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PART I

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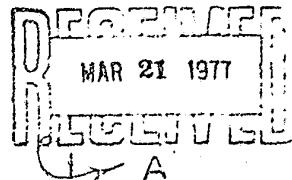
THE ARMY SCIENTIFIC ADVISORY  
PANEL

AD HOC GROUP

FOR

PHYSICAL SECURITY

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Army Scientific Advisory Panel  
Ad Hoc Group  
on  
Physical Security

~~Final Report~~ PART I

Intrusion Protection Systems for

Arms Rooms  
and Light Arms Ammunition Storage Areas

Final Report 4/24/78

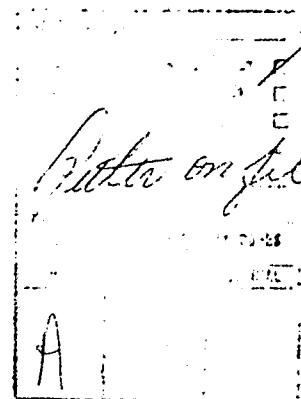
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## I. INTRODUCTION

1. The ASAP Ad Hoc Working Group on Physical Security R&D was activated on 5 November 1974 by letter from the Honorable Norman R. Augustine (ASA R&D) to the Chairman. The Terms of Reference for the Working Group, as approved by the Executive Committee of ASAP, are included as Appendix B of this report. In essence, the Group was tasked to review the current status of the available means for preventing improper intrusion into DOD facilities; to assess the ongoing and planned Army R&D program in the area of intrusion detection systems; and to recommend near-term (0-3 years) and longer-term procedures for upgrading the quality of protection afforded DOD facilities against intruders.

The membership of the Ad Hoc Working Group is listed in Appendix A. At the time of their appointment, the members of the Group were informed that the matter of physical security, from the Army viewpoint, required urgent and immediate attention. The primary reason for the renewed sense of urgency was a recent series of intrusions into arms rooms and light arms ammunition storage areas of various elements of the Army. The Group was requested to supply its final report as rapidly as possible, and preferably by 15 January 1975.

2. At its first meeting on 20-21 November 1974, at Fort Belvoir, the Group considered its overall charge, recognizing that the Terms of Reference covers the protection of all types of DOD facilities. It was the consensus of the Group that a study of the complete problem and the issuance of a final report of the Group's findings by 15 January 1975 constituted an impractical goal. It was concluded, however, that a study and analysis of the protection of arms rooms and light arms ammunition storage areas could be accomplished within the available time frame.

Therefore, since the protection of these areas against intruders appears to be the major source of immediate concern, the Group decided to concentrate on this specific part of the overall problem spectrum, with the objective of meeting the prescribed 15 January deadline. The present report contains the findings and recommendations of the Group relative to the arms room and ammunition storage area question, and constitutes Part I of the Final Report of the Group.

It is evident that many of the conclusions reached relative to the protection of arms rooms are also applicable, with appropriate modification, to other aspects of the overall physical security problem. The present report thus serves as a base document for further consideration of allied questions.

Following issuance of this report, the Group intends to continue its studies of other facets of the overall intrusion prevention problem. Further findings and recommendations will be contained in a Final Report: Part II.

3. Following the initial meeting at Fort Belvoir, additional meetings of the Group as a whole were held on 18-19 December 1974 at Fort Hood, Texas, and on 15-16 January 1975 at Fort Belvoir. In the intervals between meetings, members of the Group made individual visits to various arms rooms and allied facilities connected with Army elements.

Preparation of this report was a Group effort, with considerable help from Messrs. J. E. Boneta and Ben C. Barker, USAMERDC, Mr. K. A. Grafton, HQDA, Col. Guy M. Huskerson, Jr., and Mr. John Nicholas, HQ AMC.

## II. THE THREAT: WHO IS A POTENTIAL INTRUDER?

1. The losses of significant amounts of weapons from Army stores pose a serious problem. There is the initial and manifest danger that such weapons will be used for violent purposes in the service of illegitimate parties both at home and abroad. Moreover, an Army that cannot prevent its weapons from falling into unauthorized hands casts doubt upon its own internal organization as well as deleteriously affecting the Army's credibility among the national citizenry at large.

While concern in this report is with the rather delimited area of arms room security, we are cognizant that approximately half of all weapons losses in 1971-74 appear to be unrelated to arms rooms. The possibility should be kept in mind that major improvement in arms room security may lead to increased weapons losses in other areas, e.g. field exercises, and during transit. Nevertheless, for the immediate purposes of this report, attention is focused on the threats to arms room and light ammunition storage. The problems such as "losses" by individual soldiers, which in fact are perpetrated for purposes of subsequent sale, are profound and significant; however no attempt has been made to address such areas in this report.

The preliminary and basic question is, of course, whether there is a demonstrable threat to arms room security. The reported losses of 2,119 weapons in 1971-1974 related to arms rooms (e.g. illegal entry with or without force) indicate an affirmative answer as to the reality of the threat. However, a second and more involved question raises itself. Is there a patterned and/or increasing threat to arms room security? Here the evidence is more fragmentary and inconclusive. If anything, there has been a decrease in weapons losses over the four-year period, although ammunition losses have remained at relatively constant levels.

2. The candid fact is that the available data is too cursory and superficial to allow for any definitive statement on which to predicate the nature of the significant threats to arms room and allied security. Without further analysis and continued updating of the circumstances surrounding weapons losses, characterizations of the threat to arms rooms will remain uncertain.

It should be noted that any empirical analysis of the threat to arms rooms and ammunition storage facilities requires some kind of interpretive scheme. We are not in a position to offer a carefully designed model of weapons losses, however the following should suffice for illustrative purposes:

- (a) Insider-Outsider, e.g., is a significant source of threat from a soldier assigned to the unit in which losses occur, another soldier from the installation, a DA or NG civilian employee, an ex-soldier or ex-employee, or a bona fide outsider?
- (b) Individual-Group, is the threat from a culprit working entirely alone, a culprit who plans to sell the weapons to a group, or a consciously organized group intent on weapons thefts?
- (c) Criminal-Political, is the stolen weapon for personal use or collection, for resale for profit, for criminal activities of a conventional sort, or for a politically revolutionary purpose?

To the degree that threats to arms rooms and allied facilities can be categorized into all or some of the above types, or any other typologies further research might uncover, the nature of the threat and protection therefrom can be made more specific. Thus, for example, a threat coming from type 'insider-individual-criminal' may require security procedures quite different from those coming from the type 'outsider-group-political'. Indeed, various combinations of the above hypothetical types can require alternative security arrangements. The kind of threat analysis proposed here is to be viewed as complementary and not a substitute for the more ordinary weapons losses data (e.g., manner of entry, type of weapons stolen, time of theft, etc.).

3. Underlying any analysis of the threat from weapons thefts is the skill level of the possible thief. The unskilled intruder may be deterred by only minor improvements in present security arrangements. The truly skilled and prepared intruder can probably accomplish weapons thefts independent of any practicable security measures. It is with the semi-skilled intruder that much of the problem of arms room security inheres. The semi-skilled intruder may or may not be deterred by hardened facilities and by adequate systems for intrusion detection and response; although it would be reasonable to conclude that these factors do act as substantial handicaps for the semi-skilled intruder. It is also conceivable that for semi-skilled intruders, the improvement of arms room security might entail displacement of their activities to other arenas of weapons thefts. At the same time, however, improved arms room and ammunition storage security will reduce the likelihood of thefts by unskilled intruders who might sell weapons for monetary gain to illegitimate groups.

With full awareness that the threat is multi-faceted and not amenable to easy specification, we do perceive that ~~a hypothetical~~ credible threat does exist, particularly from what we have termed the semi-skilled intruder. The most dangerous semi-skilled intruder is regarded as a person highly motivated in a politically revolutionary manner, and possessing high formal education or having access to such persons. He (or she) is probably a member of a subversive group which advocates some form of violent confrontation with the established political order and which has some experience in avoiding law enforcement agencies. Although semi-skilled intruders do not typically possess the technical expertise of professional criminals, they can compensate for this by extensive prior planning and a willingness to suffer high personal risks in the procurement of weapons.

The existence of dedicated revolutionary groups on the American scene seems to be a reality which will persist into the foreseeable future. The procurement of weapons by such groups of semi-skilled intruders would damage the social fabric to a magnitude much greater than that implied by similar activities by conventional criminals or individual gun collectors (as serious as these problems are). Moreover, because surveillance of such groups has not been very effectual by governmental agencies, the most efficacious course in reducing weapons losses seems to be in the improvement of counter-intrusion security. Our concern with the semi-skilled intruder is qualified, however, by the acknowledgment that no weapons losses up to this point have been conclusively linked to such politically motivated revolutionaries.

4. Precisely because politically motivated revolutionaries are not unique to the United States, but also threaten the well being of other Western parliamentary democracies, it would seem eminently suitable to take note of the pattern of weapons losses and attendant arms room security measures in some of our NATO allies. In particular, it would be informative to learn what special or novel --if any -- procedures have been adopted by Canada (viz the F.L.Q.), Great Britain (viz the I.R.A.), and the Federal Republic of Germany (viz the so-called "Baader-Meinhof gang"). It may be learned that certain social organizational as well as technical security procedures have been developed by these NATO allies -- in light of their own security problems -- which could be adapted advantageously for our own purposes. The Group had insufficient time to pursue this avenue of investigation with the deadline established for the issue of this report.

5. In summary, the Group is of the opinion that additional investigation and analysis is in order to better establish the nature of the threat to weapons and ammunition thefts from Army facilities. The studies to date are confined essentially to statistical reports of theft incidents, with little attempt to interpret the results from a sociological and criminal-ogical point of view.

A better definition of the threat characteristics is important to the design of adequate protective systems. The use of highly sophisticated systems, with their attendant complexity, cost, and reliability disadvantages, is obviously not required to deal with the threat from unsophisticated intruders. Conversely, if a significant potential threat does exist from the activities of well-organized, semi-skilled intruders (which does appear to be a credible circumstance), then the provision of adequate security levels does require the use of sophisticated protective systems of the kind discussed later in this report.

### III. A GENERAL DISCUSSION OF THE ARMS ROOM AND LIGHT ARMS AMMUNITION STORAGE PROBLEM

1. The difficulty of providing a uniform approach to hardening, intrusion detection alarming, and response to intrusion, results from the quantity and the diversity of arms rooms and light arms ammunition storage areas used by the Active Army, Army Reserve, and Army National Guard forces. In designing responses to possible threats against these arms and ammunition areas, the overall approach must provide flexibility for combinations of hardening, intrusion detection alarms, and intrusion response mechanisms optimized to the characteristics of each individual storage area.

This section of the report outlines the characteristics of the storage areas requiring protection, examines the place of intrusion detection alarms in the total effectiveness tradeoffs which must be considered, and reviews the content of AR 190-11 and NGR 190-11 as related to the diversity of storage areas to be protected.

2. Light-Arms Storage - There are approximately 10,500 arms rooms and arms buildings operating within various elements of the Army, distributed as follows:

|                                |               |
|--------------------------------|---------------|
| U.S. Army CONUS                | 2,000         |
| U.S. Army OCONUS               | 2,600         |
| U.S. Army Reserve              | 1,000         |
| Army National Guard            | 4,500         |
| ROTC, Gun Clubs, etc.          | 1,000         |
| Total individual areas . . . . | <u>10,500</u> |

Of this total, approximately 9,500 are arms rooms, generally located in multi-purpose structures.

Beyond the large quantity of areas, the major characteristics noted are: the diversity of structures in use; the variation in their degrees of structural hardening; geographic differences in terms of location in populated vs. sparsely populated areas; and the diversity of the organization and physical proximity of units designated to respond to intrusion alarms.

In general, arms rooms of Regular Army units are on military posts in structures used for barracks and/or offices, with military personnel (at least C.Q.'s) in proximity at all times, and with military police or other organizations responsible for responses to intrusion. At the other extreme, National Guard and Army Reserve arms rooms tend to be in more isolated armories which are unoccupied a significant part of the time and for which the response unit is a commercial guard service and/or a civilian law enforcement agency.

While improvements are being made as funds become available, a significant percentage of the arms storage areas do not fully meet the hardness specifications of AR 190-11 (or NGR 190-11 for Army National Guard sites). Deficiencies include inadequacies of door and window protection, of locking mechanisms for arms storage devices, and of the basic structures themselves. Most remotely located (Reserve and National Guard) arms rooms have, or are having installed, automatic electronic intrusion detection alarms, but there is a wide diversity in the sensitivity, false alarm rate, countermeasure resistance, degree of monitoring, and even basic functioning of the intrusion detection and alarm systems now installed. In many cases the system is leased as a part of the cost of a commercial guard service.

3. Light Arms Ammunition Storage - Light arms ammunition is stored in a part of the approximately 19,500 ammunition storage facilities (of which approximately 16,000 are storage buildings) used by the Army, the Army Reserve, and the Army National Guard. As is the case with arms storage, there is a great diversity of hardening and security in ammunition storage. Storage of almost all significant quantities of ammunition is in depots under security control of active army units, but in many cases the storage areas are widely dispersed and only lightly patrolled. There is relatively little present use of intrusion detection alarms in ammunition storage areas.

4. To examine the actions the Army might take to increase the level of physical security, it must be assumed that the threat can conceivably consist of groups of people relatively well educated and skilled in the use of instruments and hand tools, patient enough to take the time to study the degree of security of Army resources, and with sufficient funds to support a well-financed operation. The actions to be taken to counter this threat should be a combination of the following:

- (a) Reduction in number of storage units;
- (b) Insuring that requirements for rapid accessibility are balanced with operational necessities;
- (c) Increase in the hardness of storage sites;
- (d) Introduction and improvement of the effectiveness of intrusion detection alarm systems;

- (e) Increase of the effectiveness of on-site guard forces when available;
- (f) Reduction of the response time of off-site active response resources.

In determining the proper balance among these actions, the diversity in characteristics of the various storage sites must be considered and any procedures, specifications and equipment developed must be sufficiently flexible to permit optimization to each particular site and its problems.

In regard to the reduction of the number of storage units, it should be noted that efforts are already under way throughout the Army organization to accomplish the consolidation of storage sites to the maximum practical extent. Reduction in numbers alone does not, of course, necessarily reduce the vulnerability to loss (it may even increase it by making the "prize" larger). It is, nevertheless, reasonable to assume that it will be less costly and more manageable to provide a high degree of security to a smaller number of sites.

During the course of the Group's studies, it was observed that in some instances, particularly where the Reserve and National Guard are concerned, arms storage on-site is viewed as a traditional part of an armory complex. In contrast to this traditional acceptance of the need, it was observed that light weapons are often used by the trainees only infrequently. The extent to which light weapons are needed as a regular part of training varies, of course, depending on the mission of the unit. In some instances, the arms rooms remain closed and unused except for infrequent exercises.

The question at once arises as to whether arms rooms should be in active use at such installations. The current practice is to store ammunition centrally, with one storage site serving a number of armories, and this same practice might also be applicable for the storage of weapons. In the event of a mobilization emergency, or when needed for training, a quick-reaction system for the distribution of arms to the troops does not appear to entail substantial difficulties.

It is the Group's recommendation that a study be made along these lines, as a step toward the reduction of the number of arms rooms to the practical minimum.

It seems axiomatic that readiness and flexibility for operational use place practical limitations on the types of security measures which can be utilized to prevent theft. Therefore, it seems essential that the operational needs be specified carefully and that storage areas be designed to meet just these needs. This may in some instances permit major improvements in security, for example, by using techniques to reduce the rapidity with which arms can be removed even for authorized use and thus increasing the time available for response to hostile actions. Other examples include the permanent sealing of unneeded access doors, partial disassembly in storage, separation for storage of critical components, or the use of double-key systems.

5. When considering the protection of a particular site, it has already been pointed out that a balanced systems approach is required to provide maximum effectiveness. Thus, increased hardening has the objective of prolonging the time required to enable physical entry by intruders. The role of the intrusion detection alarm system is to provide rapid notification to the response force that an intrusion is under way. The reaction of the response force must be sufficiently rapid to ensure that breaching of the arms room or the ammunition storage site cannot be accomplished prior to the arrival of the interdiction force.

It is generally agreed that hardening alone cannot provide protection adequate to the need. The heavier padlock always results in a bigger hacksaw and the hardest structure can be breached by determined and prepared intruders, either by physical assault or with the aid of insider cooperation. When the facility is remote and unattended, the task is made far easier. Therefore, an intrusion detection and alarm system is a necessary part of an acceptable protection arrangement. It is also important to note that a hardened structure also allows for the introduction of more reliable, less false-alarm prone, and lower cost intrusion detection alarms.

The survey conducted for the Army Physical Security Review Board has disclosed that there are severe discrepancies (as compared with criteria of AR 190-11) in the degree of hardness of many arms rooms. The survey also shows that the cost of raising the level of hardness to the standards is not excessive (approximately 13 million dollars, or an average of about 1,300 dollars per room). This improvement appears particularly worthwhile with regard to the approximately 6,000 Army Reserve, National Guard, and RUTC arms rooms, in which cases the need is great for a high level of security. The cost of improved hardening of ammunition storage sites is estimated to be considerably larger (an average of \$5,000 per storage unit) and increased hardening of these areas must be carried out selectively.

6. A wide variety of intrusion detection alarms is commercially available. Unfortunately, there is a wide range of performance and reliability of these systems. The most serious limitations are related to the installation, maintenance, and testing of the commercial systems. MERDC has developed an extensive standardized intrusion alarm system (J-SIIDS) and is developing follow-on improvements and increased capabilities under the FIDS program. The remainder of this report is devoted largely to a discussion and analysis of commercial and Army-developed intrusion alarm systems and some general comment here will serve as an overview of these systems and their place in physical security picture.

A good intrusion detection alarm system should have reasonable installation and operational cost, good sensitivity to actual intrusion when coupled with reasonable hardness, low false alarm rate, ease of operation and test, and resistance to counter-measures (such as simple as undetected saturated use of telephone lines). Typically these systems detect the opening of doors, windows and ventilation grills; the penetration or attempted penetration of walls, floors, and ceilings; motion inside the protected area; and the attempted removal of protected items.

For the average arms rooms or ammunition bunker, the alarm system will have an equipment cost of approximately \$1,000 with installation cost of about the same amount. To this the operational costs of the communication line (usually standard telephone) and system maintenance and periodic checkout must be added. These two items will cost from \$100 to \$500 per year, depending on the site. When commercial guard services are used, it is often possible to include operation of an intrusion alarm system as part of the service. One example of the cost of such a service, including lease and maintenance of the system and monitoring for alarms, has been given at approximately \$170/month.

Good intrusion detection and alarm systems are available at reasonable cost, but their effectiveness is only as good as that of the monitoring and reaction forces associated with them and these resources must be provided to match the degree of hardening and the alarm system. If the hardness of the protected structure causes a ten minute delay in entry the reaction time from alarm through recognition of alarm to arrival of reaction forces should be consistent with that delay. A significant concern of the ad hoc Group is that large amounts of money might be spent on alarm systems, but appropriate resources not be provided to monitor the systems and to react to intrusions in a timely fashion.

7. Procedural questions related to alarm systems must be addressed. The total system -- from locks to response -- must be capable of specification, test, and continued evaluation by the local responsible commander. Regulations, requirements, and guidance provided to him must be adaptable to his particular situation and must be geared to giving him confidence that he does have an acceptable level of physical security.

To conclude this general overview of the problem, it worthwhile to assess the quality and adequacy of the current regulations pertaining to the construction and protection of arms rooms and ammunition storage facilities.

The applicable Army guidance covering physical security for arms and ammunition is contained in Army Regulation AR 190-11. This document prescribes acceptable practices for the Active Army, Army Reserve and non-appropriated fund activities located on Army facilities. The equivalent guidance for the National Guard is contained in the National Guard Regulation NG 190-11 and contains essentially the same material. Included in these documents are requirements for, and guidance on, the following subjects:

- (a) Storage structures - a penetration delay of at least 15 minutes should be provided against an intruder using normal hand tools
- (b) A "triple barrier" of locking devices to protected items
- (c) Intrusion detection and alarms and their monitoring
- (d) Response to intrusion alarms

(e) Inspection of physical security mechanisms, and

(f) Physical inventory of protected items.

A review of these documents indicates that they do provide reasonable guidance for the design of facilities with adequate structural hardness. On the other hand, the performance specifications relating to intrusion detection alarm systems and the associated communications and monitoring functions are general in nature and lacking in specificity. Also omitted are considerations of the physical security installation as a complete system, i.e., of the inter-relationships between degree of hardening, performance and reliability of the detection system, and the time interval after the receipt of an alarm and the arrival of interdiction forces.

Although not constituting a formal regulation, a fairly detailed and comprehensive analysis of arms room protection systems is contained in a report issued on 31 May 1971 by the Operations Directorate, Intelligence and Concepts Division, entitled "DSPG/Services Broad Qualitative Requirements for Arms Room Intrusion Alarm Systems". This document contains a considerable amount of worthwhile information, including a qualitative set of specifications for the performance of the alarming system. However, specific performance requirements for system components and for the system as a whole are not dealt with.

Finally, mention should be made of Interim Federal Specification W-A-00450 (GSA-FSS), "Alarm Systems, Protective, Interior (Security)". This document presumably applies to all security systems procured and installed in Federal, non-DOD installations. It reflects the same shortcomings as have already been noted in connection with Regulation AR 190-11.

All current regulations are deficient in providing suitable instructions for the check-out of newly installed systems, and for periodic tests to insure that systems in service are operating properly. Since the local commander is responsible for the security of the weapons issued to his command, it is essential that he be provided with proper guidance on proper acceptance procedures for new security installations, as well as recommended practices for insuring that the systems continue to be functional. None of the current regulations address this question directly and in a meaningful way. It is the Group's recommendation that this omission be corrected in future revisions of the current Regulations.

#### IV. ANALYSIS OF COMMERCIAL DEVELOPMENTS

1. Intrusion detection equipment has been commercially available for many years. Military usage of this type equipment began in the mid-1940's for protection of highly classified weapons, such as nuclear bombs, used in WW II. The devices used in these applications consisted of simple switch closure of continuity devices such as magnetic switches, vault door bolt position indicators, and grid wire systems. As system vulnerabilities became known through user evaluations and as concern grew over "stay behind" intruders and intruder entrance by wall penetration, the commercial alarm industry responded with development of motion detectors (ultrasonic, microwave, infrared), proximity detectors (electromagnetic, capacitance), and wall penetration sensors (vibration, acoustic).

Many firms have been engaged in development/manufacture/distribution of intrusion detection equipment over the past 30 years. A survey in 1971 revealed approximately 300 such firms recognized nationally or regionally in the alarm industry. Other smaller firms are recognized only locally. A significant part of this security alarm industry engages what could be referred to as "gadgeteering", i.e., the hurried introduction of a device that performs well in a sterile demonstration environment but is prone not to detect intrusions or else will generate excessive false alarms in an actual installation.

2. Satisfactory government standards for the definitive procurement of acceptable intrusion detection equipment have not been developed. The General Services Administration has published a Federal Specification (W-A-00450, Nov. 1965) for such equipment and Underwriter Laboratories have standards for such equipment; however, these specifications are very general and not definitive enough to prevent qualification of unsatisfactory equipment. In 1970, the Department of the Army Office of the Provost Marshal General (OPMG) introduced a more suitable standard entitled, "Specifications for Interior Intrusion Detection Systems." This standard caused the commercial alarm industry to further improve the construction and performance of equipment to be used in Army installations. One nationally recognized firm took this standard seriously enough to introduce a "Government Product" line of equipment meeting both the letter and intent of the OPMG specifications. The OPMG standard is not specific enough, however, to eliminate certain marginal and less than satisfactory equipment on the market today.

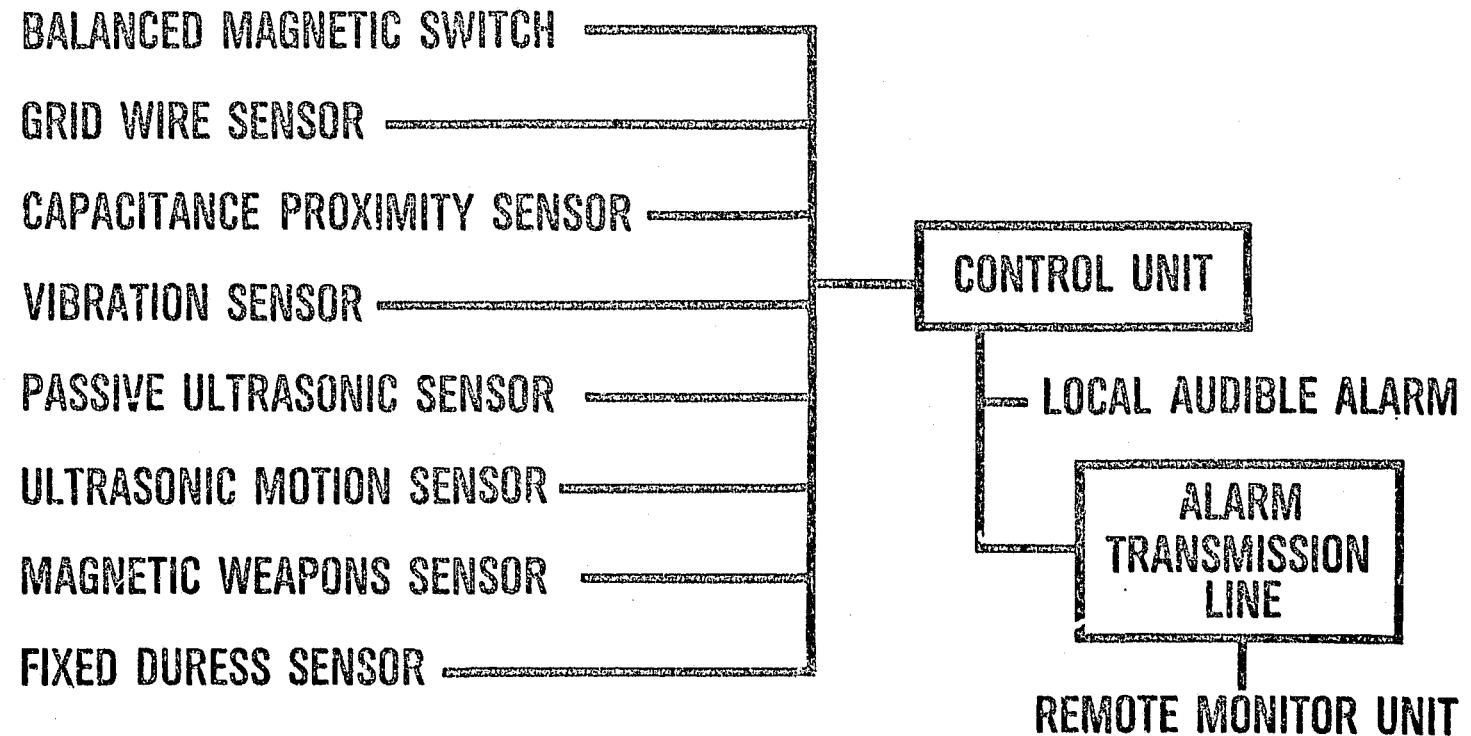
Procurement of commercial intrusion detection systems by some Army users from less qualified and experienced manufacturers and suppliers can and does result in troublesome and unsatisfactory installations in many instances.

3. The more qualified manufacturers of intrusion detection and alarm systems are developing and providing satisfactory equipment for both government and industrial applications. These manufacturers are continually improving their products to better satisfy these present and future expanding market demands. The competitive commercial motives of this situation are, indirectly, a beneficial safeguard against obsolescence and vulnerability of such systems through age and compromise. What is needed in order to take greatest advantage of this aspect of the commercial development sector for Government security needs is a definitive means for specifying and procuring only the qualified and acceptable equipment components and systems. It is important to note that the costs for such security monitoring capabilities are of a continuing nature in that the obsolescence and assumed compromise time cycle of such equipment is presently estimated to be about 5 years, after which certain changes and improvements become necessary for reliable and effective protection.

#### V. HISTORY, STATUS AND ANALYSIS OF J-SIIDS

1. In December 1970 the Defense Special Projects Group was tasked by Secretary of Defense to coordinate all DOD physical security RDT&E, whereupon programs for interior and exterior physical security R&D were initiated. Under the interior program, the Army was assigned to develop an Arms Room Intrusion Alarm System later designated as the Joint Services Interior Intrusion Detection System (J-SIIDS). The development approach for J-SIIDS was to survey, test and evaluate existing commercial alarm systems and components to determine technical requirements for satisfactory equipment performance, increased reliability, and standardization. In April 1972 DOD responsibility for all interior physical security, including J-SIIDS was transferred to the Army. Responsibility for exterior physical security was transferred to the Air Force.
2. In June 1973 the basic J-SIIDS components were type classified Standard - Logistics Control Code A for arms rooms use only, and production contracts in the amount of \$6.9 million were awarded to provide systems for Army and Navy use in approximately 4,000 arms rooms. The initial quantity of Army systems being procured under these contracts will be free issue for arms rooms only based on specific requisitions from user units. Additional systems for active Army arms rooms, as well as for Army National Guard, Reserve, or ROTC arms rooms, will have to be requisitioned separately, citing funds.
3. J-SIIDS consists of various mixes of intrusion detection components shown in figure 1, selected for use on the basis of arms room size, environment, wall and door construction, and postulated intrusion vulnerability. Initial production testing of the J-SIIDS hardware began in February 1974 and is now complete. An in-process review will be conducted in 3Q FY75 to certify suitability for release to the field. Prior to release, retrofit of J-SIIDS will be required and is under way to resolve six correctable items of deficiency:

# JOINT SERVICE INTERIOR INTRUSION DETECTION SYSTEM



- (a) Mode switch on Control Unit (Countermeasures);
- (b) Control Unit alarm circuit resistor values incorrect; causes overload of resistor in Control Unit power supply;
- (c) Monitor Cabinet a.c. fail circuit susceptible to false activation by a.c. line transients;
- (d) Data Transmission System failure to operate under high humidity conditions;
- (e) Data Transmission System susceptibility to lightning induced transients; causes loss of synchronization between transmitter and receiver; and
- (f) Magnetic Weapon Sensor high false alarm rate.

4. J-SIIDS Add-On components, developed to provide additional sensing and higher security capabilities as well as civilian alarm monitor interface capability, are presently undergoing testing and are scheduled to be type classified standard during 4Q FY75. It is planned to qualify J-SIIDS and J-SIIDS Add-Ons for use in areas other than arms rooms. This will require additional testing to evaluate J-SIIDS vulnerability to better skilled intruders and the effects of the environments of other applications on J-SIIDS performance.

5. Past RDT&E funding on J-SIIDS as administered by USAMERDC through FY 75 has amounted to a total of \$4.116 million. Of this total, \$1.328 million was spent on in-house efforts and \$2.788 million was spent on outside contracts. A breakdown of these RDT&E funds and the funds spent on J-SIIDS hardware production contracts is given in Table I.

It should be noted that current funding levels do not provide for the correction of deficiencies which have been surfaced during DT II testing.

6. The Group appraisal of the AMC/MERDC program and efforts for J-SIIDS is summarized by the following remarks:

- (a) Army technical efforts by which J-SIIDS evolved have been and continue to be good work for which all participating personnel should be commended;
- (b) Certain technical design features and operating functions in J-SIIDS (e.g. sensor frequency response ranges, event-count alarm threshold logic, etc.) differ from similar characteristics of comparable commercial systems. These differences appear to have evolved to satisfy specific objectives of J-SIIDS as a military-wide arms room security system adaptable to the many different installation sites required. It should be pointed out that all intrusion detection systems, J-SIIDS and commercial, that utilize standard telephone lines for alarm transmissions are susceptible to the vulnerabilities of these lines;



TABLE I - J-SIIDS FUNDING

| FUNDING<br>CATEGORY           | FY 1971            |           | FY 1972       |           | FY 1973                       |           | FY 1974       |           | FY 1975     |           |
|-------------------------------|--------------------|-----------|---------------|-----------|-------------------------------|-----------|---------------|-----------|-------------|-----------|
|                               | MERDC              | CONTRACTS | MERDC         | CONTRACTS | MERDC                         | CONTRACTS | MERDC         | CONTRACTS | MERDC       | CONTRACTS |
| <u>RDTE:</u>                  |                    |           |               |           |                               |           |               |           |             |           |
| Basic-J-SIIDS                 | \$160K             | \$50K     | \$320K        | \$1,558K  | \$280K                        | \$50K     | ---           | ---       | ---         | ---       |
| J-SIIDS Add-On                | ---                | ---       | ---           | ---       | \$140K                        | \$1,130K  | \$203K        | \$16K*    | \$225K      | \$27K     |
| <u>HARDWARE PROCUREMENT:</u>  |                    |           |               |           |                               |           |               |           |             |           |
| Basic - J-SIIDS               | ---                | ---       | ---           | ---       | \$6.2M(Army)<br>\$700K (Navy) |           | \$156K*       |           | ---         | ---       |
| <u>MERDC Level of Effort:</u> | <u>4 Man-Years</u> |           | 7.8 Man-Years |           | 10 Man-Years                  |           | 4.8 Man Years |           | 5 Man-Years |           |

\* - FOR TECOM TESTING.

TABLE I - J-SIIDS FUNDING

- (c) J-SIIDS is judged to be an equipment system offering additional sophistication in monitoring functions and adaptability to the wide variety of arms room settings over similar commercially available equipment;
- (d) As a result of its efforts in J-SIIDS development MERDC has gained a recognized expertise in physical security systems which is informally serving numerous other federal agencies in a useful related consultation and advisory capacity.

**VI. A RATIONALE FOR THE EMPLOYMENT OF BOTH  
ARMY-DEVELOPED AND COMMERCIALLY-DEVELOPED  
EQUIPMENT TO MEET THE TOTAL NEED**

1. The Army problem of protecting arms rooms and light arms ammunition storage areas can be categorized into two principal parts: first, the protection of Active Army facilities which are located on active Army installations, and second, the protection of Army Reserve and National Guard facilities. The operational circumstances and system requirements for the two classes of service differ sufficiently that, in the opinion of the Group, a single solution for both will not result in optimum operational and cost effectiveness.
2. Active Army facilities are generally located on active military bases and consist of arms rooms, storage depots and ammunition storage sites. Arms rooms are located in buildings which are ordinarily populated round-the-clock, such as barracks or command posts. They are either under direct guard, or are subject to surveillance by personnel located in adjacent areas of the building. Most rooms which are under continuous guard need no intrusion alarm protection other than duress alarms. Rooms under part-time direct guard, and otherwise subject to surveillance in the immediate vicinity, should be protected by intrusion alarm systems commensurate with the threat level.

Storage depots on bases are generally subject to guard checks at periodic intervals, but may be unoccupied other than during normal working hours. Such installations are in evident need of protection by means of intrusion alarm systems.

Finally, in the case of ammunition bunkers, locations are often remote and unoccupied outside of normal working hours. While such facilities are usually well-hardened structurally, and are subject to regular guard check during off hours, achieving an adequate level of security would appear to require the use of a properly designed intrusion detection and alarm system.

Active Army installations are located world-wide and in widely varying environmental circumstances. Intrusion detection and alarm equipment for Army-wide use should be standardized in its design and manufacture in order to simplify logistics, training and maintenance.

3. In the case of Army Reserve and National Guard facilities, the circumstances are substantially different. Arms rooms are located in armories which are occupied only during conventional working hours, training and mobilization periods. Geographic locations are often remote from populated centers. Response forces usually consist of local law enforcement agencies whose headquarters may be some distance from the armory. Such facilities are seldom under continuous surveillance, or even subject to regular guard checks. It is quite evident that intrusion detection and alarm systems should be an essential part of the security measures taken to protect such installations.

The process of alerting the response force in the event of an alarm also has features different from the Active Army. Most local law enforcement agencies will not accept responsibility for the alarm monitor function. Accordingly, the monitoring is accomplished through commercial security services engaged primarily in the protection of civilian commercial and industrial installations. In normal practice, such security services install detection and alarm equipment of their own design; charges to the customer are based on a total service consisting of installation, maintenance of equipment, and monitoring service.

It has already been pointed out earlier in the report that experience to date with commercial detection and alarm hardware has been variable in terms of quality. The more responsible manufacturers provide equipment of high quality, designed for domestic environmental service conditions. The hardware is not, of course, normally fully militarized in design and manufacture, but serves adequately for the purposes intended.

4. The question at once presents itself as to the proper roles of Army-developed and commercially-developed equipment in meeting the total spectrum of Army needs. Policy alternatives range from a movement toward complete standardization employing Army-developed systems, to an almost complete reliance on systems procured in the commercial market. Based on the earlier discussion of the requirements of the Active Army, the Reserve and the National Guard, it seems clear that neither extreme is desirable.

The Group is of the opinion that the greatest advantage to DOD will be derived from an approach which combines in-house effort with continued participation by the commercial sector. From the research and development point of view, this has the advantage of mutual interaction of ideas, as well as the incentives derived from competition. The in-house effort is necessary to insure that the specialized requirements of the Army are met, while the commercial sector contribution will be enhanced by the added experiences derived from serving the larger non-military market for security services.

5. With this objective in mind, a logical division of effort between in-house and commercial sources at once suggests itself: Use Army-developed systems (J-SIIDS and follow-on systems) for Active Army needs, and satisfy Reserve and National Guard requirements through commercial sources. The earlier discussion of the special circumstances surrounding the two classes of service supports this approach.

For world-wide deployment, J-SIIDS and future Army developments will possess the necessary degree of militarized design to satisfy the broadest diversity of operating circumstances. Since all Active Army systems will employ standardized components, problems of logistics and supply, as well as training for operating and maintenance personnel will be minimized.

If the commercial sector is to continue to serve the Reserve and National Guard requirements, however, it is clear that tighter controls are needed in order to insure that operational effectiveness is kept to adequate levels. It has already been pointed out that currently applicable Regulations are inadequate for the purpose, and that experience to date has ranged from acceptable to poor in terms of the quality of installed systems.

It is important to note that there are currently no adequate specifications governing the performance requirements for commercially procured equipment. It is suggested that the optimum solution to the Reserve-National Guard problem rests with the generation of procurement specifications that are standardized, modular, and contain requirements for performance installation, test, acceptance, maintenance and spares from which the users can invite open bidding for the equipment in their areas. Simply, the intent is to buy the appropriate protection and alarm devices (to meet operational requirements) from a standard specification, but allow commercial sources to use acceptable components or subsystems.

6. It is the Group's recommendation that MERDC be charged with the responsibility for preparing improved specifications and applications guidance suitable for the purpose described above.

In addition, because of the sensitive character of the weapons protection problem, it is the opinion of the Group that a formal procedure should be initiated to insure that the quality and performance of commercial components are in accord with specifications. Thus, in advance of the use of a particular component in a field installation, the manufacturer will be required to submit evidence that supports the operational and maintenance adequacy of the unit. It is suggested that MERDC be assigned the responsibility for maintaining and monitoring such a "qualified products list" (QPL).

QPL techniques are widely used within the DOD, and the procedures for implementation are well understood. MERDC should be required to review and approve all applications by manufacturers, and at its discretion undertake independent investigations as a check against data submitted by outsiders.

7. In addition to its role in preparing and maintaining adequate specifications for intrusion detection and alarm equipment, and for administering the QPL function, MERDC should also serve as a consultation and advisory agency to those responsible for constructing new facilities or modernizing older ones. It should once again be emphasized that levels of protection should be consistent with levels of threat, and that each new installation should be analyzed from the viewpoint of its particular operational environment. It is the Group's understanding that MERDC presently provides consultation services on a limited basis to government agencies requesting help, and that aid of this kind is given regularly.

## VII. FUTURE DEVELOPMENTS

1. Future Army plans for R&D in the physical security area relating to arms rooms and ammunition storage areas are included within the FIDS program. The aims of FIDS extend well beyond the enhancement of protection capabilities for arms rooms and ammunition storage, although it offers improvements over J-SIIDS capabilities.

The Group has not thus far completed its evaluation of the total FIDS program, but intends to do so during its further studies. The present remarks are confined to those facets of the program which relate to arms room and ammunition storage protection.

2. The total FIDS consists of two phases, Basic and Advanced. Included within the Basic phase are several capabilities and features representing advances over J-SIIDS. Included among these are the following:

- (a) Smaller alarm monitor consoles (by use of micro-processor controlled communication and display functions).
- (b) Fewer dedicated data lines (by use of time-division-multiplex data transmission techniques).
- (c) Automatic system test (command function at monitor console).
- (d) Hard copy printer in monitor console providing date and time tagged log of all system status changes, operator acknowledgements and operator initiated system commands.
- (e) Map display with light indicators to rapidly orient operator to location of intrusion.

All of these features are considered important by users. The Group is in agreement that these improvements are desirable and ultimately necessary in the continued development of protection systems.

The Group has also addressed the question of the adequacy of the research concepts and planning encompassed by the FIDS program. It is our conclusion that the plans are comprehensive, and to the best of our knowledge do not overlook promising avenues for future exploitation.

3. We are aware that the program is lagging behind its originally established schedule, due in large measure to inadequate funding. While the Group is concerned over this slowdown, it is believed that J-SIIDS affords a level of protection for arms rooms and ammunition storage areas which is consistent with the immediate future threat. Therefore, while FIDS should progress, the level of effort should be judged in terms of its future importance to physical security needs as a whole.

As already noted, the Group will address this question more comprehensively as part of its further studies. Exterior perimeter sensor systems also have relevance to the protection of ammunition storage sites in particular, and this subject will also be addressed during future investigations.

## VIII. CONCLUSIONS AND RECOMMENDATIONS

1. The theft of arms and ammunition through illegal entry into arms rooms and ammunition storage areas constitutes a sensitive problem for the Army and the Department of Defense. Such losses must be minimized to avoid public embarrassment to the armed services, and because of the fear that stolen arms will be used during training and maneuvers, loss during transit, and other unaccountable reasons.

The available statistics regarding weapons losses indicate that substantial numbers are the result of illegal entry, but other important sources are losses by individual soldiers during training and maneuvers, loss during transit, and other unaccountable reasons.

In recent years, losses of weapons and ammunition are not increasing in absolute numbers, and in fact show a relative decline.

None of the losses to date can be proven to be due to planned action by revolutionary groups or by organized crime.

Recommendation: Maintenance of accurate statistical records of arms and ammunition losses should be a continuing effort. Equally important, each incident should be analyzed, to the extent possible, to determine the motivations for the thefts. It is of the greatest importance that sociological or criminological trends be identified in relation to arms thefts.

2. In the design of systems to prevent theft through illegal entry, an important factor is the degree of skill and planning of the perpetrators of the thefts. This requires definition of the threat, i.e., is it from sophisticated, educated and well-organized intruders, or is it from action by individuals or groups of lesser skill levels?

Recommendation: Research and analysis should be directed toward definition of the probable threat in terms of intruder skill, degree of planning and preparation, and intensity of motivation. Until further data is available, it should be assumed that the credible threat of most concern is from the semi-skilled intruder, the well-motivated and well-educated person with a revolutionary political background.

3. If the number of potential targets can be reduced, the level of protection afforded to each can be increased. Thus, studies should be directed toward consolidating arms rooms when possible, and otherwise reducing and/or consolidating the number of arms and ammunition storage areas. In the case of the Army Reserve and the National Guard, arms rooms are maintained in certain armories but the stored weapons are infrequently used.

Recommendation: Take action to reduce the number of arms rooms and ammunition storage areas. In particular, analyze Reserve and National Guard needs to determine whether arms rooms are required in all armories.

4. It should be recognized that the protection of an unguarded facility from intruders requires the system integration of the following elements: A structurally hardened facility which increases the time required for forcible entry; an intrusion detection and alarm system to signal that an illegal entry is being attempted; and a response force which takes action to interdict the intruders. A properly balanced protection system insures that intruders will be apprehended before their mission is completed.

Recommendation: The design of a protection system for a particular facility should be based on an understanding of the inter-relationships between the degree of structural hardness, the alerting time, and the time required for the arrival of the response force.

5. Increased structural hardness is not, by itself, adequate protection for an unguarded arms room or ammunition storage site. Many facilities now in use do not meet existing specifications in regard to desirable degree of structural hardness.

Recommendation: Arms and ammunition storage facilities should be structurally upgraded as rapidly as possible, or else removed from service as quickly as circumstances permit.

6. Intrusion detection and alarm systems are essential for the protection of unguarded weapons and ammunition storage facilities. The degree of sophistication employed in a particular location should be consistent with the threat level.

7. J-SIIDS represents a high-quality, well designed intrusion detection and alarm system. Currently type-classified for use in arms rooms, it is also capable of being adapted to the protection of ammunition storage sites.

Recommendation: J-SIIDS should be employed for the protection of Active Army arms rooms and should be type-classified for use in ammunition storage sites as rapidly as practicable.

8. The nature of the threat and the characteristics of storage sites and of weapons and ammunition to be stored can be expected to change, resulting in changing future requirements for intrusion detection and alarm systems. The Army needs an in-house capability which will advance the state-of-the-art and provide the technology base for equipment and system development to meet future requirements.

Recommendation: MERDC has a well-planned program and should continue active research and development aimed at improvements in intrusion detection and alarm technology and systems.

9. Reputable commercial manufacturers of physical security equipment are marketing system components with performance generally equivalent to J-SIIDS. Although not completely militarized in design and fabrication, they are adequate for use in many installations.

It is in the best interests of the Army to retain the participation of commercial manufacturers in providing physical security equipment. Commercial manufacturers serve a wider market than the military alone, and must strive to produce low-cost equipment with adequate performance. For this reason, as well as to benefit from innovations derived from the commercial segment, a continuing interaction is desirable between government and commercial RDT&E.

10. The requirements of the Active Army for physical security systems differ from those of the Army Reserve and the National Guard. In the case of the latter, a total security service is required, including the installation of intrusion detection and alarm systems, maintenance of equipment in the field, and full-time support of the facilities through monitoring services to react to intrusion alarms and alert the response forces. It is impractical for the Reserves and the National Guard to supply their own maintenance and monitoring services, functions which can be performed internally by the Active Army.

Recommendation: To satisfy the needs of the Army Reserves and the National Guard, and to obtain the benefit of commercial participation in the overall physical security problem, it should be the Army policy to permit use of commercial security services to satisfy Reserve and National Guard requirements.

11. Current Regulations applicable to the construction and protection of arms rooms and ammunition storage areas provide adequate guidelines regarding structural hardness, but do not afford adequate guidance for the design of protection systems, decisions regarding the acceptability of system components, and procedures for acceptance testing and periodic in-service checking of system performance.

Recommendation: MERDC should be assigned the task of preparing improved specifications and application guidance for intrusion detection and alarm systems for arms rooms and ammunition storage areas.

12. Because of the sensitive nature of the weapons protection problem, a formalized procedure should be implemented to insure that commercial equipment meets the necessary performance levels. It is suggested that a "qualified products list" of acceptable system components be maintained and administered by MERDC. Only products on this list should be approved for Reserve and National Guard use.

Recommendation: MERDC should be tasked to maintain and administer a "qualified products list" as a means of achieving quality control over installations using commercial equipment.

13. MERDC is presently serving on a limited basis as an informal advisor to various government agencies for the design of physical security systems. This should be made a formalized MERDC responsibility, particularly with regard to the design of Army-installed systems.

Recommendation: MERDC should provide advisory services to those engaged in the installation and operation of physical security systems.

DEPARTMENT OF THE ARMY  
ARMY SCIENTIFIC ADVISORY PANEL  
Washington, D. C. 20310

5 November 1974

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TERMS OF REFERENCE  
AD HOC WORKING GROUP ON

Physical Security RDT&E

1. BACKGROUND:

In December 1970, the Defense Special Projects Group (DSPG) was tasked by SECDEF to coordinate all DOD physical security RDT&E, whereupon DSPG initiated new interior and exterior physical security R&D programs. Under the interior program, DSPG then tasked the Army to develop an Arms Room Intrusion Alarm System (ARIAS), later designated Joint-Services Interior Intrusion Detection System (J-SIIDS) due to its Joint-Service applicability and its potential future application to other than arms rooms. In April 1972, during the phase-out of DSPG, the SECDEF transferred DOD responsibility for interior physical security, including J-SIIDS to the Army. Responsibility for exterior physical security was transferred to the Air Force. The J-SIIDS in June 1973 was type classified Standard - Logistic Control Code A for arms rooms use only, and production contracts were awarded to provide systems to the Army and Navy. The initial quantity of Army systems being procured under these contracts will be free issue for arms rooms only. Additional systems for active Army arms rooms, as well as for National Guard, Reserve, or ROTC arms rooms, will have to be requisitioned separately, citing funds. TECOM DT III (initial production) testing, initiated during February 1974, will be completed during October 1974, and a Special In-Process Review will be conducted early in 3QFY75 to certify suitability for release to the field. Concurrently, add-on J-SIIDS components, developed to provide additional sensing and higher security capabilities as well as a civilian interface capability, will undergo TECOM DT III testing and are scheduled to be type classified standard during 4QFY75. Currently effort is planned to qualify J-SIIDS for use in areas other than arms rooms. However, this effort is unfunded. An Army Materiel Need (MN) for a Facility Intrusion Detection System (FIDS) was approved during March 1973, and a development program was initiated and funded July 1973 with FY 74 funds. The FIDS, designated a Joint-Service system, will have capabilities not provided by J-SIIDS for protecting all areas against espionage, sabotage, theft, etc. The basic FIDS is currently scheduled to be type classified standard during 1QFY78. However, funding limitations will not allow this schedule to be met. If additional funds are not made available, the schedule will slip approximately one year. Recent thefts of weapons and ammunition especially the losses of weapons from National Guard Armories in Kansas and California prompted a request by Secretary of the Army to address the problem and generated the specific request by ASA(R&D) to convene an ASAP Ad Hoc Group to review the Army's Physical Security equipment program.

**2. TERMS OF REFERENCE:**

- (a) In view of the increasing threat of intrusions into DOD facilities, what continuing exploratory and advanced development programs should be pursued to provide technological bases to counter the threat?
- (b) What measures should be taken to accelerate the current physical security equipment development and deployment schedules?
- (c) What measures should be taken to provide immediate, short term (0-3 years) protection?
- (d) In view of the recognized urgency to provide adequate security for weapons and munitions - conventional, nuclear, and chemical - should Physical Security, be designated an AMC Major Thrust?
- (e) Compare J-SIIDS and commercially available security equipment suitable for protecting arms rooms.
- (f) Is the type of intruder well enough defined to perform effectiveness studies and determine system limitations? Define what is meant by a semi-skilled and skilled intruder.
- (g) Is the RDT&E physical security program, as presently structured, responsive to the formal requirements?
- (h) What considerations have been given to a revision in the overall physical security policy to include the use of standardized physical security equipment?
- (i) Does the Army's Materiel Need (MN) for a Facility Intrusion Detection System (FIDS) and Required Operational Capability (ROC) for a Fixed Installation Exterior Perimeter Sensor System (FIEPSS) properly reflect the Army's current and projected minimum Physical Security requirements?

**3. TERMINATION:**

The Chairman of the Ad Hoc Group is requested to conclude his efforts at the earliest possible date. A written report should follow not later than 15 January 1975.

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