inherent restrictions, may find it necessary to add, delete, or modify this information to meet individual needs. The training management personnel who function as instructors for the exercises are responsible for overseeing the following flow of events.

General Briefing

The general briefing is the first activity conducted in preparation for an exercise. It should be used to establish the atmosphere for the entire exercise. It is important that participants be aware that lines of communication and authority have been established and are in existence.

Introduction

The members of the training staff who will be conducting or evaluating the exercise should be introduced to all participants.

Purpose of the Exercise

The purpose of the exercise. the training objectives, and the desired learning outcome should be explained to the participants.

Equipment Demonstration

The equipment which the participants will use during the exercise should be demonstrated.

Weapon(s) -- The weapons used in the exercise are equipped with blank-fire adapters and laser transmitters. These weapons should be demonstrated to the participants before the exercise begins.

Laser Transmitter -- The operation of the ESS laser transmitter should be demonstrated. The following points should be made clear to the participants:

- The laser transmitter is activated by the acoustic report when the blank round is fired. (Indicate the location of the microphone on the weapon.) (See also "User's Guide" on Video Tape.)

- The transmitter, upon receiving the blank report, emits a pulsed laser beam which contains both "near-miss" and "hit" words.

- The effective distance of the laser beam is equivalent to that of ball ammunition for the type of rifles being used and 00 buckshot for the shotgun.

- The laser beam will go through some vegetation, glass, screen wire, and fences. Glass may cause the beam to bend due to refraction.

- The laser beam will ricochet off of some glass, wood, or a shiny surface. Note: Participants should be warned that it is possible to neutralize themselves with a ricochet beam.

- The laser beam travels in a direct line at the speed of light. Instruct participants not to lead moving targets but to aim directly at the target. Due to the fact that the beam travels to its target virtually instantaneously, participants may not hear the weapon report when they are "hit."

- The laser beam can be deflected by brush, bushes, leaves, or weeds. However, if an opponent's detector can be sighted, a direct hit will neutralize him.

- The transmitter lens must not be obscured by brush, leaves, window sills, door frames, etc. If it is obscured, the laser beam will not be transmitted downrange.

- Removal of the yellow key in the weapon transmitter disables the transmitter. It is removed and placed in a receptacle on the harness by participants when they are neutralized. Yellow-key operation must be demonstrated thoroughly.

NOTE

Whenever the yellow key is turned to the "OFF" position, a 5-second delay should elapse before the key can be turned back to the "ON" position. (This allows the inner circuit to reset itself.)

Harness and Head Assembly -- The laser detectors which register a "near-miss" or a "hit" are contained on the torso harness and head array. Participants should be shown the location of detectors and their operation should be clearly explained: (See "User's Guide" on Video Tape.)

- The harness has four sensors on the front and back, and the head array contains five.

- The sound alert is located on the left side near the wearer's ear.

- The receptacle in which the yellow key is inserted to disable the sound alert is also located on the left side of the harness.

- The instructor should use the controller gun to demonstrate the sound of a "near-miss" and a "hit." To disable the sound alert, a participant must remove the yellow key from his/her weapon transmitter, insert the key in the harness key receptacle with the tab away from the body, and turn the sound alert OFF. Each participant must understand this procedure completely.

- The yellow key cannot be removed once it has been placed in the key receptacle without reactivating the sound alarm.

- The instructor should reactivate the sound alarm and then alternately cover and uncover the sound alarm to demonstrate the method used to ascertain which participant has been neutralized when several participants are grouped together.

- An umpire resets the sound alarm or harness with a green key or controller gun at the conclusion of the exercise.

- The head array must be adjusted to fit tightly since, otherwise, it has a tendency to fall off when a participant is running. If the head array does fall off, it must be replaced as soon as the participant reaches cover.

- The harness assembly, when properly worn and adjusted, requires that the Webb belt be positioned and adjusted tightly around the waist. The four front and back sensors should be centered an equal distance between the shoulders and waist. (See "User's Guide" on Video Tape.)

Controller Gun -- The uses of the controller gun should be understood by participants.

- The controller gun is used to check and reactivate the harness.

- The controller can use the controller gun to point out to a participant, by shooting a "near miss" at him/her, that the participant is using inadequate cover or poor tactical techniques.

Test Director Role

The Test Director is responsible for the overall control and safety of the exercise. He also monitors the operational channels of all participants' radios. The radio is the primary means of communication between the Test Director and the participants. The radio will be used by the Test Director to stop, start, or suspend all exercises. The term "administrative hold" when used by the Test Director indicates an unsafe condition, equipment malfunction, or an injury. During an administrative hold, all activity will cease until the problem

has been resolved. A hand-held siren (or air horn) should be used to indicate that the exercise has terminated. Participants should be familiar with both the hold and the termination signals.

Umpire Function

All umpires have the authority to remove participants who are not following the rules of engagement. They also have the authority to terminate the exercise when an unsafe condition exists. Umpires should wear yellow vests or lights (during nighttime exercises) to ensure that they can be quickly and correctly identified by participants.

Rules of Engagement

The rules of engagement will vary somewhat from facility to facility; however, the following rules are established as firm and must be emphasized to participants:

- No personal weapons may be brought to the exercise site
- No live ammunition is allowed in the exercise area
- No knives are allowed
- No hand-to-hand combat is allowed

In addition, the following constraints are suggested for consideration:

- Disarming of anti-intrusion devices not be allowed
- Cutting of fences, wires, etc., not be allowed
- Climbing of towers, ladders, buildings, trees, etc., not be allowed
- Destruction of equipment, including doors, windows, TV cameras, radios, vehicles, lights, etc., not be allowed
- Firm exercise boundaries be established

Once a participant has been neutralized, the participant's radio, weapon, or ammunition may be used by another participant.

NOTE

To use another participant's weapon after he/she has been neutralized, it is necessary for the participant to remove the yellow key from his/her own weapon and place it in the newly acquired weapon.

Safety Aspects

All weapons should be treated at all times as if they contained live ammunition. At the end of the exercise or boresighting procedure, all weapons are to be cleaned, the magazines removed, bolts locked to the rear, chamber or cylinder opened, and the safety lever positioned to ON. Each participant will personally inspect his or her weapon magazine and blank round to ensure that no live ammunition is being used or loaded. The weapon should not be loaded until just prior to the start of the exercise or unless the participant is boresighting the weapon.

A weapon should not be fired directly at the face of an individual if the distance between the weapon and the individual is less than 15 feet. A weapon should not be fired when the gas port is pointed toward an individual's body and the separation distance is less than 3 feet. Eye protection and ear protection are required.

Participants who may have a physical limitation should be identified. Participants should not be placed in an environment in which, because of personal physical limitations, they may be forced to overextend their own capabilities.

NOTE

Always treat all weapons as if they contained live ammunition.

Indemnification

The host facility may find it advisable to have members of outside agencies who are participating in an exercise sign an indemnification which releases the facility from liability due to injuries (see Appendix B).

Nonparticipants and Observers

Personnel categorized as nonparticipants or observers should be confined to a centralized area. If an observer wishes to enter the actual exercise area to obtain a closer view of the activities, the observer should wear a yellow vest or lights (during nighttime exercises) for identification.

Scenario Briefing

The scenario briefing should include

1. The objectives of the exercise,
2. Evaluation criteria,
3. The duration of the exercise,
4 The objectives of the teams, and
5. Any restrictions imposed on the exercise.

Selection of Team Members

The participants should be divided into teams, as required, for the conduct of the exercise, and team leaders should be assigned. Team designations such as Alpha and Delta, Team 1 and Team 2, or some other designation that the participants can identify with should be used. If more than one type of weapon is used, the weapon(s) should be assigned to individuals by type.

Tactical Information

A short review of tactical information should be presented which includes the following advice for participants:

- When firing around obstacles, change hands or shoulder if required.
- When looking around the corner of a building, through doorways, or through windows, vary your height or move to the opposite side of the window. This will preclude the adversary from anticipating where your head will next appear.
- Practice positive target identification; do not neutralize your teammates.
- Cover your teammates' movements.
- Use the radio as an intelligence-gathering tool. Pass on pertinent information to teammates, such as the number and location of the adversaries, your location if you have moved, and any other information vital to the scenario.
- Do not flag your position by extending the barrel or stock of your weapon beyond your cover.
- Be alert for any audible indications of opponent location, e.g., magazine changes, weapon charging, radio noise, breaking branches, etc.
- Crouch while moving and select cover that can be attained a short distance away. Two or three short movements from intermediate cover to cover are safer than one long movement with no cover.
- Assign backup team leaders.
- Conserve ammunition; one good shot is better than three bad ones.
- Use hand signals, either standard or developed on-site, that each team member understands.
- Do not silhouette or skyline your position.

Equipment Issue

Participants should be briefed on the procedures for equipment issue. Points covered should include

- Where equipment will be issued
- What time equipment will be issued
- Harness (ESS equipment)
- Radios
- Weapons
- Ammunition
- Magazines

Boresight Procedures

Following equipment issue, the participants should be instructed to boresight their weapons. Ammunition should then be issued and loaded into the magazines.

Review of the Scenario

Immediately prior to the exercise, a brief review should be held to emphasize the objectives, duration, and restrictions applicable to the exercise.

Conduct the Exercise

After-Action-Review (AAR)

The AAR should be held immediately following the exercise.

Equipment Turn-in

Participants should be briefed on the procedure for equipment turn-in.

TACTICAL IMPROVEMENT PACKAGE

ABBREVIATED INSTRUCTOR'S GUIDE

This is an abbreviated instructor's guide. It briefly lists the format the instructor should follow in preparing for, conducting, and concluding an Engagement Simulation System (ESS) exercise. It is designed to be used by a person who is knowledgeable in the conduct of ESS exercises. The format used is identical to the original expanded "Instructor's Guide."

____ General Briefing

____ Introduction

____ Purpose of the Exercise

____ Equipment Demonstration

- Weapon(s)
- Laser Transmitter
- Harness and Head Assembly
- Controller Gun

____ Test Director Role

____ Umpire Function

____ Rules of Engagement

____ Safety Aspects

____ Indemnification

____ Nonparticipants and Observers

____ Scenario Briefing

____ Selection of Team Members

____ Tactical Information

____ Equipment Issue

____ Boresight Procedures

____ Review of the Scenario

____ Conduct the Exercise

____ After-Action-Review (AAR)

____ Equipment Turn-in

APPENDIX B

Sample Indemnification

SAMPLE INDEMNIFICATION

[Used by SNL for nongovernment and non-DOE participants]

WHEREAS, Sandia Corporation ("Sandia") operates the Department of Energy's Sandia National Laboratories at Kirtland AFB, Albuquerque, New Mexico;

WHEREAS, _____ desires that he/she be permitted to participate in Security Forces Experimentation and Evaluation ("SFEE") exercises to be conducted by Sandia National Laboratories at _____ on or about
(Location)

_____.
(Dates)

WHEREAS, the program to be conducted involves vigorous physical activity and combat techniques including the discharge of actual and/or laser modified automatic weapons.

NOW THEREFORE, in consideration of the foregoing, _____ _____ hereby agrees as follows:
(Name)

He/She shall indemnify and hold harmless Sandia, the United States and their employees from and against any and all claims, demands, and causes of action for personal injury or property damage sustained by the participant, Sandia, the United States, a third party, or their employees arising out of the participation in SFEE by the participant, whether or not such injury or damage was caused or contributed to by the negligence or alleged negligence of the United States, Sandia, or their employees.

_____
(Signature)

_____ _____
(Date) (Organization)

APPENDIX C

Sample Questionnaire

UTILITY OF LASER-EQUIPPED TRAINING WEAPONS
IN THE LICENSED NUCLEAR INDUSTRY

The following questions concern your perceptions of laser-equipped training weapons (such as the Engagement Simulation System) and their use in the nuclear security environment. The questionnaire is intended to provide to Sandia National Laboratories preliminary feedback from those licensees exposed to laser-equipped training weapons and methods.

In your opinion, does laser technology provide a capability that would be useful for security force training or exercise?

[ ] Yes
[ ] No

How useful do you believe that such technology would be in training or exercise?

[ ] Not very useful
[ ] Moderately useful
[ ] Very useful

Do you feel that laser technology could be useful for security force evaluations?

[ ] Yes
[ ] No

How useful would the technology be for evaluation?

[ ] Not very useful
[ ] Moderately useful
[ ] Very useful

In your opinion, could joint exercises involving site security personnel and local law enforcement personnel using laser technology significantly improve the responsiveness of local law enforcement personnel?

[ ] Yes
[ ] No

Do you feel that training or exercise with laser technology can affect security force morale?

[ ] Yes
[ ] No

What degree of improvement (if any) in security force morale would result from the application of laser technology?

[ ] No improvement
[ ] Moderate improvement
[ ] Significant improvement

Do you believe that the use of laser technology could significantly influence the overall efficiency of security forces?

[ ] Yes
[ ] No

Is it feasible to conduct exercises using laser technology and blank ammunition on owner-controlled property or at a normally used training facility?

[ ] Yes
[ ] No

Under certain conditions, it appears that regional training facilities might be an appropriate vehicle for training or exercise involving laser technology. Is a regional approach feasible, and does such an approach warrant further investigation?

[ ] Yes
[ ] No

Who should operate and maintain such a regional facility?

[ ] An association of licensees
[ ] A third party
[ ] _____

Does the concept of mobile training teams (available to exercise a security force at the licensee's site) warrant further investigation?

[ ] Yes
[ ] No

Who should provide and operate such teams?

[ ] An association of licensees
[ ] A third party
[ ] NRC
[ ] _____

The "third party" option referred to in the above question could be under contract to (and therefore under the control of) either the NRC, a licensee, or a licensee association. Which, from your point of view, is more desirable?

[ ] An association of licensees
[ ] A licensee
[ ] NRC

At the present time, the NRC does not plan to use laser technology as an evaluation tool; however, there are many alternatives open to the NRC and the licensed community should the evaluation option be seriously considered later. For example, evaluation during initial training by a licensee or nonlicensee training organization, evaluation after initial training by a licensee training organization, evaluation during specific retraining periods by a licensee training organization, or evaluation by NRC are some of the many possibilities. NRC evaluations could, for example, be conducted at the end of an initial training cycle, during the operational inspection cycle, or during special safeguards assessments by personnel from NRC's Office of Nuclear Material Safety and Safeguards (NMSS).

If laser technology were to be used as an evaluation tool, would it be feasible to conduct exercises within the protected area?

[ ] Yes
[ ] No

If laser technology were to be used inside the protected area (whether for training or evaluation), the following issues might be of concern. Are any of these potential areas of concern, in your opinion, significant enough to influence management attitude against the use of laser technology?

	No	Yes
• maintaining normal security	[ ]	[ ]
• possible injury to participants	[ ]	[ ]
• disruption of normal operations	[ ]	[ ]
• possible media attention	[ ]	[ ]
• reaction of nonparticipating employees	[ ]	[ ]
• _____	[ ]	[ ]
• _____	[ ]	[ ]
• _____	[ ]	[ ]

Given the fact that the time required to learn to operate laser-equipped training weapons is relatively short, do you think it would be necessary for the NRC, prior to an evaluation using the technology, to make the equipment available for licensee familiarization and exercise?

[ ] Yes
[ ] No

The following list describes possible areas of concern in using laser technology. Please indicate the relative importance of each of the areas by ranking them beginning with the number 1 for the highest priority concern. If any additional areas are of concern, please add them to the list and include them in your ranking.

___ cost of hardware and associated consumables (e.g., blank ammunition)

___ potential requirement for revision of training plans

___ legal ramifications (e.g., could such a system tend to foster the use of an inappropriate or illegal degree of force?)

___ liability concerns

___ safety of participants

___ maintenance of hardware

___ potential for modifications of equipment

___ possible increased media interest in training methods

___ _____

___ _____

___ _____

___ _____

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The Tactical Improvement and Security Force Evaluation Program, which demonstrates the feasibility of using the Engagement Simulation System (ESS) at licensee nuclear facilities, requested by the Nuclear Regulatory Commission, is described. Background information on the ESS and observations on its use, based on exercises at four licensee facilities, are provided. The information required by the licensee to utilize the ESS for security officer training is presented in the form of a Tactical Improvement Package (TIP). Two Instructor's Guides (an expanded and an abbreviated version) are included as aides to interested users. A video tape that complements the text is available on loan from the NRC.

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