VEHICLE ELECTRONIC DISRUPTION SYSTEM

INTRODUCTION AND DESCRIPTION OF PROPOSED RESEARCH AND DEVELOPMENT PROGRAM

I. Introduction

Science Applications International Corporation ("SAIC" or "Applicant") was founded in 1969, and has grown to become the largest employee-owned research, development and engineering company in the United States. SAIC has almost 25,000 employees and over 350 locations worldwide. SAIC's scientists and engineers solve complex technical problems for governmental, commercial and international customers in a variety of market areas, including telecommunications, transportation, information technology, national security, energy, environment and health care technology. SAIC's scientists and engineers have received numerous awards for their scientific achievements. Approximately 79 percent of SAIC's business is generated through federal government contracts.

By this application, SAIC is seeking an experimental radio service authorization that will enable the Applicant to conduct testing and continue the development of a vehicle-mounted electronic device to be used by federal, state and local law enforcement personnel to end high-speed automobile chases by electronically disabling the fleeing vehicles. The system under development is called VEDS (the Vehicle Electronic Disruption System). The purpose of the proposed three phase program of research and development is to confirm and refine the operating parameters of VEDS, to develop and establish deployment standards that will effectively control interference or collateral damage and, finally, to test VEDS in trial uses by law enforcement personnel in actual high speed chase situations. As is set forth in greater detail below, the Applicant is seeking an experimental license to cover the first two phases of a three phase program of proposed research and development, subject to the satisfaction of certain requirements with respect to each phase as a condition to proceeding to the next phase. SAIC will file in due course a separate application seeking authorization for the testing proposed in the third phase of the development.

II. Background

Before describing VEDS in detail and outlining the comprehensive experimental program for which authority is being sought, it is useful to describe the severity of the law enforcement problem being addressed, to explain the VEDS solution in conceptual terms, to set forth the manner in which SAIC is approaching the task and to outline the scope of the experimental license authority the Applicant is seeking.

A. The Problem: High Speed Car Chases Impose Extremely High Societal Costs

Law enforcement officers repeatedly are faced with the need to stop or intercept vehicles involved in suspected criminal activities. Frequently, the only means of accomplishing this task is through a high-speed chase. These chases occur many times each day throughout the nation. Unless a pursued driver voluntarily stops the fleeing vehicle, law enforcement officials may be forced to use physical means to end a high-speed chase, such as road blocks, high speed interceptions, or the use of deadly force. As shown in Attachment 1, these measures often end in tragedy, with either the officers, the suspects, or innocent bystanders being seriously injured or killed. For example, the state of California alone had over 7200 reports of high speed chases, 1200 involving injury, in one recent reporting year. Nationally, 1% of all high-speed chases result in fatality. In addition to the incalculable cost in human terms, liability costs can be staggering. New York City alone paid out over $100,000,000 in one year to settle liability claims resulting from high-speed chases. These liabilities have forced some jurisdictions to prohibit high-speed chases, with the unfortunate result that suspects can flee with impunity.

B. The VEDS Solution: Using Advanced Electronics to Terminate High Speed Car Chases and Reduce Collateral Damage

Recent advances in directed energy source technology offer a potential technological solution to the high speed chase problem. SAIC has determined that it is possible to construct a relatively lightweight transportable electromagnetic pulse ("EMP") source that will enable authorized law enforcement users to electronically disable a fleeing vehicle by disrupting its electronic systems.

SAIC has drawn upon these advances in developing its patented Vehicle Electronic Disruption System.[1/] VEDS is not a communications device. It is a non-lethal radiating device designed to be mounted on specially-configured law enforcement vehicles. VEDS employs electromagnetic pulses to disrupt or destroy electronic circuits within fleeing vehicles which are specifically isolated and targeted by the authorized law enforcement VEDS user. If the fleeing vehicle has computer-controlled systems or other electronics, it is vulnerable to VEDS. A successful VEDS discharge will result in the fleeing vehicle stalling and coasting to a stop.

C. The Scope of the Authority Sought by SAIC

SAIC has approached the development of VEDS by assembling a team of technology experts, engineering professionals, legal and regulatory consultants, federal, state, and local law enforcement representatives and others to address the series of interrelated issues presented by VEDS development. Recognizing that VEDS

1/ SAIC was awarded US patent 5,293,527 on March 8, 1994 and, to date, remains the sole patent holder employing miniaturized EMP technology. Allowed claims include both VEDS hardware and the VEDS engagement process.

utilizes a broad band of radio frequencies in an unconventional short-burst emission, the Applicant has devoted considerable time and attention to developing a progressive research and development program to allow the technical parameters of VEDS to be confirmed and refined concurrently with the establishment of operational constraints to manage potentially adverse collateral effects.

The research and development progresses in three stages from a completely controlled to a real-world environment. While the authority to move to the second phase of the program will be subject to the submission of program report sufficient to satisfy the Commission that certain design criteria and program objectives have been met, and commencement of the third phase will be subject to the FCC's grant of a further experimental license application to be filed by SAIC, it is important to the Applicant for the Commission to consider the entire scope of the three-phase experimental license program in evaluating the instant application. Substantial financial and other resource commitments will be made to complete Phase I of the program, and the Applicant wants to undertake this expenditure with a reasonable expectation that Phases II and III will be allowed to proceed. SAIC understands, however, that authority for Phase III of the program will be based upon the Commission's action on SAIC's separate application with respect to that phase of the project.

III. Vehicle Electronic Disruption System

A. Technical Background

VEDS employs an electromagnetic pulse of sufficient strength, pulse width and rise-time to disrupt or disable targeted electronic circuits. In effect, VEDS electronically "reaches in" and disables critical circuitry in a designated vehicle. This sub-section outlines the technical background leading to the development of such a system, and describes the biological effects, other potential associated effects, and operating characteristics of VEDS.

EMP Phenomenology Electromagnetic ("EM") pulses are waves of very high intensity electric and magnetic fields which, if large enough and at the correct pulse modulation, can induce voltages and currents within the components and wiring of an electronic system, as depicted in Attachment 2. This current can disrupt the operation of an electronic system without having an adverse effect upon human health.

Source Technology Recent advances in EM source technology have resulted in the development of relatively inexpensive, compact, and rugged EM sources. VEDS employs an ultra-wideband pulser based upon those developed by the National and Service Laboratories for testing of EMP vulnerabilities. SAIC has been involved in the design of these pulsers for over ten years. The patented VEDS technology is depicted in Attachment 3.

Automotive Susceptibility Many tests have been conducted by private industry and the government which document the susceptibility of automobiles to EMP. Automobiles are vulnerable due to the extensive use of electronic circuitry to control engine functions. These systems include the main microprocessor control unit,

electronic fuel injection, and electronic ignition modules, to name just a few. If the EM energy is sufficient, these systems can be disrupted, leading to false timing and out of sequence ignition events ("upset"), system component failure until power is recycled ("lockup"), or the disabling of components ("burnout"). Preliminary testing has indicated that these events can occur, depending upon the pulse waveform, at field strengths beginning at about 15 to 35 kV/m, see Attachment 4. In Phase I VEDS will project an EM field which is designed to be 50 kV/m at approximately 50 meters (other field strengths and ranges are possible). In Phase II the field strength will be decreased to establish the minimum level consistent with operational effectiveness.

Biological Effects There is considerable data to back the conclusion that EMP is safe to humans. For US Government testing, and in ANSI/IEEE C95.1-1992, a pulsed wave exposure standard of 100kV/m has been adopted. Although on the boresight of the VEDS pulse, that standard can be exceeded within a distance of approximately 25 meters, the field strength drops off rapidly with angular departure from the boresight. At a right angle to the targeted direction, a field strength of 100 kV/m is reached only within one meter of the antenna. For both the experimental and operational phases of the use of VEDS, triggering of the pulse will not be initiated if the probability exists that human exposure would exceed 100 kV/m.

Mitigation of Collateral Effects The design characteristics of VEDS limit the potential for adverse collateral effects. The VEDS unit will employ a directional antenna so that vehicles targeted in high-speed chases are effectively isolated. Furthermore, the EMP employed by VEDS consists of a few extremely short pulses (2 nanoseconds). This reduces the prospects for electromagnetic interference because the radiated energy within the bandwidth of an electronic device is extremely small. Also, VEDS will be employed only by law enforcement personnel who have completed an extensive training program and who will be certified in the use of VEDS. These authorized users will be directed to use VEDS only in limited circumstances where the potential for collateral damage can be reduced.

Due to the early phase of development of the VEDS device, it has not been FCC type accepted. The Applicant seeks a waiver of any type acceptance requirement in Phases I and II of the experimental program based upon the highly controlled nature of the test conditions in these phases. Type acceptance will be revisited in advance of commencing Phase III tests.

B. VEDS Operation

Attachment 5 describes the VEDS operation. Operation can be divided into three sequences: Initiation and Security Interlocks, Pulse Generation, and Deployment Control.

1. Initiation and Security Interlocks To preclude unauthorized use, VEDS employs a series of security interlocks which prevent VEDS initiation unless a set of verifying conditions are met. These interlocks include both hardware and software security keys. For example, the system will check for the presence of the vehicle's ignition key, employing the same

approach as the security microchip embedded into late-model luxury car ignition keys. In addition, a cypher key must be inserted into the VEDS control panel, similar to the method in which a secure telephone (e.g., STU-3) is operated. Finally, the operator must manually enter an authorized user's password. VEDS will not operate unless all of these interlocks are removed.

2. Pulse Generation After the security interlocks have been satisfied, the VEDS will be energized through its power conditioning component, and it will automatically enter a standby mode.

   When the user decides to disable a target vehicle, the operator arms the device and initiates the triggering sequence. This sequence is designed to prevent inadvertent deployment by requiring the operator to depress a Safety and a Firing Switch simultaneously. This initiates a triggering pulse to the pulse generator and oscillator, which produces a series of EM pulses that are radiated through the antenna, disabling the target vehicle. Each discharge sequence normally lasts about 20 microseconds, during which time ten EM pulses are radiated. The system remains ready for further discharges until the chase engagement is completed and the user returns the system to the "safe" mode. VEDS will automatically "drain" its capacitors during the shutdown sequence.

3. Deployment Control During a VEDS engagement, the pursuing officer will close-in behind the target vehicle to a distance of 150 feet or less. The VEDS antenna will be affixed to the roof of the pursuing vehicle and is "aimed" by virtue of the pursuer and pursued being in line. Upon initiation of the VEDS engagement, the EMP field is generated, enveloping the target vehicle. The vertically polarized EM pulse couples to the targeted vehicle's electronics, disabling the vehicle through upset, lockout, or burnout.

In addition to the foregoing, several measures will be taken to promote responsible, effective use of VEDS. SAIC contemplates that use of VEDS will be limited to users currently eligible for service under the Commission's Rules relating to the Police Radio Service, and SAIC will accept a grant of experimental authority subject to a condition imposing such a limitation on the class of eligible users in actual field trials during Phase III. Further, SAIC will require users of VEDS to complete a thorough training and certification program which will explain the operation of VEDS and instruct law enforcement personnel regarding the appropriate use of VEDS in limited situations. Also, each VEDS deployment will be "date-and-time-stamped," meaning that the date, time and location of each VEDS deployment will be recorded so that proper use of the system may be monitored and verified.

IV. Proposed Program of Research and Experimentation

SAIC has made substantial progress in the development of VEDS. A preliminary system design has been completed based upon substantial input from the

law enforcement community regarding performance objectives and engineering experts regarding technical feasibility. By this application, SAIC seeks Commission consent to commencement of the next critical stage of the developmental process: demonstration and field testing, which SAIC proposes to accomplish in three phases, each of which will be described below. SAIC requests authority to commence the testing proposed in Phases I and II. A separate application will be filed seeking authority to conduct the real-world testing proposed in Phase III.

Attachment 6 provides an overview of the methodology employed to design the VEDS system. SAIC first surveyed representatives of the law enforcement community to determine how they envisioned integrating the VEDS technology into their law enforcement activities, how VEDS should be packaged, which vehicles or installations are the most likely to serve as its host, how VEDS will be employed, which targets are most likely to be encountered, and what operational features VEDS must have to ensure its safe and effective deployment. Based upon those surveys, SAIC developed preliminary performance, packaging, platform integration, and operating parameters. SAIC then modified its initial proposed system design based upon the reactions of law enforcement personnel to the initial design specifications. After consideration of survey results and the costs involved in developing VEDS and integrating it into law enforcement systems, SAIC established the final system design.

Using its system design, and based upon the data gathered during development testing, SAIC will develop a demonstration prototype in its laboratories. VEDS is composed of three sub-parts: the pulser, antenna, and control. SAIC will utilize some commercially-available components, and will fabricate others in its laboratories. After the prototype is developed, SAIC will conduct extensive laboratory testing to ensure that circuit continuity and design specifications have been met. The testing will include performance modeling and analysis using standard EMP effects models to predict how the pulser will perform.

The next stage of the VEDS development process is field testing. SAIC has developed a three-phased demonstration and testing plan, which will ensure that the VEDS prototype is fully and appropriately tested. Progress to Phase II will be dependent upon the receipt of acceptable results from the previous phase. Progress to Phase III will be subject to the FCC's grant the application which SAIC will be filing with respect thereto. At the end of each phase, a written report will be submitted to the FCC providing data and analysis from that phase and outlining in further detail the plans and objectives for the next phase. The testing plan is described below:

A. Phase I: Development Testing at Los Alamos

SAIC plans to conduct Phase I testing of VEDS upon the FCC's grant of the instant application at the U.S. Government's Los Alamos National Laboratory ("LANL") in New Mexico. One test unit will be used during a single period in the testing process. The tests will be conducted between the hours of 8:00 AM and 5:00 PM. SAIC and LANL personnel experienced in EMP technology and testing will be present at all tests. SAIC has been authorized by the Department of Energy,

Albuquerque Operations Office, to conduct radio frequency experiments in Technical Area 49 of the LANL testing grounds. See Attachment 7.

Multiple considerations support the conclusion that the Phase I test will not result in interference to others, including the remoteness of the LANL site, the lack of integrated electronics devices within the controlled zone, the previous use of this site for EM testing, the extent to which SAIC will exert control over the location of testing and test personnel, and the available information of expected signal levels. The attached Engineering Statement prepared by Jules Cohen, P.E. confirms this conclusion. See Attachment 8. Also attached are copies of the site map reflecting the location of testing, contours of the expected VEDS signal levels, and the User Facility Agreement ("UFA") between SAIC and LANL pertaining to the joint testing of VEDS. (See Attachments 7 and 8).

The purpose of Phase I development testing is to demonstrate that VEDS can operate within the design parameters established by SAIC. SAIC will measure the pulse rise time and beam patterns of the VEDS device during testing, and establish power output across the frequency spectrum.

Using the information gathered during Phase I, SAIC will submit a report to the FCC that will include:

1. Measured contours of the VEDS signal *as verified* during the Phase I test using the configuration of the pulser and radiating antenna proposed for use in Phase II;

2. RF data for the radiating antenna mounted on a simulated vehicle roof to establish the levels to which police officers inside their vehicle would be exposed. (If needed, sputtered metallic vehicle windshield film, or other protective measures, will be employed to reduce RF levels to an acceptable range.);

3. Calculations of signal strength as a function of frequency to relate the VEDS signal to various spectrum uses; and

4. Estimates of shielding that can be provided by building walls and by underground and above ground utility structures.

The Applicant proposes to proceed with Phase II of the VEDS experimental program subject to the satisfaction of the following conditions:

1. The submission to the FCC of the above-referenced Phase I report;

2. The filing of topographic maps detailing the proposed Phase II test area at the FBI facility at Quantico, Virginia, in relation to on-site and off-site facilities and users;

see amdmt 4.

3. The establishment of a detailed Phase II test plan outlining the program objectives and deliverables and the information to be included in the Phase II report;

4. The demonstration that there is an executed CRADA between SAIC and the FBI governing the Phase II test; and

5. The submission of an engineering statement demonstrating, based upon the Phase I results and the Phase II test plan, that interference to non-targeted devices is not predicted to occur.

B. Phase II: Effectiveness Testing at ~~FBI Facility~~ amended 3-12-98 to Los Alamos

SAIC intends to conduct Phase II testing for a period of four to six months, commencing approximately three months after Phase I, at the FBI facility in Quantico, Virginia. In Phase II, SAIC will optimize the parameters of VEDS to establish effective success rates in disabling targeted vehicles while minimizing collateral effects. SAIC also will measure the susceptibility of certain types of consumer electronics equipment (e.g., vehicular AM/FM radios, television receivers, or pre-mounted cable television amplifiers and power supplies) to harmful interference with their functioning in the vicinity of a VEDS discharge. Equipment susceptibility testing will be conducted in accordance with the Phase II test plan.

Phase II testing will not cause any interference or collateral damage because the locations of uncontrolled communications users and electronic devices will be sufficiently far removed from the testing site.

SAIC intends to invite interested parties, (e.g., representatives of the FCC, National Broadcasters Association, cable industry, common carriers, cellular providers, equipment manufacturers, Congress, etc.) to witness the Phase II testing.

Based upon Phase II testing, SAIC will submit a comprehensive report to the FCC that will refine and update the information supplied in the Phase I report. The Phase II report also will contain data on the effectiveness of VEDS, radiation parameters to be used in Phase III testing and the results of equipment susceptibility testing. The Phase II report will define the area surrounding a VEDS discharge in which the potential exists for collateral effects to various electronic devices.

The Applicant proposes to proceed with Phase III of the VEDS experimental service program subject to the satisfaction of the following conditions:

1. The FCC's grant of the application to be filed by SAIC requesting authority to conduct Phase III testing;

2. The submission to the FCC of the above-referenced Phase II report;

3. The establishment of VEDS deployment criteria designed to place operational constraints on the user of the device to prevent utilization in circumstances where collateral damage to non-targeted electronic devices is predicted. These criteria shall be developed in conjunction with the National League of Cities which now acts as an underwriter of insurance policies which cover liabilities of governmental entities arising out of high speed chases;

4. The identification of one (or more) local communities in which the VEDS trial shall be conducted, along with evidence that the test has been endorsed by the participating local law enforcement agency and governmental officials;

5. The submission of a detailed Phase III test plan outlining the technical and operational constraints that shall be in place to avoid interference and/or collateral damage to untargeted communications devices;

6. The establishment of a detailed Phase III test plan outlining the program objectives and the information to be included in the Phase III report. One element of the Phase III program shall be analysis after each and every time-and-date stamped deployment of the effectiveness of the technical and operational constraints in preventing interference and/or collateral damage;

7. The submission of an engineering statement demonstrating, based upon the Phase II results and Phase III test plan, that interference to non-targeted devices is not predicted to occur; and

8. SAIC will have analyzed all categories of spectrum users in the 100 MHz through 2 GHz bands, and all electronic equipment upon which VEDS could have an impact, in the cities where VEDS testing will be undertaken.

C. Phase III: Operational Testing in a City

SAIC intends to conduct Phase III operational testing for a period of approximately six months, subject to FCC approval, commencing around January 1999, in one or more cities. After completion of an extensive training program, selected law enforcement personnel will utilize VEDS in actual high-speed chase situations. Precise records of the details of every time-and-date stamped discharge will be generated for subsequent analysis.

In addition to the inherent design characteristics of the system which will reduce potential interference and damage, SAIC or its agent will limit distribution of VEDS to law enforcement officers, and will develop training and certification programs to teach officers the appropriate use of the system. If collateral damage occurs

unexpectedly, the liability of municipal authorities to compensate owners for that damage, as they do presently for damage resulting from a high-speed chase, remains.

A detailed Phase III report will be filed with the Commission containing the results of the trial. The report will evaluate the operational utility of VEDS to law enforcement personnel and provide real-world data regarding the success of the program in avoiding collateral damage to non-targeted devices.

V. Conclusion

VEDS has been conceived and launched to mitigate the substantial peril to life and property which results from high-speed automobile chases. The powerful VEDS technology is being developed in a responsible manner, with pertinent input from potential law enforcement users, in order to create a mechanism by which the damage caused by high speed chases may be reduced in an environmentally safe and socially acceptable way.

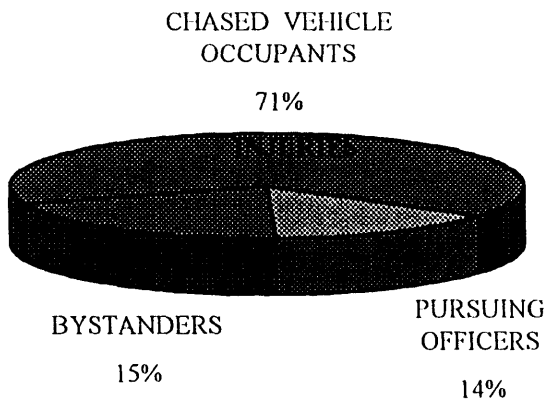
SAIC has undertaken an extensive program in designing VEDS. SAIC now seeks to embark upon its three phase demonstration and testing process. SAIC seeks Commission consent to the first two phases of testing at this time. SAIC understands that authority to proceed with Phase II will be contingent upon its satisfaction of the conditions set forth in the experimental license as described herein.

SAIC respectfully submits that grant of the requested approval will serve the public interest. The demonstration and testing functions that SAIC seeks to perform will enable SAIC to monitor the performance of the VEDS unit, make any necessary modifications, and then offer to law enforcement a viable means by which to reduce the damage caused by high-speed chases.

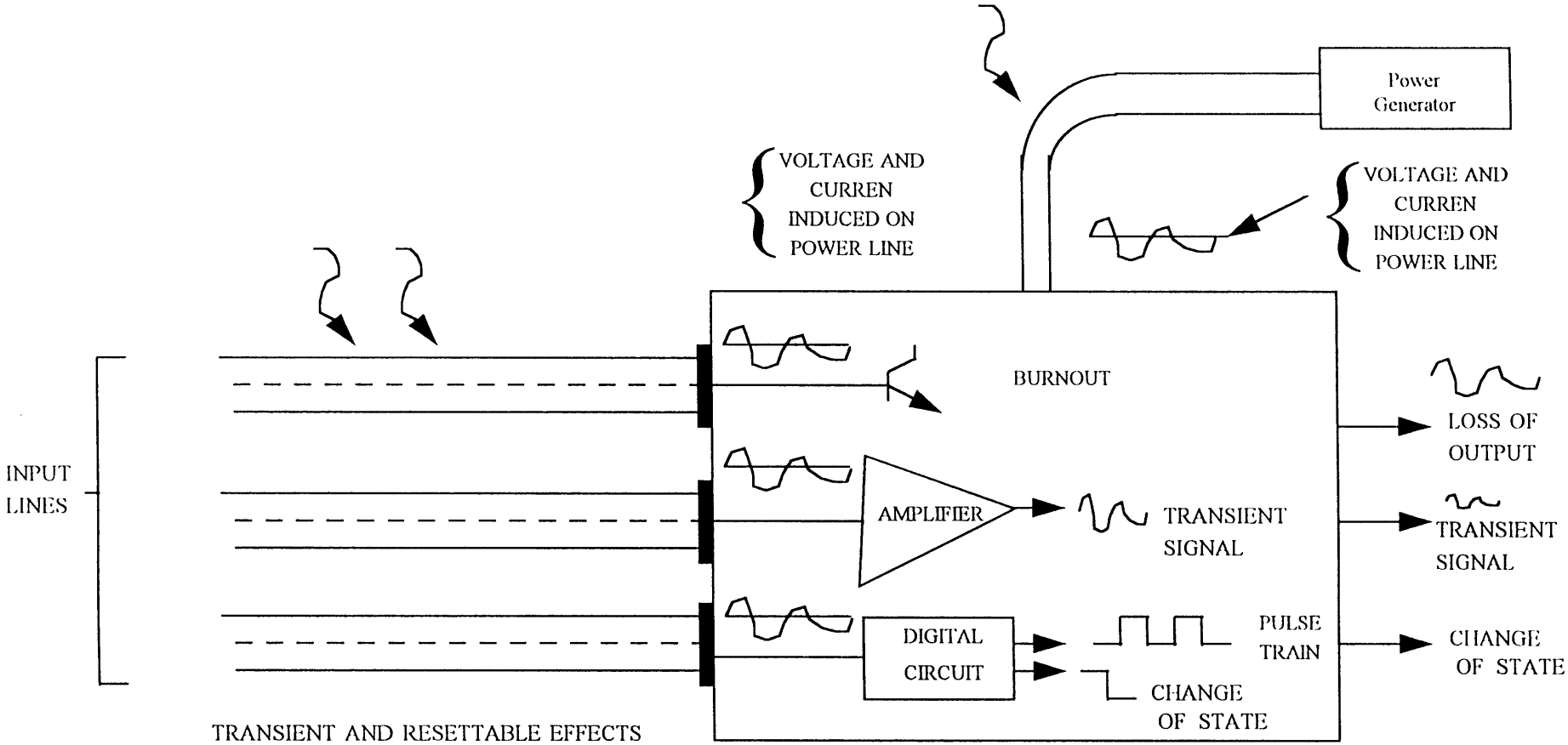
In light of the foregoing, SAIC respectfully submits that a grant of the instant request would serve the public interest, and requests that the Commission grant this application.

- CALIFORNIA - 1992
  - 7200 REPORTED HIGH SPEED CHASES
  - 1200 RESULTED IN INJURIES
  - 1% RESULTED IN DEATH

- NEW YORK CITY - 1992
  - HIGH SPEED CHASE LIABILITY SETTLEMENTS EXCEED $100,000,000



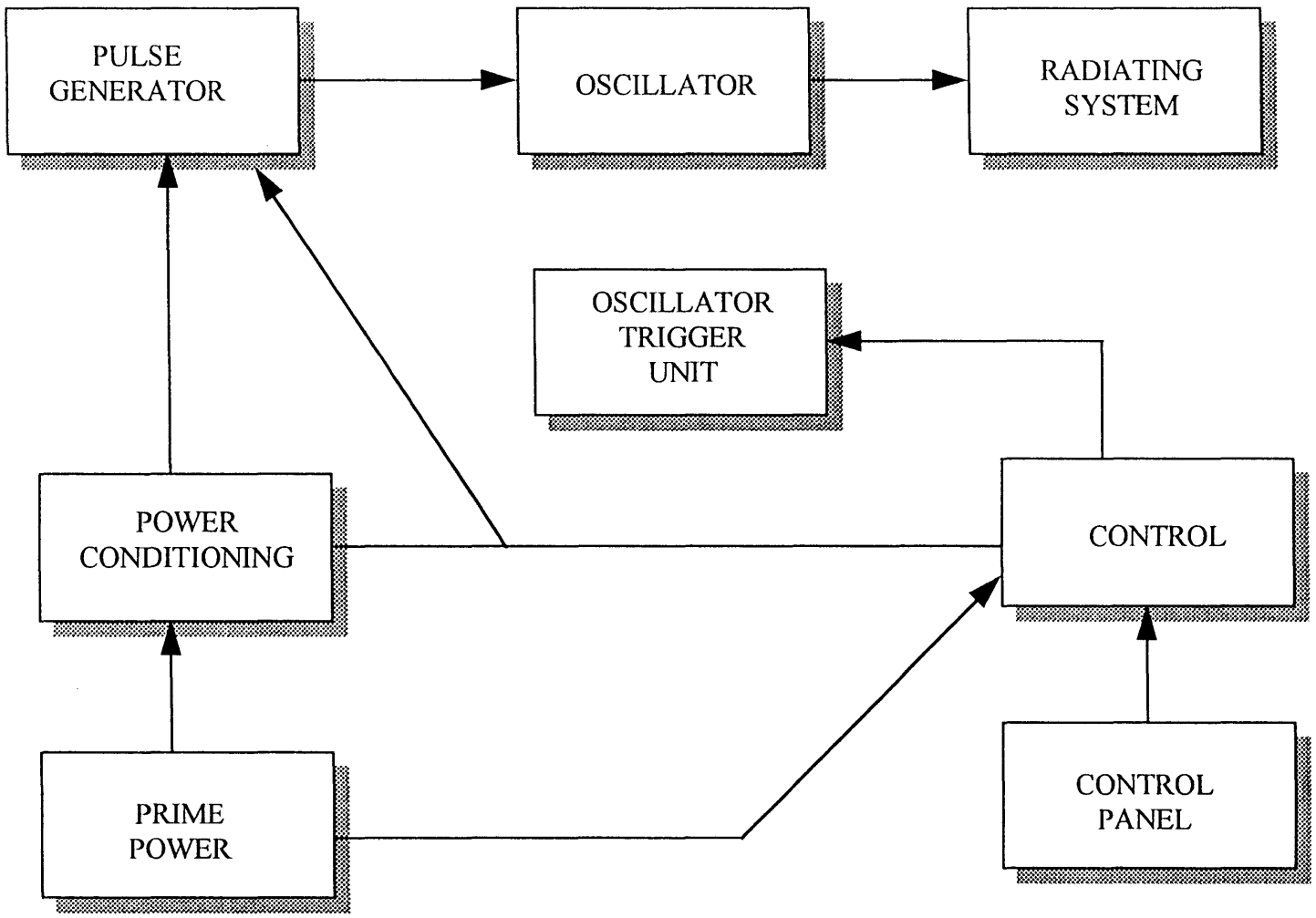
Attachment 1. The cost of high speed chases



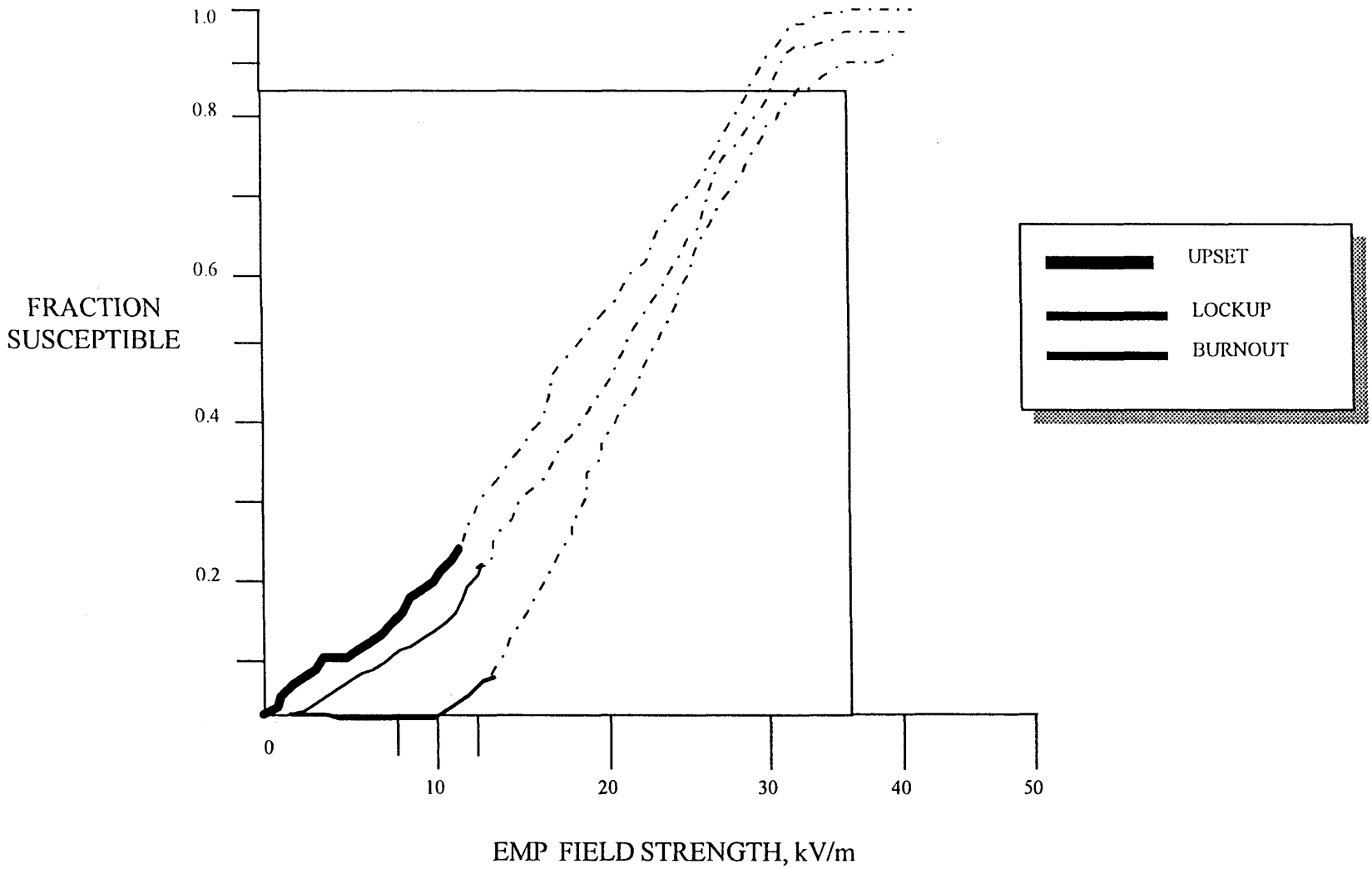
EMP INTERACITON WITH

VEHICLE ELECRTONICS

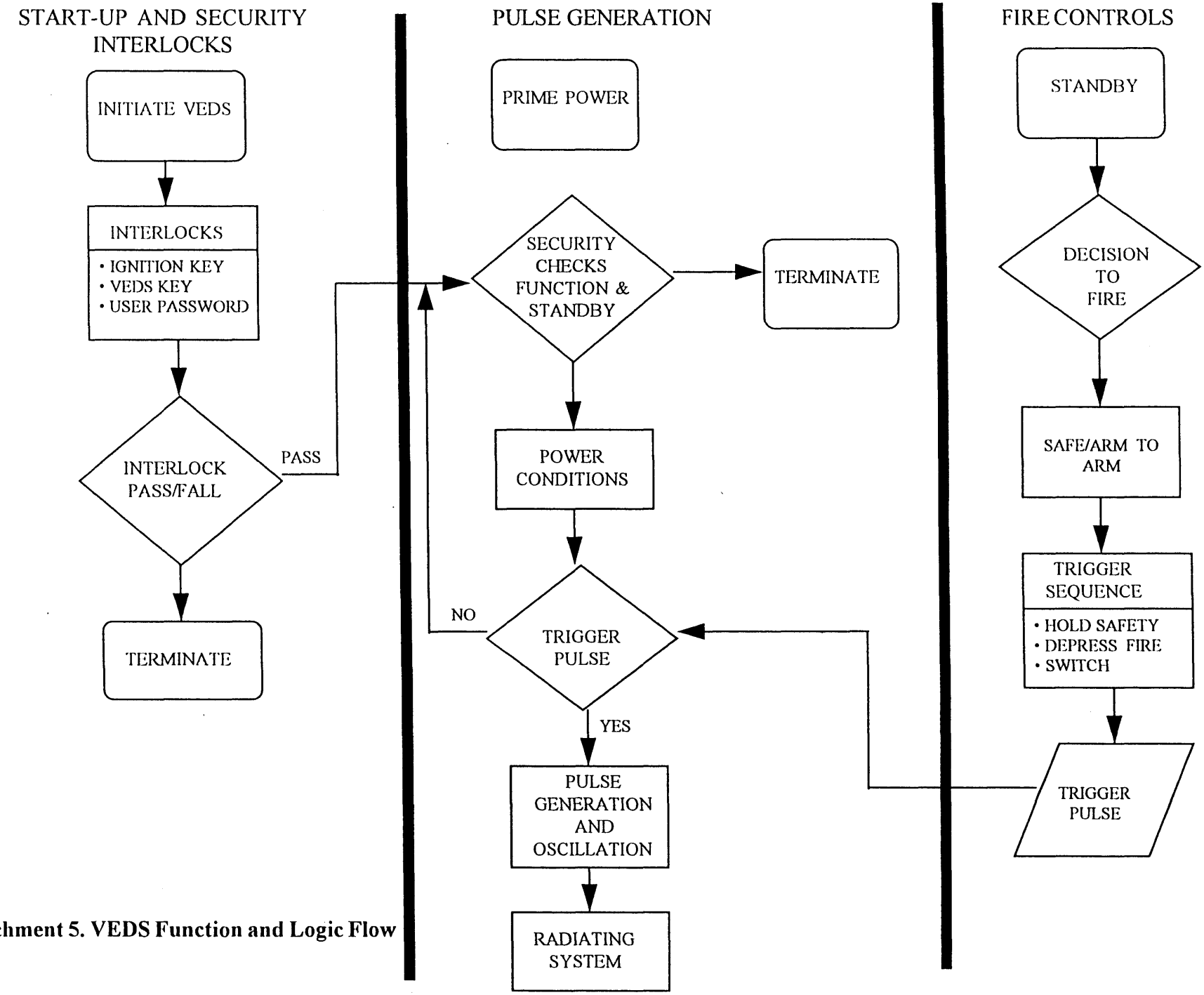
Attachment 2. EMP-Electronics Interactions



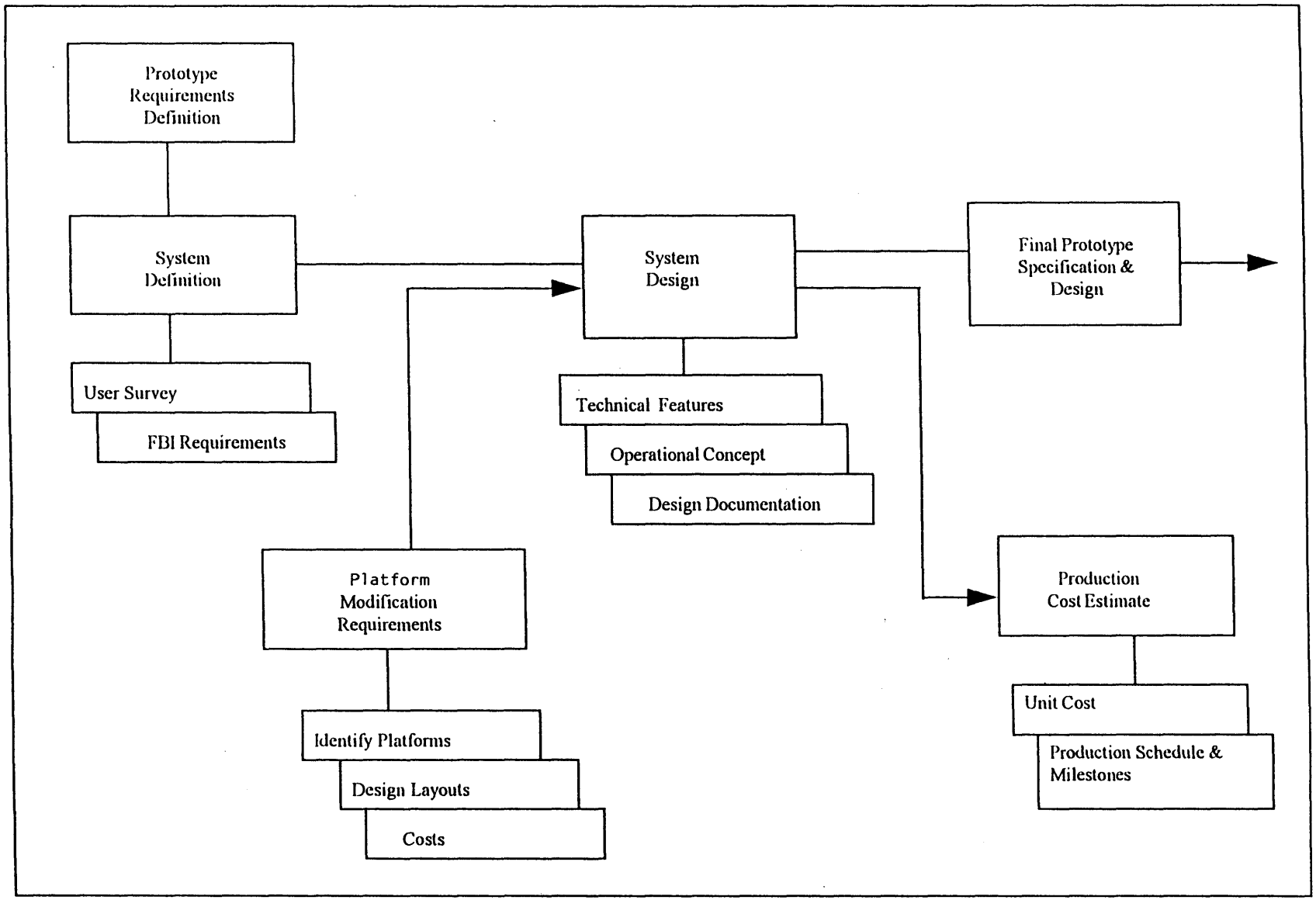
Attachment 3. VEDS Block Diagram



Attachment 4. Consumer Electronics Susceptibility



Attachment 5. VEDS Function and Logic Flow



Attachment 6. System Design

DOE F 1325.8

File TA-49

United States Government | Department of Energy

Albuquerque Operations Office

memorandum

DATE: May 20, 1997

REPLY TO: SSB:IRMD:C. Baca (505) 845-5300

SUBJECT: Experimental Use of the Radio Frequency Spectrum

TO: Robert F. Hoeberling, AT-9, Los Alamos National Laboratory

In accordance with the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management, 7.11, you are authorized to continue radio frequency experiments in Technical Area 49, until December 31, 1999. Only short duration, intermittent transmissions are authorized under this authority. All operations must be confined to the immediate vicinity of the station and every reasonable measure must be taken to ensure that harmful interference will not be caused to authorized services.

This authorization will be terminated immediately upon notification that harmful interference is being caused to an authorized service.

If you have any questions contact the DOE/AL Contract Spectrum Manager, Randy Minyard, (702) 295-4766.

Michael D. Gomez, Chief
Systems and Services Branch
Information Resources Management
Division

cc:
R. Minyard, BN, Las Vegas, NV
E. Powers, C-4, LANL

Attachment 7

ATTACHMENT 8

Jules Cohen, P.E.
Consulting Engineer

ORIGINAL

**ENGINEERING STATEMENT ON BEHALF OF
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
IN SUPPORT OF APPLICATION FOR EXPERIMENTAL LICENSE**

This engineering statement, prepared on behalf of Science Applications International Corporation ("SAIC"), is in support of an application for experimental license. The license is requested to permit the collection of empirical data necessary to establish the feasibility of implementing a system believed to have the potential of being an important weapon for federal, state and local police forces in the apprehension of persons engaged in criminal activities.

The system to be tested under the authority of the experimental license is designed to stop a fleeing vehicle being used by a fugitive, without resort to the physical forces that are now used to end high speed chases and often result in loss of life and extensive property damage. The Vehicle and Electronics Disruption System ("VEDS") is targeted at the fleeing vehicle and emits a burst of pulses of electromagnetic energy of sufficient magnitude to cause the vehicle's electronic systems to fail.

SAIC proposes to conduct testing of the system in three phases. Phase I is to be conducted in Test Area 49 at the Los Alamos National Laboratory, Los Alamos, New Mexico. Phase II is to be conducted also at ↗ at the ~~Engineering Research~~ Facility of the ~~Federal~~ Bureau of ~~Investigation~~ at ~~Quantico~~, Virginia. Phase III is to be conducted at a community to be later specified. In Phase I, empirical data are to be collected to confirm and adjust,

where necessary, predicted conclusions relative to system performance. Some limited testing is to be done also on electronic devices other than the targeted vehicle to determine their sensitivity to electromagnetic pulses used by VEDS.

At the conclusion of Phase I, a report of the results will be submitted to the Commission. Those results will be used to (i) establish the pulse magnitude necessary to accomplish the desired vehicle electronics disruption, (ii) identify and measure the extent of the areas in which the VEDS signal strength may exceed the standards for personal exposure to electromagnetic pulses, and (iii) calculate the size of the area likely to offer some threat of disruption or failure of non-targeted electronic equipment in general use by the public. Phase II testing will then further refine and confirm system parameters to be used in the construction of the prototype unit(s) required by the Phase III field testing to be performed under real world conditions.

amended

At Los Alamos (and in Phase II testing ~~at Quantico~~) the VEDS system will be mounted on a fixed platform, with the operator located at a distance that will assure his/her not being exposed to pulse levels in excess of 100 kV/m, the standard found in Sections 4.1.1(f) and 4.1.2(f) of ANSI/IEEE C95.1-1992, a standard that has been adopted also by the Department of Defense. A pulse generator will provide a burst of pulses, each approximately two nanoseconds wide, with 0.5 nanosecond rise time. Spacing between pulses will be approximately two microseconds, and the entire burst period will be approximately twenty microseconds. The pulses will be projected via a transverse electromagnetic (TEM) horn of

a conic section antenna. Pulse magnitude is designed to provide a field of 50 kV/m at a distance of 50 meters. Tests may show that the magnitude need not be that high to accomplish the desired results.

Based on present knowledge of the pulser and antenna, the following table includes the predicted distances to selected field levels as a function of angle from the boresight. The calculations show a rapidly attenuating field strength outside of the targeted area.

	DISTANCES TO CONTOURS IN METERS				
Angle (deg.)	100 kV/m	50 kV/m	10 kV/m	4 kV/m	1 kV/m
0	25	50	250	625	2,500
1/359	25	50	248	619	2,475
2/358	24	48	240	600	2,400
3/357	23	46	230	575	2,300
4/356	22	43	215	538	2,150
5/355	20	40	198	494	1,975
6/354	18	35	175	438	1,750
7/353	15	31	153	381	1,525
8/352	13	26	130	325	1,300
9/351	11	21	105	263	1,050
10/350	8	15	75	188	750
20/340	5	10	50	125	500
40/320	3	5	26	66	263
60/300	2	4	20	50	200

80/280	2	3	15	38	150
100/260	1	2	10	25	100
120/240	1	2	9	21	85
140/220	1	2	8	20	80
160/200	1	2	8	19	75
180	1	2	8	19	75

Accompanying this statement is a section of the Frijoles, New Mexico, United States Geological Survey topographic quadrangle showing the Phase I test location. Included on the map are the 10, 4 and 1 kV/m contour locations. The 100 and 50 kV/m contours are too small to show on this map scale; however, a very much enlarged map will be used in the field to better define those critical contours.

As may be seen on the map, the test area is remote from housing or buildings which could include personnel and equipment. An unimproved road is found in Water Canyon, more than 500 feet lower in elevation than the test site. That road climbs out of the canyon heading toward the test site but remains at least 100 feet lower until it approaches the road to be used for testing. In that area, access will be controlled to assure that no person or vehicle approaches the area where consideration must be given to exposure.

Instrumentation suitable for the purpose, and available from the Los Alamos Laboratory, will be used to measure field strength levels, providing empirical support for revised contours useful for further work. Additionally, selected electronic equipment will

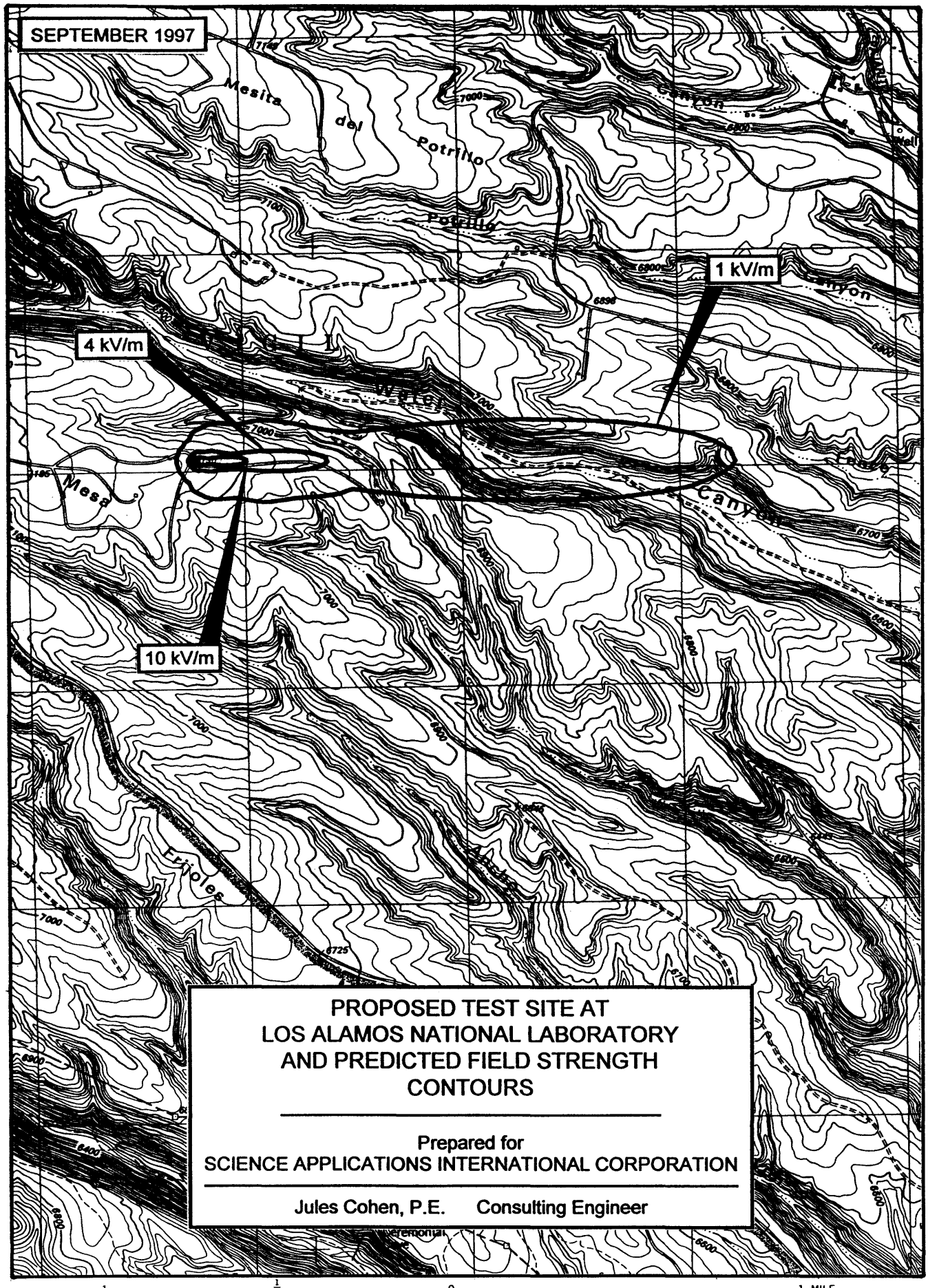
be placed at locations of known field strength to test its sensitivity to pulsed fields. A search of available reports has indicated the following minimum thresholds for such sensitivity. These data are believed to be unnecessarily conservative when considering exposure to pulses of as short duration as proposed here.

DEVICE	THRESHOLD (kV/m)
Vans and Cars	10
Digital Office Equipment	1
Household Appliances	5
TV Receivers, AM/FM Receivers and CB	8
Pacemakers	8
Other Medical Equipment	4
Aircraft Equipment	4

I declare under penalty of perjury that the foregoing is true and correct.

Executed on September 29, 1997.

Jules Cohen, P.E.


SEPTEMBER 1997
Mesita del Potrillo
Potrillo
Canyon
1 kV/m
4 kV/m
10 kV/m
Mesa
Canyon
Frijoles
PROPOSED TEST SITE AT
LOS ALAMOS NATIONAL LABORATORY
AND PREDICTED FIELD STRENGTH
CONTOURS
Prepared for
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Jules Cohen, P.E. Consulting Engineer
1 ½ 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER