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ABSTRACT
The Department of the Army Electromagnetic Environmental Effects (E3) Program is an effort to incorporate electromagnetic considerations into weapon system vulnerability assessment. The program attempts to insure that Army systems function properly in predicted electromagnetic environments. If shortcomings in system design and operational performance are found, steps are taken to correct the deficiencies. This paper represents an Integrated Logistic Support approach to interfacing with the E3 Program and the E3 Program and the E3 engineer.

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Jeffrey M. Nall
AMSMC-MAE-WL
December 1991

91-19447

ABSTRACT

The Department of the Army Electromagnetic Environmental Effects (E^3) Program is an effort to incorporate electromagnetic considerations into weapon system vulnerability assessment. The program attempts to insure that Army systems function properly in predicted electromagnetic environments. If shortcomings in system design and operational performance are found, steps are taken to correct the deficiencies. This paper represents an Integrated Logistic Support approach to interfacing with the E^3 Program and the E^3 engineer.

Proponency for this document is assumed by the Logistic Support Analysis office of the Maintenance Engineering Division, Maintenance Directorate, of Headquarters, U.S. Army Armament, Munition, and Chemical Command. Suggested changes or comments should be directed to:

HQ, Armament, Munitions, and Chemical Command
ATTN: AMSMC-MAE-WL
Rock Island Arsenal
Rock Island, IL 61299-6000

ACKNOWLEDGEMENT

Ron Duclos has been a guiding force in this effort since its inception. Recognition should be given to both Mr. Norman Svendsen and Mr. Jim Meehan for their help in the creation of this document, through phone conversations and materials provided. Mark Hahn has also provided format review and distribution support for this document.

The phone is a vital link in the Electromagnetic Environmental Effects Program. All of the Points of Contact listed in the "Available Resources" section of this document will provide excellent support in any Electromagnetic Environmental Effects effort on any Manager's system.

Also, Mr. Ned Shepherd should be recognized for his contribution of logistic expertise to this document.

Table of Contents

Electromagnetic Environmental Effects (E^3)

TARGET

The primary intended audience for this guidance is the Integrated Logistic Support Manager (ILSM), and Team members, on weapon systems that contain electrical/electronic components. However, all Army systems are required to address E^3 Program concerns.

SCOPE

The breadth of this document is not all inclusive; for more technical information refer to documents in the bibliography or an Electromagnetic Environmental Effects (E^3) Engineer. This guidance covers what an Integrated Logistic Support Manager should be concerned about when considering Program requirements.

CONSIDERATIONS

Electromagnetic Environmental Effects need to be considered over a system's life cycle by Integrated Logistic Support Managers (ILSMs) and Team members. It is neither feasible nor appropriate to make every component (even every weapon system) hardened against all electromagnetic influence. However, it is reasonable to expect that systems will work when required in their predicted electromagnetic environment. Incorporation of electromagnetic effects concerns into both the Integrated Logistic Support Plan (ILSP) and the Maintenance Plan (typically found in the ILSP) will aid in fulfilling the expectations of weapon systems.

There is a broad spectrum of Electromagnetic Environmental Effects to consider when planning support for a weapon system in development (or even a Non-Developmental Item (NDI)). Electromagnetic effects to be considered (if applicable to the environment of the weapon system) include:[1]

- Electro Static Discharge
- Electromagnetic Compatability
- Electromagnetic Radiation Hazards
- Electronic Countermeasures
- Jamming/Interception
- Electromagnetic Interference
- Electromagnetic Pulse
- Lightning Effects
- High Power Microwaves
- Component to Component Interference

1 *Definitions of these terms, taken from ADS-37 (Aeronatical Design Standard), may be found in the Glossary*

REQUIREMENTS

The Assistant Secretary of the Army, Research, Development, and Acquisition [ASA(RDA)] guidance[2] requires that "E^3 requirements shall be developed and incorporated as identifiable sections/chapters of the Maintenance Plan and/or the Integrated Logistic Support Plan for each Army system."

The guidance also mentions, "Appropriate actions must be taken by Program Sponsors, user representatives, material developers, breakout managers and item managers to reduce to an acceptable level the risk associated with electromagnetic radiation, throughout the operational life of the equipment. These managers must assure that their items are maintainable in design and are maintained in practice at an acceptable level of readiness to operate in the anticipated electromagnetic environment throughout the life cycle.

...The E^3 hardness of each Army system shall be maintained throughout its life cycle as part of normal maintenance. Regardless of complexity of the systems, E^3 surveillance concepts should be developed which utilize the lowest practical maintenance level, e.g., visual inspection of grounds, bonds, and shields by operational personnel and minimize use of highly specialized CONUS based E^3 test facilities."

THE PROCESS

Electromagnetic effects are largely dealt with in the design phase or concept phase by the design engineers. The supportability of the system also needs to be considered by these design engineers and the Integrated Logistic Support Managers. Different hardening methods require different supportability considerations. Choices such as which parts should be hardened, purchase of hardened vs. non-hardened replacement parts, maintenance procedures to maintain a hardened system, testing and monitoring of a hardened system, and procedures that sustain electromagnetic sensitive systems will all affect the maintenance concept and operations. The above considerations should be input when developing an Logistic Support Analysis (LSA) Strategy. The ILSM should also ensure E^3 requirements are written into contracts for reacquisition of the end item and procurement of supply parts.

There is a process through which an attempt is made to address all applicable Electromagnetic Environmental Effects to a weapon system. This process includes an Electromagnetic Environmental Effects Requirements Board (E^3RB) and the Program Sponsor (PM/PEO). The Program Sponsor, user representative, and material developer, as part of the E^3 Requirements Board, help predict the

2 *Army Acquisition Executive Policy Memorandum 91-3, to be written into AR 70-1*

electromagnetic environment of the system, predict weapon system performance in the environment and develop a long term strategy to deal with the electromagnetic effects.

The Electromagnetic Environmental Effects Working Group (E^3WG) conducts analyses and provides technical input to the E^3 Requirements Board. Integrated Logistic Support is a key member of the Working Group. Other members include the AMCCOM E^3 Point of Contact (E^3POC), Program Sponsor or designated representative, user representative, Product Assurance Directorate, Safety, Explosive Ordnance Disposal, and other advisory members as appropriate. Using this information and suggestions, the Requirements Board decides upon a course of action.

The Maintenance Engineering Integrated Logistic Support Management Team member should be of help in reviewing documents generated through the Army E^3 Program. A maintenance oriented perspective when reviewing repair procedures and parts will aid the ILS Manager's review of E^3 documents. Suggestions might also be gained from Maintenance Engineers and Equipment Specialists concerning possible shortcomings in the considerations of the Electromagnetic Environmental Effects Requirements Board and Working Group.

The ILS Manager's primary responsibilities in the above process are largely advisory, in conjunction with incorporating E^3 into the ILS Plan (and assessments as necessary). In the existing guidance[3] for the writing of an ILS Plan, there are several sections concerned with topics relevant to Electromagnetic Environmental Effects. The easiest way to address the program is to place all E^3 ILS and Maintenance concerns in one location, and reference redundant concepts of other sections to it[4], within the ILS Plan. The creation of a new section titled "Electromagnetic Environmental Effects," to be placed at the end of section II of the Integrated Logistic Support Plan, is neccesary due to ASA(RDA) requirements[5] of the Electromagnetic Environmental Effects Program.

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3 *DA Pam 700-55, Instructions for Preparing the Integrated Logistic Support Plan*

4 *Specifically, sections: ILS ELEMENTS/ Design Influence (d) and Maintenance Plan (i), of the Integrated Logistic Support Plan*

5 *AAE Policy Memo 91-3 states that the E^3 section of the ILSP "be developed and incorporated as identifiable sections/chapters"; the end of Section II of the ILSP is appropriate for E^3 considerations*

LOGISTIC SUPPORT ANALYSIS

A better weapon system will result if Electromagnetic Environmental Effects are considered during the development of an LSA Strategy (Task 101). Ensuring that the design engineer is aware of supportability concerns during the design process is a primary goal of the Integrated Logistic Support process and will influence the reliability of the system in the field. Maintenance engineering should be of help in accomplishing this goal.

There are many tasks that could be used to conduct analyses relevant to electromagnetic effects. Listed below are some of the tasks that should be performed[6]:

- Task 103- Program and Design Reviews, necessary for review of design and Logistic Support Analysis for concurrence with electromagnetic concerns
- Task 201- Use Study, consideration of what environment the system should be able to operate within
- Task 205- Supportability and Supportability Related Design Factors, Electromagnetic Environmental Effects design constraints and supportability goals
- Tasks in the 300 series- Preparation and Evaluation of Alternatives, these can address such considerations as Reliability Centered Maintenance, Level of Repair, method of hardening and other design and support tradeoffs
- Task 401- Task Analysis, packaging, storage requirements, integration of Electromagnetic Environmental Effects findings into Integrated Logistic Support Documentation, and determination of training requirements
- Task 501- Supportability Assessment, Test and evaluation of hardening, update Logistic Support Analysis Records and Support Plan, and analyze operational capability in environment.

Performance of Logistic Support Analyses will eliminate some of the problems associated with Electromagnetic Environmental Effects that occur after the system has been fielded. Consideration of the system's environment in this way will increase its reliability for the soldier.

6 *Logistic Support Analysis should always be tailored for the unique aspects of each weapon system*

Electromagnetic Environmental Effects Section of ILSP

CHECKLIST:

1. **Design Influence**

   a. Electromagnetic Interference (EMI)

   (1) environment
   (2) enemy jamming
   (3) corrosion control
   (4) component to component

   b. Electromagnetic Pulse (EMP)/Nuclear Hardening

   c. Electromagnetic Compatability (EMC)

   d. Electromagnetic Vulnerability (EMV) analysis and measurement of the degree of EM Susceptibility

   e. Design Tradeoff for nuclear hardening

   f. Tradeoff for method of protection

2. **Scheduling and Funding**

   a. Communication

   (1) Electromagnetic Environmental Effects Requirements Board (E^3RB)
   (2) Providing input to Electromagnetic Environmental Effects Working Group (E^3WG) as an Integrated Logistic Support Manager
   (3) Testing
   (4) Timing before first Milestone

   b. Examination

   (1) Electromagnetic Environmental Effects Working Group (E^3WG) recommendations
   (2) Testing Findings: Logistic Support Analysis Record relevance

   c. Requesting funding from Program Sponsor

3. Safety

a. Electromagnetic Radiation Hazards (EMRH)

(1) Hazards of Electromagnetic Radiation to Ordinance (HERO)
(2) Hazards of Electromagnetic Radiation to Personnel (HERP)
(3) Hazards of Electromagnetic Radiation to Fuel (HERF)

b. Training and Publications

4. Nuclear Hardness Maintenance and Surveillance

a. Proper maintenance procedures

(1) Training
(2) Publications

b. Surveillance and testing for hardness

(1) Reliability Centered Maintenance (RCM)
(2) Surveillance procedures- support parts as well as system
(3) Level of maintenance
(4) Requirements
(5) Ensure replacement parts are hardened as originals

A PRIMER

I. The first part of the Electromagnetic Environmental Effects section of the ILS Plan should be concerned with Design Influence. Design Influence is a prime player in insuring the reliability and supportability of the weapon system. Possible E^3 problems must be considered in the design phase. Physical or performance degradation of the system due to Electromagnetic Interference (EMI) is a common problem. EMI may take shape in many forms: environmental "noise", enemy jamming using Radio Frequency (RF) energy, degradation of contacts (bonding) due to corrosion, or even intercomponent magnetic field interference within a weapon system. For those systems intended to withstand the electromagnetic effects of a nuclear blast, Electromagnetic Pulse (EMP) testing[7] should occur. Hardening of the system offers protection from this broadband, high power effect of short duration.

Vulnerability of the system to intentional jamming or destruction, and susceptibility to other battlefield environment electromagnetic energy should also be considered. The proper support of a system in the field can only take place if the system works under predicted field conditions. Electromagnetic Compatability (EMC) is achieved when EMI is eliminated and all components and systems are communicating and functioning effectively.

There are generally four methods of protecting a weapon system or component from harmful electromagnetic effects, all of which affect the maintenance concept.[8] The first method, hardening, is the technological approach to protecting systems and components from electromagnetic effects. The second method that can be used to eliminate problems caused by electromagnetism is called an Operational Fix. This method is basically operational avoidance of electromagnetic sources and elimination of reliance on susceptible items. Another basic method that can be used is called Proliferation, fielding the system in sufficient numbers to compensate for expected susceptibility. The remaining option is called Mobility and Dispersion, mobilizing and/or dispersing systems to increase survivability rates and compound targeting difficulties. This method is effective in preventing interference from

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7 *Testing facilities have the capability to simulate the electromagnetic after-effects of a nuclear blast, through use of powerful generators and conduction coils to generate a powerful uni-directional magnetic field within the structure*

8 *The Maintenance Concept plays a large role in determining appropriate support actions for a system*

systems designed for intentional jamming and degradation of systems. An ideal system protection strategy utilizes a combination of these methods.

In many cases, all component parts or subsystems cannot be adequately hardened against electromagnetic interference due to weight restrictions, space limitations, lack of funding, or other development limiting factors. A tradeoff of which parts need to be hardened, as well as a tradeoff on what level of hardening for the predicted environment, are analyses that need to be performed. Additional considerations are the method of hardening or protection[9] and design related factors that might affect maintenance or support. In simpler systems such analyses could rely on experience and judgement, in the more complicated systems Logistic Support Analysis (LSA) tasks might be used to gather data and conduct analyses. A combination of tasks in the 300 series[10], suitably tailored, would give the best results.

II. There are several actions within the framework of the program that an Integrated Logistic Support Manager (ILSM) should do, and schedule for, to provide maximum benefit to the weapon system. Effort should be made to advise the Electromagnetic Environmental Effects Requirements Board (E^3RB) from a supportability standpoint in its consideration of the weapon system. The members of the board change for each system. Voting members of the board are the Material Developer, Program Sponsor, user representative, and technical/engineering members. The E^3RBs are held as early as possible, preferrably before Milestone I, to develop criteria for the weapon system. The board will provide its suggestions to the Program Sponsor of the system, that is also the sole authority for reviewing the Boards findings.

The Board is technically supported by the Electromagnetic Environmental Effects Working Group (E^3WG), chaired by the AMCCOM E^3POC, and of which Integrated Logistic Support is a member. The Working Group provides recommendations. along with supporting rationale, to the Requirements Board. The ILSM should request to be furnished all of this information. The Board findings should be reviewed by the ILSM and Team members, when they are provided to the Program Sponsor, for potential impacts on the support of the weapon system. Testing may have been

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9 *Hardening and protection refer to the process of designing a system to withstand harmful electromagnetic effects*

10 *300 Series LSA tasks are concerned with the Preparation and Evaluation of Alternatives, in the design and support of a system*

called out that duplicates Logistic Support Analysis already performed or perhaps more testing is needed.

The Program Sponsor[11] is the main interface to the Requirements Board, the Integrated Logistic Support Manger acts in a largely advisory role for Electromagnetic Environmental Effects Program efforts. However, for supportability to be properly represented, the Integrated Logistic Support Manager should be in contact with the Project Manager, actively advising both Program Sponsor, Requirements Board, and providing input to the E^3 Working Group. Material changes, changes in mission, or changes in threat require a re-evaluation by the Board and the process begins again. The Program Sponsor may be able to provide information to the ILSM as well. The ILSM should keep current on any new data from testing so that Logistic Support Analysis Documentation (LSAD) and Record (LSAR) entries may be updated if necessary.

It may be necessary to contact the Program Manager office if major involvement in the Electromagnetic Environmental Effects Program by the Integrated Logistics Support Manager is forseen. All funding for this program will be obtained from the Program Manager for the weapon system. Manhours might be charged to the Program Manager, as well as travel, that is due to involvement in the Working Group and planning. E^3 related Logistic Support Analysis costs will probably not be funded outside of the monies for all other Logistic Support Analysis.

III. Electromagnetic Radiation may have harmful effects to both equipment and personnel. There may be a direct influence on personnel such as irradiation of the body, or an indirect influence such as a malfunction of the system due to Electromagnetic Interference that places the operator in danger. The environment must be considered for its influence on the operators. Also, guidance should be developed in the form of training and publications that informs the operators of what maintenance and operation procedures are acceptable and which are unsafe due to dangerous levels electromagnetic radiation. Obvious examples are: don't stand in front of an emitting radar, sit on radiating components, or grab bare (uninsulated) power cables.

There are Logistic Support Analysis and Integrated Logistic Support Programs in existence currently that account for safety of personnel. MANPRINT has personnel as its largest concern. Other analysis such as the Reliability Centered Maintenance Safety Analysis also help in protecting the soldier from danger. The E^3 Program is an extension of this concern and may illuminate problems unseen by the other efforts in the electromagnetic environment.

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11 *Effectively, whomever is the Program Manager, and in some cases the WSM (when there is no PM or PEO for a system), will have responsibility for ensuring that E^3 Program requirements have been met.*

Safety of personnel is just one consideration. There is also the safety factor in electromagnetic hazards affecting ordinance and fuel. Electrostatic discharge can ignite flammable fuels, while any number of electromagnetic effects may influence fuzes, timers, and electroexplosive devices on ordinance.

IV. Many problems that are solved by hardening of a weapon system will reoccur if the hardening degrades. Effectiveness of a hardened component is greatly affected by maintenance procedures, use, and wear. A system may become susceptible to electromagnetism through failure to reconnect a grounding cable or a gap left in a components housing after repair. It may be that personnel operating or repairing the system pick up a large amount of static electricity in the work area, inadvertantly damaging sensitive electrionic components. Natural wear might occur to external connections and bonds of systems, rust may disconnect a grounding wire or weld causing the system to become vulnerable to electromagnetic effects. Proper maintenance procedures need to be developed so that a previously hardened component does not become susceptible in the field. Logistic Support Analysis (LSA) Task 401 analyzes all operator and maintenance actions, and properly tailored, could be used to prevent electromagnetic support problems. These maintenance procedures need to be well specified in both training and publications.

To ensure continued hardening, surveillance procedures,[12] preferrably at field direct support level and part of a scheduled maintenance process, should be developed. If awareness is created that grounds should always be replaced after maintenance, corrosion of connectors should be watched, and shielding placement is important, then less systems should suffer degradation from electromagnetic disturbances. Also, Reliability Centered Maintenance (RCM) should be explored in relation to shielding, if any. The effect of storage, handling, and transportation methods should be explored. Replacement parts packaged by themselves may not have the shielding and hardening a whole system might afford. Special packaging may be required for sensitive replacement parts in order for them to pass through such things as metal detectors, magnetic bar code scanners, or electronic inventory control equipment.

The surveillance concept also relates to the procurement of new parts for the system. If the Government changes the manufacturer of a part that is specified in the design (and Technical Data Package drawings and specifications) to be hardened, then the component must continue to be produced with the appropriate shielding. It may be the case that the contractor with the lowest bid to produce a component may not maintain as high a level of hardening, if any, as the original manufacturer.

12 *Essentially a certification of continued hardening*

GLOSSARY OF TERMS:

ASA(RDA)- Assistant Secretary of the Army, Research, Development, and Acquisition.

Bonds- connections between metal parts to make low resistance electrical conductivity.

CONUS- Continental United States

Electromagnetic Compatability (EMC)- The condition which prevails when electronic communication equipment is collectively performing its individual designed functions without causing or suffering unacceptable degradation to or from other systems and equipment in the same environment.

Electromagnetic Environmental Effects (E^3) Program- The E^3 Program is an effort by the Army to properly consider the influence of all electromagnetic environments on the operation of its systems. Adverse effects of electromagnetic energy (radio, RADAR, lightning, etc.) on systems can range from misfunction to destruction of electrical components. The goal of the E^3 Program is to identify and quantify probable limitations of systems in their predicted electromagnetic environment. Informed tradeoffs of system design or modification decisions can be made using this information. The E^3 Policy applies to all systems, subsystems, component parts and support equipment from all mission areas acquired under any acquisition strategy.

E^3POC- Electromagnetic Environmental Effects Point of Contact, There are many Points of Contact for the E^3 Program. The Point of Contact for all AMCCOM systems is Norman Svendsen located at Picatinny Arsenal, see Available Resources.

Electromagnetic Environmental Effects Requirements Board (E^3RB)- A functional committee of the E^3 Program that makes decisions regarding compliance of weapon systems. Membership includes: Chairman (Associate Technical Director), Program Sponsor Representative, User Representative, E^3 Technical Representative, and other advisory members as appropriate.

Electromagnetic Environmental Effects Working Group (E^3WG)- The actual technical analysis supporting development of E^3 criteria, recommendations, and trade-off analyses will be performed by this group. As a minimum, membership consists of the AMCCOM E^3 POC or representative (chairperson), Program Sponsor, and a User Representative. Normally there shall be other advisory members such Product Assurance, Safety, Explosive Ordinance Disposal, Integrated Logistic Support, and/or any others deemed appropriate by the principal required members.

Electromagnetic Interference (EMI)- Any electromagnetic energy which interupts, obstructs, or otherwise degrades or limits the effective performance of electronic equipment.

Electromagnetic Pulse (EMP)- Broadband high power effect encompassing the totality of the system as an antenna, such as would occur from a nuclear blast.

Electromagnetic Radiation Hazards (EMRH)- The danger of electromagnetic radiation to ordnance.

Electromagnetic Radiation Operational (EMRO)- The effect of electromagnetic radiation on the operation of systems containing electronic components.

Electromagnetic Susceptibility (EMS)- The degree to which an equipment, system, or subsystem evidences undesired responses caused by electromagnetic radiation to which it is exposed.

Electromagnetic Vulnerability (EMV)- The characteristics of a system which cause it to suffer a finite level of degredation in performing its mission as a result of having been subjected to a certain level of threat mechanism in a man made hostile environment.

Electrostatic Discharge (ESD)- A transfer of electric charge between bodies of different electrostatic potential in proximity or through direct contact.

Filters- Devices that permit selectively the passage of only certain frequencies.

Grounds- (A) The bonding of an equipment case, frame or chassis, to an object or vehicle structure to ensure common potential. (B) The connecting of an electrical circuit or equipment to earth or some connecting body of a large extent.

Hardening- The method of protection of electical components/systems from electromagntic disturbances that might harm operation. In general, there are three methods; shielding, filtering, or protective circuitry.

High Power Microwaves- High intensity electromagnetic radition in the microwave frequency spectrum. Usually considered in relation to a radio frequency weapon fielded for the sole purpose of upsetting or damaging electronic systems.

ILSMT- Integrated Logistic Support Manager's Team.

ILSP- Integrated Logistic Support Plan, for additional guidance see DA Pam 700-55

Lightning Effects (LE)- Damage or degredation of systems or subsystems due to a sudden discharge of static electric potential that occurs naturally.

Radio Frequency (RF)- Electromagnetic radiation occuring in the spectrum commonly used for telecommunications.

Shields- Barriers that enclose or shadow a device for the purpose of preventing or reducing the transmission of electrical energy. The barrier can be conductive, dielectric, or have a nonmetallic absorptive core.

AVAILABLE RESOURCES

E^3 Electromagnetic Compatability Design Guide-
For further information contact: SARD-IPV (AV 225-3718) or AMSLC-VL (AV 298-6828), or one of the persons below

Points of Contact for the Electromagnetic Environmental Effects Program		
Department of the Army	Major Roddy Department of the Army Office of the Assistant Secretary, ATTN: SARD-DOV Washington, DC 20310-0103	DSN 227-5584 COM (703) 697-5584
HQ, AMC	Mr. Joe Kreck Department of the Army HQ, U.S. AMC 5001 Eisenhower Avenue ATTN: AMCDE-PQI Alexandria, VA 22333-0001	DSN 284-9546 COM (703) 274-9546 FAX (703) 274-5417
AMCCOM and Picatinny Arsenal Installation	Mr. Norm Svendsen ARDEC ATTN: SMCAR-AEC-IE Picatinny Arsenal, NJ 07806-5000	DSN 880-3025 COM (201) 724-3025 FAX (201) 724-5861
CRDEC	Mr. Tony Saponaro CRDEC ATTN: SMCCR-SPO Aberdeen Proving Ground, MD 21010-5423	DSN 584-2865 COM (301) 671-2865 FAX DSN 584-3143
AMCCOM(R)	Mr. Jim Meehan HQ, AMCCOM ATTN: AMSMC-ASR-A Rock Island, IL 61299-6000	DSN 793-6325 COM (309) 782-6325 FAX DSN 793-3296
ILSM Resource	HQ, AMCCOM ATTN: AMSMC-MAE WL Rock Island, IL 61299-6000	DSN 793-2673 COM (309) 782-2673

AVSCOM E^3 Lessons Learned Database
Point of Contact is the AVSCOM Directorate for Engineering,
AVSCOM
ATTN: AMSAV-ES
4300 Goodfellow Blvd
St. Louis, MO 63120-1798

OGDEN/ERC Government Systems, Applied Engineering Group, analysis tools for the PM

E^3 Test Facilities:
Picatinny Arsenal
Aberdeen Proving Ground
White Sands Missile Range

TRADOC E^3 Awareness Video- PIN#708504DA, or TVT9-200
(Must order from Tobyhanna Army Depot through local Audio-Visual office) or contact:
Mr.William Napier AV 746-1837 or COM (205) 876-1837
USAOMMCS
ATTN: ATSK-WE
Redstone Arsenal, AL 35897-6740

TRADOC E^3 Awareness Training Package (Lesson Plans and Briefing Charts)
Point of Contact: Mr. William Napier or Mr. Ken Meacham, AV 746-3094, address same as above

BIBLIOGRAPHY

AAE 91-3 Policy Memorandum, to be replaced by the future revision to the AR 70-1

ADS-37 AVSCOM Aeronautical Design Standard, Electromagnetic Environmental Effects Management, Design, and Test Requirements,16 APR 1990
Proponent: U.S. Army Aviation Systems Command (AVSCOM)
AMSAV-ES
4300 Goodfellow Blvd.
St. Louis, MO 63120-1798

Air Force Automated Lessons Learned Capture and Retrieval System (ALLCARS) Database

VENUS Briefing Charts and Videos:
25 MAR 91, HQDA E^3 Overview Briefing
30 MAY 91, PEO Progress Briefing to DA (Video available from Mr. Jim Meehan)
29 AUG 91, E^3 Progress and Activities at AMCCOM Briefing to AMC

DA Pam 700-55, Instructions for Preparing the Intengrated Logistic Support Plan

Electromagnetic Environmental Effects Requirements Board **(E^3RB) Charter**, SMCAR-AEC-IE

Engineering Design Handbooks:
AMCP 706-235,"Hardening Weapon Systems Against RF Energy," 16 FEB 1972
DARCOM-P 706-410,"Electromagnetic Compatability," 1 MAR 1977

AMCCOM Implementing Procedures Memorandum, SMCAR-AEC-IE

AMCCOM Electromagnetic Environmental Effects (E^3) POC Charter, SMCAR-AEC-IE