DEFENSE SPECIAL WEAPONS AGENCY

The Defense Special Weapons Agency (DSWA) is seeking small businesses with a strong research and development capability and experience in nuclear weapons effects, phenomenology, operations and counterproliferation. (Note we are not interested in nuclear weapons design or manufacture.) DSWA invites small businesses to send proposals to the following address:

Defense Special Weapons Agency
ATTN: AM/SBIR
6801 Telegraph Road
Alexandria, Virginia 22036-3398

The proposals will be processed and distributed to the appropriate technical offices for evaluation. Questions concerning the administration of the SBIR program and proposal preparation should be directed to:

Defense Special Weapons Agency
ATTN: AM/SADBU, Mr. Bill Burks
6801 Telegraph Road
Alexandria, Virginia 22036-3398
(Telephone: 703-325-5021)

DSWA has submitted 29 technical topics numbered DSWA 98-01 through DSWA 98-29
. These are the only topics for which proposals will be accepted. The current topics and topic descriptions are included hereafter. These topics were initiated by the DSWA technical offices which manage the research and development in those areas. Several of the topics are intentionally broad to ensure innovative ideas which fit within DSWA's mission are submitted. Proposals do not need to cover all aspects of the broad topic. Technical questions concerning the topics should be submitted to:

Defense Special Weapons Agency
ATTN: AM/PMX, Mr. Ronald Yoho
6801 Telegraph Road
Alexandria, Virginia 22036-3398
(Telephone: 703-325-6475)

DSWA selects proposed for funding based on the technical merit, criticality of the research, and the evaluation critiera contained in this solicitation. Funding is limited, therefore, DSWA reserves the right to select and fund only those proposals considered to be superior in overall technical quality and filling the most critical requirements. As a result, DSWA may fund more than one proposal under a specific topic or it may fund no proposals in a topic area. Proposals which cover more than one DSWA topic should only be submitted once.

DSWA has not set aside funds for bridge funding (with the exception of projects that qualify for the Fast Track - see Section 4.5 of this solicitation). Therefore, proposers should not rely on bridge funding to cover the time gap between Phase I and award of Phase II.

DEFENSE SPECIAL WEAPONS AGENCY
FY 1998 SBIR TOPIC INDEX

DSWA SUBJECT WORD INDEX

SUBJECT Topic Number

DSWA 98.1 TOPIC DESCRIPTIONS

DSWA 98-001 TITLE: Nuclear Weapon Effects on Electronics

KEY TECHNOLOGY AREA: Nuclear, Chemical and Biological Defense

OBJECTIVE: Explore the effects produced by nuclear radiation and electromagnetic pulse on electronics

DESCRIPTION: The nature and magnitude of the effects produced by the interaction of nuclear-weapon produced radiation and natural radiation on electronics, electronic systems, photonics devices, and sensors in the areas of- a) Transient Radiation Effects on Electronics (TREE); b) High Altitude Electromagnetic Pulse; (HEMP); c) System Generated EMP (SGEMP); and d) Source Region EMP (SREMP) are of interest to DSWA. Particular areas of concern include: methods by which designers of space, strategic and tactical systems can assess their susceptibility to these effects; technologies to reduce the susceptibilities of electronic systems and microelectronics/photonics devices (especially those with submicron feature sizes); and methods to demonstrate survivability under specified threat criteria. Concepts and techniques to improve the survivability (decrease the response) of systems against these nuclear weapons effects are required. In addition, concepts and techniques to model the nuclear radiation and electromagnetic system effects in the distributed interactive simulation (DIS) format are required.

PHASE I: Initial feasibility studies will be completed to demonstrate the viability of the proposed approach.

PHASE II: Continue the investigation that was begun in Phase I to fully demonstrate the proposed approach using a prototype concept demonstration.

PHASE III DUAL USE APPLICATIONS: Nuclear survivable electronics will be useful; for military and commercial satellites, for nuclear power systems, system with electromagnetic interference and electromagnetic compatibility requirements.

REFERENCES:
(1) DNA EM-1, Capabilities of Nuclear Weapons, Chapter 11, "TREE" and Chapter xx, "Electromagnetic Pulse Effects
(2) Glasstone, The Effects of Nuclear Weapons

DSWA 98-002 TITLE: Pulsed Power Technology and Applications

KEY TECHNOLOGY AREA: Nuclear, Chemical and Biological Defense; Conventional Weapons

OBJECTIVE: Dramatic improvements in energy storage, switching, and power conditioning technologies.

DESCRIPTION: Future requirements for systems employing pulsed power will necessitate improvements in efficiency, energy density, reliability, repeatability and overall performance over the existing state of the art. Innovative approaches for component or subsystems development are sought to meet future demands for radiation simulators and other pulsed power applications. Examples include more energy efficient pulse forming technologies, high energy density capacitors, more efficient insulators, improved and more reliable switching technologies, and improved power flow electrical circuit models. Pulsed power technologies include those that operate at kilovolts to megavolts, kiloamperes to megaamperes, and have repetition rates fro single pulse to 10 kilohertz to meet the DoD applications such as armor/anti-armor; electromagnetic/electrothermal guns; mine/countermine; air, surface, and subsurface systems; high power microwave weapons; etc. Development of new diagnostics used to enhance the operation of the various pulsed power elements are required.
PHASE I: demonstrate the feasibility of the proposed concept.
PHASE I:, develop, test, and evaluate proof-of-principle hardware.

PHASE III DUAL USE APPLICATIONS: In addition to the DoD applications cited, these pulse power component technologies will be useful in cleaning up smoke stack effluents, general environmental pollution control, metal cutting, and electric vehicles.

REFERENCES:
(1) Radiation Test Facilities and Capabilities, 1997, DASIAC, 2560 Huntington Ave., Alexandria, VA 22303.
(2) J. C. Martin on Pulsed Power, Edited by T. H. Martin, A. H. Guenther, and M. Kristiansen, Plenum Press, New York and London, 1996, ISBN 0-306-45302-9

DSWA98-003 TITLE: X-Ray Effect Simulation Technology

KEY TECHNOLOGY AREA: Nuclear, Chemical and Biological Defense

OBJECTIVE: Develop innovative technologies for the production of x-ray radiation.

DESCRIPTION: Future requirements for x-ray nuclear weapon effects testing will require vast improvements in existing radiation source capability as well as new concepts for producing soft x-rays (1-5 keV), warm x-rays (5-15 keV), and hot x-rays (>15 keV). Soft x-rays are used for optical and optical coatings effects testing. Warm x-rays are used for thermomechanical and thermostructural response testing; and hot x-rays are used for electronics effects testing. The proposer should be familiar with the present capability to produce x-rays for weapon effects testing.

Present Plasma Radiation Source (PRS) generate copious amounts of debris (material, atomic charged particles, sub-keV photons). Debris production is an even greater concern for the simulators currently under development. New measurement and analysis technologies are required to characterize the source and the debris generated from wire array and z-pinch PRS to better understand debris sources and mitigation. Existing debris shield technologies are not adequate to support larger exposure areas and cleaner test environments while minimizing fluence degradation. New methods, or combination of methods, need to be developed to stop, mitigate, and/or delay debris generated for radiation simulators.

New technologies to measure plasma parameters for simulator sub-systems such as plasma opening switches and plasma sources are of interest. Test response diagnostic technologies are required to measure the full time and spectral history of the radiation pulse across the breadth and width of the test asset as well as the response of the test asset during and after irradiation. Pulsed power diagnostic technologies are required for accurate, in-situ measurement of voltages and currents within the various simulator subsystems in order to monitor and characterize simulator performance. Diagnostic systems include required sensors/detectors, cabling, recording equipment and media, and if necessary, computer systems and software

New concepts for compact x-ray sources for component level nuclear weapons effects x-ray testing are also of interest. DSWA is seeking innovative approaches for cost effective, compact pulsers with low end point voltage x-rays (100-500 keV) for possible operation at service customer production facilities.

PHASE I: demonstrate the feasibility of the proposed concept.

PHASE II: develop, test and evaluate proof-of-principle hardware in its working environment on a radiation simulator. This will involve coordination with DSWA to schedule testing in an above ground test simulator.

PHASE III DUAL USE APPLICATIONS: In addition to the applications cited for developing the environments for simulating the effects of nuclear weapons, the technologies will be useful with the commercial operations of nuclear instrumentation, very fast closing valves, material surface treatments, environmental clean-up and high brightness x-ray sources.

REFERENCES:

(1) DNA INWET conference Announcement Brochure, 1993 and 1991
(2) Glasstone and Dolan, The Effects of Nuclear Weapons, 1977
(3) DNA EM-1, Capabilities of Nuclear Weapons
(4) Radiation Test Facilities and Capabilities, 1997, DASIAC, 2560 Huntington Ave., Alexandria, VA 22303

DSWA 98-004 TITLE: Instrumentation and Diagnostics

KEY TECHNOLOGY AREA: Nuclear, Chemical and Biological Defense

OBJECTIVE: Advance the state of the art in nuclear and conventional weapon effects instrumentation.

DESCRIPTION: Instrumentation is used for measuring nuclear and conventional weapons effects including: phenomenology parameters and the response of test items exposed to conventional or simulated nuclear weapons effects. The instrumentation should be capable of operating under very harsh conditions, such as might be encountered in blast and shock tests, or tests involving high levels of X-ray, gamma, or neutron radiation. Instrumentation is needed for the following types of tests: airblast, ground shock, dusty flow, dust lofting, water shock, shock propagation in rock, High Explosive (HE), nuclear radiation (x-rays and gamma rays), thermal radiation, electromagnetic pulse (EMP) (high altitude or system generated) and for improved data acquisition (transmission and recording). Desirable improvements include costs, ease of use, precision, accuracy, reliability, ease of calibration (preferably on site) and maintainability. Some current problems are the ability to make airblast and thermal measurements in an explosive debris environment, machine explosive characterization measurements inside the high explosive itself during detonation, and full characterization of debris (size and momentum) from encased explosive detonations.

PHASE I: build a prototype instrument or instrument system and demonstrate its performance in laboratory scale testing.
PHASE II: design build and test a full-scale instrument system demonstrating its performance in its intended working environment. This may involve coordination with DSWA to schedule testing in a simulator.

PHASE III DUAL USE APPLICATIONS: In addition to the applications cited for measuring the environments for simulating the effects of nuclear and conventional weapons and for developing these environments, the technologies will be useful with the commercial operations of metrology, blasting, earthquake studies, radiation testing/monitoring, large structure integrity, fire protection, lightning protection, and hazardous waste containment.

REFERENCES:
(1) DNA INWET conference Announcement Brochure, 1993 and 1991
(2) Glasstone and Dolan, The Effects of Nuclear Weapons, 1977
(3) DNA EM-1, Capabilities of Nuclear Weapons
(4) Radiation Test Facilities and Capabilities, 1997, DASIAC, 2560 Huntington Ave., Alexandria, VA 22303

DSWA 98-005 TITLE: Radiation Hardening of Microelectronics

KEY TECHNOLOGY AREA: Chemical and Biological Defense and Nuclear; Sensors and Electronics

OBJECTIVE: Develop and demonstrate microelectronics technology to: (1) radiation harden; (2) improve reliability and electrical performance; (3) improve radiation hardness and reliability assurance methods; and (4) develop radiation - performance predictive device and circuit models and (5) characterize the radiation and reliability response of semiconductor devices (microelectronics and photonics) including warm and cold operation complementary metal oxide semiconductor (CMOS), bipolar, and compound material technologies.

DESCRIPTION: The trend in microelectronics and photonics devices is toward higher levels of integration density, higher speeds, higher circuit complexity, lower voltage and power, and larger die size and radiation tolerance. All of these trends have exacerbated the problems associated with radiation hardening, electrical performance, reliability, testability, producibility and affordability. In addition, improvements in material science have lead to the introduction of a wide variety of compound semiconductor materials into microelectronics and photonics devices. The radiation and reliability responses of these materials and devices is lacking or unknown.
Thus, innovative technology and methods are required that: (1) ensure that microelectronics and photonics can operate in a radiation or other stressing environment (e.g., very high or low temperatures); (2) improve radiation-hard device reliability; (3) improve producibility and yield of radiation hard processes; (4) develop cost-effective hardness and reliability assurance methods; (5) develop radiation performance predictive models for devices and circuits: (6) investigate and characterize the radiation response and reliability performance of these devices and associated materials; and (7)establish electronic design automation methods to facilitate the transfer of commercial designs to radiation-tolerant technology. The development of methods to improve the survivability of
PHASE I: Initial feasibility will be demonstrated of the proposed technology and proposed hardening approach.
PHASE II: Continue the investigation that was begun in Phase I to fully demonstrate the proposed approach or develop a prototype that reduces the concept to engineering practice.

PHASE III DUAL USE APPLICATIONS: Radiation-tolerant microelectronics will be useful for military and commercial satellites and missiles and f or nuclear power systems. The development of radiation tolerant microelectronics that enhance performance, reliability, producibility, and yield will also support the commercial electronics sector.

REFERENCES:

(1) DNA EM-1, Capabilities of Nuclear Weapons, Chapter 11, "TREE"
(2) Glasstone, The Effects of Nuclear Weapons

DSWA 98-006 TITLE: Materials Response

KEY TECHNOLOGY AREA: Materials, Processes and Structures

OBJECTIVE: Investigate material responses to nuclear weapons for strategic and tactical applications.

DESCRIPTION Recent changes in material manufacturing techniques and requirements have produced new materials that may or may not be radiation hard. Materials and structures used in nosetips, coatings, airfoils, tanks, packages, reflectors, housings, windows and antennae must be evaluated.
PHASE I: Survey materials and structures developments for lightweight composites, mylar films, rubber bladders, C-cloth, PLZT multilayers, SiC and Be lightweight mirrors, polymides, BN composites, honey combed composites and impregnated materials. Develop a test methodology, physical model and test coupon or witness sample that can be used to determine radiation response of the materials and structure.
PHASE II: Develop a plan to evaluate two sets of application specific structures and materials. Manufacture material in a type application structure, characterize the material, develop predictive model of radiation response of the materials and structures. Expose the material to radiation while performing in-situ test. Evaluate the threshold or on-set of radiation damage. Provide test data to validate theoretical model from at least two simulators, one of which must be an x-ray simulator.

PHASE III DUAL USE APPLICATIONS: Materials and structures are a dual-use multi-application field. Mechanical, electrical and optical components are critical to a military that uses technology as a force multiplier. Intelligent selection of materials for mission requirements will play a role in the development of cost-effective and reliable solutions for military needs. Dual use applications will be provided in light-weight materials that ameliorate adverse environments caused by fire, smoke, dust and rain.

DSWA 98-007 TITLE: Smart Optics

KEY TECHNOLOGY AREA: Sensors

OBJECTIVE: Replace filters and lenses with fast, tunable

band pass filters for multispectral response.
Investigate radiation hardness of the materials.

DESCRIPTION: Sensor systems will be required to be light-weight and robust. Smart optics can be achieved by placing SBN, ZnO and PLZT multilayers for wavelength selection in the optical train. Evaluation of the component for radiation effects is crucial first step to development of smart optics.
PHASE I: Develop a candidate smart optic subsystem for the UV or LWIR wavelengths. Develop a test methodology to demonstrate operation of a radiation environment caused by debris gammas and trapped electron environments.
PHASE II: Fabricate a developmental tunable band pass filter smart optic that can demonstrate the theoretical improvements. Perform optical tests to determine operational characteristics. Characterize the system after exposure to gamma and x-ray environments.

PHASE III DUAL USE APPLICATIONS: Smart optics in the UV and LWIR applications can be used for various space platforms for monitoring solar flares and environmental problems.

DSWA 98-008 TITLE: Field Expedient EMP Hardening

KEY TECHNOLOGY AREA: Electronics

OBJECTIVE: Develop innovative methods that would temporarily harden military and civilian electronic equipment to electromagnetic pulse (EMP) effects.

DESCRIPTION: Commercial Off the Shelf (COTS) products are being used in more and more military systems. COTS products are not inherently designed for immunity to EMP effects. In addition, critical elements of the commercial infrastructure (i.e., telephone, power) may possess vulnerabilities to EMP. Innovative methods to temporarily harden military and essential civilian electronic equipment to the effects of EMP (E1, E2, E3, and SREMP) are of interest. Installation should be relatively easy and quick (hours to a few days) and provide protection for several months to a year. Such hardening methods must be practical for field equipment and allow operation of the system.

PHASE I: Develop concept feasibility through either analysis or laboratory scale demonstration.
PHASE II: Further develop through more definitive experiments and/or field demonstrations.

PHASE III DUAL USE APPLICATIONS: Electromagnetic Interference (EMI) and Electromagnetic Compatibility(EMC), lightning protection.

REFERENCES: MIL-STD-188-125, MIL-HDBK-423

DSWA98-009 TITLE: Smart Archive Search and Presentation Methods

KEY TECHNOLOGY AREA: Computing and Software (intelligent systems, user interface)

OBJECTIVE: Develop innovative technologies for the intelligent search, presentation and relating of data and objects within a digital archive.

DESCRIPTION: The Defense Special Weapons Agency (DSWA) is interested in improving the search and knowledge extraction capabilities of its Nuclear Weapons Effects archival database, the Data Archival and Retrieval Enhancement (DARE) system. DSWA has invested heavily in the acquisition of a comprehensive collection of unique and irreplaceable nuclear weapon effects information in such varied forms as reports/documents, photographs, film, waveforms, tables and diagrams. DSWA is keenly aware of the risk to the preservation of this legacy information, gathered at great cost and effort, as budgets and human and capital resources are reduced. In the post-Cold War environment with no new data from nuclear testing expected and nuclear data experts rapidly retiring, the ability to rapidly find, display, correlate and analyze this material via DARE is increasingly crucial to future research efforts which will rely more on simulations and high fidelity calculations coupled with correlation with the archived data. Thus innovative, value adding tools are required to relate and extract knowledge from the collection.
PHASE I: demonstrate the value added the technology offers and the feasibility of incorporating the proposed technology into DARE and develop an implementation plan.
PHASE II: implement the developed technology into DARE's search and navigation mechanisms.

PHASE III DUAL USE APPLICATIONS: Improved archive search technologies apply directly to a large and fast growing civilian market involving digitized workflow, data archiving and data mining technologies. A possible follow-on would be to adapt the technology to access remote databases and archives.

DSWA98-010 TITLE: Automated data capture and metadata creation for a digital data archive

KEY TECHNOLOGY AREA: Computing and Software (software and systems development)

OBJECTIVE: Explore and develop innovative, automated and low-cost methods for the digital capture and storage of documents and creation of associated metadata for a data archive.

DESCRIPTION: The digital capture and storage of documents into the Defense Special Weapons Agency's data archival system has proven to be slower and more costly than anticipated. In particular, the creation of metadata labels for the digitally captured documents and material, a manual and time intensive process, has limited archive population. While information for label creation is available from different digital sources such as the agency's STILAS database, data integrity issues have limited implementation of this information into metadata labels.

PHASE I: research will demonstrate the feasibility of an automated method for creation of archive metadata labels which significantly improves the rate of metadata label production.
PHASE II: implement the developed technology and procedures into the DSWA's data archiving effort.

PHASE III DUAL USE APPLICATIONS: Suggested research is applicable to many current data transfer problems in both government and civilian sectors such as transferring data between dissimilar databases and tools for linking remote archives with different metadata.

DSWA98-011 TITLE: Use of Digital Video for archiving technical information

CATEGORY: Computing and Software (software and systems development, user interface)

OBJECTIVE: Explore and develop innovative methods for storing, retrieving, displaying and transferring digital video for use in a digital archive program.

DESCRIPTION: As part of its stewardship program, the Defense Special Weapons Agency is involved in the digital archival of video. This effort includes capturing legacy film, but also includes the videotaping of experts involved in technical discussions germane to Nuclear Weapons Effects research. Storing digitized video, searching and analyzing the subject film and associated audio and transferring these typically large files are challenging research areas which offer a large return in the capability of data archival systems to maintain useful video collections.
PHASE I: research will demonstrate the feasibility of a proposed technology to improve digital video archiving.
PHASE II: implement the developed technology and procedures into the DSWA's data archive system.

PHASE III DUAL USE APPLICATIONS: Suggested research is applicable to many current data transfer and archival problems in both government and civilian sectors. Follow on applications might include x-ray diagnosis/analysis tools and smart military imagery analysis tools for targeting.

DSWA98-012 TITLE: Metadata modeling product for data engineering

CATEGORY: Computing and Software (software and systems development)

OBJECTIVE: Explore and develop an innovative modeling method for the process of engineering metadata for new data types within the Defense Special Weapon Agency's (DSWAs) Data Archival and Retrieval Enhancement (DARE) system.

DESCRIPTION: Efforts are currently underway to define the numerous numeric data types which will eventually be in the DARE system. The DARE system uses Object Definition

Language to define metadata. The current process is extremely time and labor intensive, requiring considerable domain expertise.
PHASE I: research will demonstrate the feasibility of a proposed technology to streamline and improve the process of creating metadata fields for new data types for the DARE system.
PHASE II: implement the developed technology and procedures into the DARE Data Engineering process.

PHASE III DUAL USE APPLICATIONS: Suggested research is applicable to virtually all data archives, both government and civilian.

DSWA98-013 TITLE: Digitization and archiving of high speed cinematographic film

CATEGORY: Computing and Software (software and systems development)

OBJECTIVE: Explore and develop an innovative and cost effective method for digitizing high speed cinematographic film.

DESCRIPTION: The Defense Special Weapons Agency (DSWA) currently has numerous high speed cinematographic films documenting fireball effects from nuclear tests. These old specialized films must be carefully handled due to their age and require special digitization techniques to ensure resolution is retained in digital form. Current technology involves capturing each video frame as a TIFF file and linking the associated files, a timely intensive and costly process.
PHASE I: research will demonstrate the feasibility of a cost effective new method and/or technology to streamline and improve the process of digitizing high speed scientific film without sacrificing resolution quality.
PHASE II: implement the developed technology and procedures into the DARE Data Engineering process.

PHASE III DUAL USE APPLICATIONS: Suggested research is applicable to virtually all data archives, both government and civilian. Technology may be specifically applied to the digital archiving of collections of valuable photographic negatives where resolution is a concern.

DSWA98-014 TITLE: Evaluation and Archival of Nuclear Weapon Effects Material

KEY TECHNOLOGY AREA: Computing and Software (user interface)

OBJECTIVE: Development of innovative products, systems, evaluation methods, electronic archival methods, location and retrieval methods and distribution methods for the preservation and use of nuclear weapons effects material.

DESCRIPTION: Specific objectives are to capture nuclear

weapon effects test data, identify, prioritize, and caveat test data for transfer to digital archives. Objectives can also be to design information retrieval and storage systems which are user friendly and accessible.
The Department of Defense has invested heavily in the acquisition of a comprehensive collection of unique and irreplaceable nuclear weapon effects information in such varied forms as reports/documents, photographs, film, waveforms, tables and diagrams. This legacy information, gathered at great cost and effort is at risk, as budgets and human capital resources are reduced. Access to this irreplaceable database is crucial to future national security needs that will rely more on simulations and high fidelity calculations. Improved methods are required for the management of technical information that relates to archival of nuclear weapon phenomenology and test data as well as input to and retrieval of such data.
PHASE I: the research will demonstrate the feasibility of the proposed approach to improve the understanding of nuclear weapon effects or the archival and ease of retrieval and use of stored data.
PHASE II: the research concepts developed in phase I will be further developed and incorporated into existing DSWA electronic archival systems.

PHASE III DUAL USE APPLICATIONS: Electronic filing and data retrieval is the touchstone of this information age. The output of this SBIR could have tremendous potential to further the understanding of how to improve current systems and the design of future systems.

DSWA98-015 TITLE: Nuclear Weapons System and WMD Demilitarization Safety Assessments/Special Studies

KEY TECHNOLOGY AREA: Modeling and Simulation

OBJECTIVE: Improved safety of US nuclear weapons systems and WMD demilitarization operations.

DESCRIPTION: Quantifying, reducing, and managing the risks associated with the life-cycle management of military nuclear weapons systems and weapon demilitarization is of vital importance. New and innovative concepts to improve on traditional probabilistic risk assessment techniques and methodologies, as well as operations are desired to increase the overall safety of these assets. Abnormal environments that these systems may encounter include mechanical insults (e.g., drops, vehicle accidents), thermal insults (e.g., fuel fires), electrical insults (e.g., lightning, electrical power), and combinations of these environments. Long range program thrusts include characterizing these abnormal environments, analyzing human factors and developing quick running models to allow decision makers to manage safety risks. Concepts should employ innovative ideas and make use of new and emerging technologies. Work will include measuring risk improvements, risk reduction techniques, and advanced algorithms for improved quick-look capabilities.Measures to improve the safety of nuclear weapons systems and demilitarization operations against all possible abnormal environments are required. Safety

enhancement measures include prediction of the liklihood of adverse events through characterization of initiators and eliminating/mitigating such initiators. Proposals should describe how they will improve protection against known and predicted risks and should emphasize risk elimination/reduction where appropriate.
PHASE I: demonstrate the feasibiliity and potential usefulness of the proposed safety technologies/techniques.
PHASE II: fully develop the proposed technologies/techniques so they can be compared to existing techniques.

PHASE III-DUAL USE APPLICATIONS: Data and models from an activity such as this SBIR area have potential for adaptation to a variety of users. Risk is a common concept used in commercial activities as varied as finance (e.g., insurance) to transportation and other technical areas. Minimization of risk is important in many occupations, such as manufacturing. Risk models can be used in evaluating manufacturing alternatives, optimizing safety budgets and equipment, to reducing risks in the home or comparing potential alternate decisions. The quantification and understanding, as well as the reduction or elimination of risks can be used to increase the continued viability of many commercial endeavors.

REFERENCES:
1) Joint DoD/DOE Surety Plan, August 1991
2) Report of the Panel on Nuclear Weapons Safety, December 1990

DSWA 98-016 TITLE: High Speed Non-Line-of-Sight Wireless Data Transmission

KEY TECHNOLOGY: Command, Control and Communication

OBJECTIVE: Develop the capability to securely transmit large amounts of data such as video images from the point of transmission (camera, sensor, etc.) to a central point of annunciation at least one kilometer away.

DESCRIPTION: Sophisticated intrusion detection and assessment devices are often deployed in tactical environments without access to, nor is it logistically feasible to provide, hard wire transmission capability for the data generated. This constraint has severely hampered the mission of the security force to provide quality security for critical resources at temporary locations, where they are at greater risk, equivalent to the level of security provided at fixed permanent sites. Further restricting the transmission of large amounts of data is the requirement for low probability of interception of the transmission. The transmission must be secure and reliable. Our limited capability in this area adds great expense to deployments because of the high personnel costs associated with increased manpower requirements to compensate for the reduced technological capability.
PHASE I: Demonstrate the capability to transmit data rapidly over the devised medium during Phase I.
PHASE II: Insure secure data transmission and include the

deployable security systems such as the Tactical Automated Security System (TASS) during Phase II. Examine parallel commercial applications for the home and business security industries.

PHASE III DUAL USE APPLICATIONS: Commercial home and business alarm systems.

DSWA 98-017 TITLE: Conventional Weapons

OBJECTIVE: Develop a capability to detect explosives in large containers, preferably without having to make contact with the container.

DESCRIPTION: Senior level concern for the protection of personnel and resources from the threat and acts of terrorist attacks where large amounts of explosives are employed to destroy facilities and to maim or kill personnel has prompted the call for the immediate procurement of a mobile explosive detection capability that is man portable and reasonably priced. The choice method for perpetrating terrorist acts is through the use of bulk explosives which are normally placed in large containers such as trucks, shipping containers, etc., and detonated on or near DoD installations. The logistics of detecting explosives in a large container are often employed at the expense of operational mission accomplishments and inhibits effective mission completion. While detection without contact is the ultimate goal, limited contact is acceptable under circumstances such as when explosive contraband may be hidden, obscured, or combined with a valid shipment.

Develop a prototype in Phase I and deploy for operational testing and evaluation in Phase II. If successful, initiate immediate production after OT&E and TOA for the protection of DoD personnel deployed in high terrorist threat areas.

PHASE III DUAL USE APPLICATIONS: High level Executive Protection; Municipal Infrastructure Protection and Support.

DSWA 98-018 TITLE: Detection of Minute Intrusion

KEY TECHNOLOGY AREA: Sensors

OBJECTIVE: Develop a capability to detect small penetration of controlled spaces.

DESCRIPTION: It is widely stated that listening and video devices are now being constructed on a scale which permits discreet introduction in areas which are protected by intrusion detection devices. These devices are said to be small enough to be inserted into a secure area via a point of intrusion smaller than 1/8". Their size permits minimal signature and are difficult to detect, or assess if detected.

Phase I will seek to demonstrate the reliability of detection of miniature surveillance devices, and Phase II will incorporate the developed technology into intrusion detection systems of secure facilities where COMSEC and OPSEC are of paramount concern.

PHASE III DUAL USE APPLICATIONS: Private Investigation; Protection from industrial and economic espionage.

DSWA 98-019 TITLE: Multi-Source Data Fusion for Monitoring to Detect Nuclear Tests

KEY TECHNOLOGY AREA: Computing and Software

OBJECTIVE: Prototype innovative techniques for detecting and characterizing patterns of interest across large, heterogeneous databases to improve the capability to monitor for violations of the Comprehensive Nuclear Test Ban Treaty.

DESCRIPTION: The impending completion of the Comprehensive Nuclear Test Ban Treaty (CTBT) has focused attention on the technical challenges of monitoring to detect evasively conducted nuclear tests, and discriminating between such tests and other events, such as earthquakes or mining activities. Monitoring the CTBT, which prohibits testing in all environments, will require the acquisition, management, fusion, interpretation, and presentation of data from heterogeneous sources and of heterogeneous types. The resulting databases will include the following classes of data: time and space series, imagery, text and speech, and more complex types (e.g., video, analog data, etc.). DSWA seeks prototype system to support robust data fusion, including the detection and characterization of interesting temporal and spatial patterns across these data classes. The prototype should focus initially on the four components of the International Monitoring System (i.e., seismic, hydroacoustic, infrasound, and radionuclide monitoring) and be extensible to broader databases, including satellite imagery, EMP, HUMINT, etc. The prototype should operate initially within, and take advantage of, the systems infrastructure of the prototype International Data Center (IDC) being developed by the Nuclear Treaty Program Office, and be extensible to final IDC in Vienna, Austria. Techniques in the related areas of data fusion, knowledge discovery, database mining, and data visualization should be considered. Prototypes that demonstrate automated and/or interactive (human driven or assisted) data fusion and decision support are of interest.

PHASE III - DUAL USE APPLICATION: Data fusion techniques to support areas involving high volumes of disparate data, e.g., the airline, mining, or medical industries. A potential military application would be for battlespace management.

DSWA 98-020 TITLE: Tracking Atmospheric Plumes Based on Stand-Off Sensor Data

KEY TECHNOLOGY AREA: Computing and Software

OBJECTIVE: Develop an approach to identifying and locating the source of nuclear events that generate atmospheric plumes by backtracking their atmospheric plumes.

DESCRIPTION: An essential element of the International Monitoring System (IMS), being established to monitor compliance as part of implementing the Comprehensive Nuclear Test Ban Treaty (CTBT), is the radionuclide subsystem. The collection component of the stations of the subsystem will continuously sample the atmosphere. Periodically (e.g., every six hours) a sample will be completed and analyzed by the radionuclide detectors and their supporting systems. The results of the analysis will be transmitted to regional and/or national data centers, and/or on to the International Data Center (IDC). Analysts and/or their support systems need to be able to determine the source of those samples of interest; i.e., those that contain either certain radioactive products and/or abnormally high levels of other radioactive products. The source includes the identification and location of the nuclear-related activity that produced the radionuclide(s).
This research initiative seeks solutions (or contributions there to) to determining the likely location of the source with an immediate accuracy of within an area as small as 1,000 sq. kms (ultimately perhaps as small as .5 kms by .5 kms).
Solutions should incorporate those characteristics related to nuclear materials/products (e.g., their weight, fractionation, and recombinant potential) and the parameters associated with weather and/or climate (e.g., velocity and direction of wind currents, temperature gradients and rain) that appear to control or influence the transport and disbursement of nuclear materials/products.
It is anticipated that solutions will leverage past work on fallout and atmospheric modeling. Fallout analysis and prediction work, particularly that done during the period when atmospheric nuclear tests were allowed (approximately 1946 to 1962) and perhaps additional work related to leaks during underground testing as well as from such unfortunate events as the Three Mile Island (in Pennsylvania, USA) and Chernobyl Russia) accidents, should be considered.
Atmospheric transport models should be identified and reviewed to see what factors they use as inputs and how up to date they appear to be, etc.
Solutions may automate the integration of meteorological and climatological data with quantitative data from stand-off sensors (biological, chemical, nuclear, etc.) to rapidly detect hazardous material plumes, characterize plume morphology, backtrack to the plume's source, and predict future plume propagation.

An added dimension will be determining the availability of historical data as well as current data collection activities, particularly as related to monitoring areas of interest to the United States.

PHASE III - DUAL USE APPLICATION: Environmental monitoring, including power generation plants (both nuclear and non-nuclear) and weather, and air travel safety.

DSWA 97-021 TITLE: Multi-Dimensional Visualization of Data to Identify Seismic Events or for Other Complex, Multi-Dimensional Data Problems

KEY TECHNOLOGY AREA: Computing and Software

OBJECTIVE: Develop a visualization subsystem for the discrimination of different types of detected seismic events; test the subsystem with the Nuclear Treaty Programs Office's (NTPO's) Intelligent Monitoring System; and demonstrate the subsystem's potential application to other multi-dimensional data problems.

DESCRIPTION: NTPO is developing a global system for monitoring nuclear proliferation activities and for potential use in verifying compliance with a Comprehensive Nuclear Test Ban Treaty (CTBT). The system will collect data from a worldwide network of seismic stations and arrays, as well as sensors deployed for air, particulate, and other types of environmental sampling. The seismic system alone will have to process data from several hundred monitoring stations for tens of thousands of detected earthquakes and explosions per year. Results of the final analysis must be available within 24-48 hours of the occurrence of the events. Achieving this goal within the available resources will require automatic data processing and an enhanced data interpretation capability. NTPO is exploring technologies such as machine learning, machine discovery, and visualization methods to aid in the data interpretation.
This initiative seeks subsystems implementing novel visualization techniques and components to aid in interpreting the results of multivariate seismic discrimination analysis, particularly for small seismic events detected at regional distances out to 2,000 km. The subsystems will be installed in the Intelligent Monitoring System at NTPO's Center or Monitoring Research (CMR) located in Rosslyn, Virginia, and tested with data acquired and processed by the Intelligent Monitoring System. The performer will demonstrate how the visualization techniques can be applied to the general problem of monitoring the proliferation of weapons of mass destruction by demonstrating that it is capable of aiding human analysts in interpreting data from the global seismic monitoring system. The performer will also demonstrate how the techniques can be used to solve other

PHASE III - DUAL USE APPLICATION: Visualization subsystem to aid in the solution of generic multi-dimensional or multivariate problems. This could include topics ranging from environmental monitoring to air traffic control.

DSWA 98-022 TITLE: Nuclear Weapon Effects Phenomenology

TECHNOLOGY AREA: Exploratory Development, Survivability and Hardening

OBJECTIVE: Develop innovative algorithms to improve our understanding of nuclear weapon effects and the implementation of these algorithms

DESCRIPTION: To improve the understanding of the impact of nuclear weapons under battlefield conditions, we require more accurate, efficient, user-friendly methods of calculating and displaying the affects of nuclear scenarios and their operational impact. Areas of interest include: improved accuracy even as calculational times are minimized: reliance on basic physical principles validated by measured test results: faster running calculations; and new improved ways to enable users (be they advanced nuclear weapons effects researchers, weapon systems developers, or managers with limited nuclear weapons effects experience) to calculate, estimate, and appreciate nuclear weapon effects and their system impacts. Nuclear weapon effects include airblast, ground shock; water shock; cratering; thermal radiation; neutron, gamma and x-ray radiation; electromagnetic pulse; fallout; blueout; blackout; redout; and dust cloud formation.
Improved methods are required for the management of technical information that relates to archival of nuclear weapon phenomenology and test data as well as input to and retrieval of such data archives. Methods for developing unifying test data standards devised with application beyond just nuclear test effects are needed to improve data processing efficiency and reduced hardware and software specific requirements.
PHASE I: the research will demonstrate the feasibility of the proposed approach to improve the understanding of nuclear weapon effects or the archival and ease of use of stored data.

PHASE II: the research concepts developed in Phase I will be further developed and incorporated into appropriate codes.

COMMERCIAL POTENTIAL: Computer codes related to earthquake effects, pollution transport, signal propagation, data archival, and test standards for data.

REFERENCES:
(1) DNA EM-1, Capabilities of Nuclear Weapons
(2) Glasstone, The Effects of Nuclear Weapons

DSWA 98-023 TITLE: Nuclear Collateral Effects

KEY TECHNOLOGY AREA: Computing and Software

OBJECTIVE: Demonstrate innovative applications of advanced theoretical and numerical technologies for nuclear source terms, transport and doses.

DESCRIPTION: Of interest to DSWA is the development and demonstration of capabilities to predict nuclear hazards from facilities and weapons. These hazards must cover accident, incident and military action. New methodologies on how to create numerically efficient source terms, transport them atmospherically or by water, and effectively predict doses to different populations.
PHASE I: the research will develop concept feasibility for application in DSWA's Hazard Prediction and Analysis

Capability (HPAC) software, through either analysis or laboratory demonstration.
PHASE II: the concepts will be further developed for application in DSWA's Hazard Prediction and Analysis Capability (HPAC) software.

PHASE III-DUAL USE APPLICATION: Nuclear Hazard Source, Nuclear Transport and Nuclear Dose Modeling

DSWA 98-024 TITLE: Advanced Lethality Technologies

KEY TECHNOLOGY AREA: Conventional Weapons

OBJECTIVE: Demonstrate innovative applications of advanced non-nuclear technologies for enhanced target lethality or nuclear effects simulations

DESCRIPTION: Of interest to DSWA is the development and demonstration of capabilities which may significantly extend weapons range-to-effect or enhance lethality against hard targets. The response of a hardened bunker complex or of intrinsically hard ballistic missile sub-munitions warhead payloads are of particular interest. Novel applications of explosives technology, hyperkinetic technologies concepts will be of interest.
PHASE I: the research will develop concept feasibility through either analysis or laboratory scale demonstration.
PHASE II: the concepts will be further developed through more definitive experiments and/or sophisticated computational analyses.
PHASE III: Dual use applications technologies demonstrated in this SBIR may be applicable to commercial application such as mining, where advanced explosives, increase yield, oil drilling for stemming wells, Other hyperkinetic applications apply to space craft shields.

DSWA98-025 TITLE: Structure Design Software Tools

KEY TECHNOLOGY AREA: Exploratory Development, Modeling & Simulation

OBJECTIVE: Develop software tools and translators to automatically redesign existing CAD structures based on specified hardness, building code requirements.

DESCRIPTION: The Defense Special Weapons Agency supports DoD warfighting capabilities through modeling and simulation of weapons effects, target responses, and propagation of collateral effects. Modeling and simulation tools developed for warfighting also support distributed simulation systems which provide realistic, real time simulations for training and evaluation. Tools that are incorporated into distributed simulation systems must meet DoD mandated High Level Architecture compliance.
DSWA supports the development of simulation targets (tunnels, "cut & cover" structures, deep underground targets, and the like) using state-of-art CAD software tools. Targets are designed with a degree of detail

determined by the weapons likely to be encountered and the failure modes likely to be invoked by the postulated weapons. DSWA seeks to develop automated software tools and translators that can automatically transform existing CAD designs to meet new specifications for structural hardness, design-cod specification changes, or other high level specification changes. These tools will maintain HLA compliance for translated targets used in distributed simulation architectures.
PHASE I: The Phase I effort will explore the feasibility of automating target translation. Prototype translators will be developed which will demonstrate the automated capability for selected targets of DoD interest.
PHASE II: The Phase II effort will expand the capabilities and understanding developed in Phase I and will accomplish HLA compliance for incorporation of translators in the distributed simulation environment.

PHASE III-DUAL USE APPLICATION: Software tools to assist in the evaluation of the risk of financial loss through widespread earthquake damage, to evaluate the cost effectiveness of building code adjustments, retrofits in pre-existing structures, planning and zoning design support, insurance actuarial support, civilian government planning and crisis support.

DSWA98-026 TITLE: Enhance Imaging/Search Modeling & Simulation Technology

KEY TECHNOLOGY AREA: Exploratory Development, Modeling & Simulation

OBJECTIVE: Develop new technologies through merging of oil exploration software, generic algorithm techniques, and sensor technologies as tolls for identifying underground structures of DoD interest and potential material and structure failure modes.

DESCRIPTION: The Defense Special Weapons Agency is interested in developing modeling and simulation tools that can be used to identify the existence and character of underground structures, the potential structural failure modes of both above-ground and underground targets, the prediction of failure produced by in and out of target explosives releases, and tools that can assist in the visualization of these structures. Modern software engineering techniques have been merged with advanced earth science to develop applications enabling intelligent, high resolution and physically constrained imaging of static and dynamic geological processes. DSWA has been conducting RDT&E related to generic algorithm (GA) techniques to improve modeling, algorithm development, and overall modeling and simulation capabilities. The GA technique provides an innovative approach to solving complex search and optimization problems; it offers characteristics which make it conductive to machine learning methods. the marriage of GA techniques with geological modeling and simulation promises to provide effective tools to support the DoD mission of identifying and characterizing underground targets.

PHASE I: The Phase I effort will be devoted to the incorporation of generic algorithm techniques and geological modeling and simulation capabilities in order to demonstrate the efficacy of such tools for identifying and characterizing underground targets. These may include tunnels, "cut & cover" targets, and deep, underground targets.

PHASE II: The Phase II effort will select and adopt selected remote sensor performance models and algorithms and incorporate these into tools developed under Phase I. The objective of this effort will be to demonstrate how target identification and characterization can be automated for DoD applications.

PHASE III-DUAL USE APPLICATION: Oil exploration enhancement, structural failure analysis, earthquake resistance assessment, visualization technologies enhancement.

DSWA 98-027 TITLE: Low Frequency Magnetic Signatures for Detecting & Discriminating Nuclear/non-nuclear Underground Tests

KEY TECHNOLOGY AREA: Sensors Technology/ Simulation & Modeling

OBJECTIVE: Develop physics models and computer algorithms to generate a comprehensive catalog of low frequency magnetic signal signatures arising from a finite set of known and /or possible underground nuclear and non-nuclear test (UGT) devices. In conjunction with conventional seismic techniques, use these signatures to correlate and characterize the test device to discriminate between nuclear and non-nuclear UGT events.

DESCRIPTION: Underground nuclear testing provides an effective means for concealment of clandestine nuclear weapons development programs. In particular, with proper tamping and cavity construction of volume much larger than the weapon size, seismic signals can be masked or sufficiently distorted to preclude positive identification of a nuclear test through standard seismic identification techniques. This problem has emerged from the so-called evasion technology. Moreover, low-yield nuclear tests can be seismically indistinguishable from similar sized (non-nuclear) high explosive (HE) detonations. HE detonations are very common in the operation of existing mines and oil wells. They are also needed for the exploration of new mineral deposits and oil belts. At the present time, there is no reliable method in the national technical means (NTM) to verify if an UGT explosion is conducted for an economic development program or for a weapon development program in violation of the international comprehensive test ban treaty (CTBT). Any such UGTs are subject to challenges by the internatnal CTBT team.

An alternate but complementary method for detection and discrimination of nuclear vs. non-nuclear underground detonations is clearly needed. A promising candidate is the very low frequency (VLF) magnetic signal which is produced as a characteristic signature of an underground non-nuclear or nuclear test. The waveforms of the magnetic signal emitted in these two types of UGTs have very distinct characteristics. These waveforms can be computed by modeling the physics of signal generation for these two types of UGTs and propagation of the signal from the source to the earth surface. For nuclear UGTs the magnetic signal has been detected at a distance up to 10 kilometers from the test site [Ref. 1]. This signal can provide not only an accurate fiducial time marker of the event, but, with a proper accounting for local earth electrical conductivities and geological anomalies, can also yield information on the device size, burst location, and depth, even in situations where evasion techniques have been employed to mask seismic signal detection and characterization of the event. Moreover, in conjunction with seismic detection techniques, discrimination between nuclear and non-nuclear events should be possible. Recent advances in nano-Tesla and sub-nano-Tesla magnetic signal detection and processing techniques would permit cooperative (or covert) interrogation of identified (or suspected) nuclear test sites. However, to properly interpret these signals, a library of magnetic signal signatures for a variety of burst parameters at locations in question is required.

The signal interpretation is expected to be very difficult due to the uncertain nature of the source, the expected low level of the detected signal strength, and the presence of background natural or man-made noise and clutter. However, by comparison of the measured signal with those of the library and the use of matched filtering and other signal processing technique, an accurate assessment of the device type, yield, and other parameters could be made. Moreover, such a library would also provide information on optimum sensor placement strategy and optimization of magnetic sensor/detector hardware and software. Although qualitative estimates allow order-of-magnitude determination of signal strength and timings, quantitative information on the size, depth, location, and type of detonation can only be provided by detailed analysis and calculation of the generation and propagation of these low frequency magnetic signals to the earth surface at the sensor site. Variations and structuring in deep earth electrical conductivity significantly complicate this problem and most likely will require development of sophisticated computational techniques to accurately predict the low frequency magnetic signal propagation and diffusion through the very complex and possibly highly structured deep earth electrical conductivity. Particular attention must be paid to development of 3-D differencing algorithms or other approaches which are unconditionally stable even for significant spatial variations in earth electrical conductivity and, at the same time, are able to accurately provide (signatures) data on time scales which span from sub-microseconds to several tens of seconds or longer.

PHASE I: Select a promising approach for the accurate calculation of low frequency magnetic signals generated by underground nuclear and HE tests; carry out the preliminary development and implementation of the procedure; and demonstrate the stability, accuracy, and reliability of this approach for a variety of complex sample earth conductivity geometries (including land-ocean interfaces).

PHASE II: Finalize the approach developed under Phase I and initiate the creation of a comprehensive library of magnetic signal signatures for both nuclear and non-nuclear bursts of differing yields and depths for a minimum of three sites designated by DoD.

PHASE III DUAL USE APPLICATIONS: The procedure developed for determining the propagation of low frequency magnetic signals through realistic deep earth conductivities will be directly applicable to the problem of accurate assessment of nuclear high-altitude electromagnetic pulse (HEMP/ E3) environments, where currently, for want of a better approach, a standard uniform conductivity of 10-3 mho/m is assumed. There is a pressing need for a more accurate methodology, since in cases where nuclear HEMP/E3 environments have been calculated using experimentally measured earth electrical conductivity data, deviations by factors of 2-10 from the standard uniform conductivity model have been shown. Addressing this uncertainty will improve the assessment and mitigation of the effects of E3, and natural geomagnetic storms on long haul communacations and commercial power lines. Moreover, these same capabilities should be applicable to the commercial problems of geophysical surveying and exploration of the subsurface geological structure for minerals, oil, or natural gas, where VLF magnetic data is acquired and analyzed for prospecting. The use of natural or man-made longwave (ELF/VLF) signal probe technique is already established, but the signal data interpretation/analysis is very difficult and would be greatly improved by the development of a geology dependent signature library. New, advanced signal processing techniques could also be developed and exploited in this commercial area.

REFERENCES: J. Sweeney, "An Investigation of the Usefulness of Extremely Low-Frequency Electromagnetic Measurements for Treaty Verification", LLNL Report No. UCRL-53899, 1989. (UNCLASSIFIED)

DSWA 98-028   TITLE: Nuclear Weapon Effects Phenomenology

KEY TECHNOLOGY AREA: Exploratory Development, Survivability and Hardening

OBJECTIVE: Develop innovative algorithms to improve our understanding of nuclear weapon effects and the implementation of these algorithms

DESCRIPTION: To improve the understanding of the impact of nuclear weapons under battlefield conditions, we require more accurate, efficient, user-friendly methods of calculating and displaying the affects of nuclear scenarios and their operational impact. Areas of interest include: improved accuracy even as calculational times are minimized: reliance on basic physical principles validated by measured test results: faster running calculations; and new improved ways to enable users (be they advanced nuclear weapons effects researchers, weapon systems developers, or managers with limited nuclear weapons effects experience) to calculate, estimate, and appreciate nuclear weapon effects and their system impacts. Nuclear weapon effects include

airblast, ground shock; water shock; cratering; thermal radiation; neutron, gamma and x-ray radiation; electromagnetic pulse; fallout; blueout; blackout; redout; and dust cloud formation.
Improved methods are required for the management of technical information that relates to archival of nuclear weapon phenomenology and test data as well as input to and retrieval of such data archives. Methods for developing unifying test data standards devised with application beyond just nuclear test effects are needed to improve data processing efficiency and reduced hardware and software specific requirements.
PHASE I: the research will demonstrate the feasibility of the proposed approach to improve the understanding of nuclear weapon effects or the archival and ease of use of stored data.
PHASE II: the research concepts developed in Phase I will be further developed and incorporated into appropriate codes.

PHASE III DUAL USE APPLICATION: Computer codes related to earthquake effects, pollution transport, signal propagation, data archival, and test standards for data.

REFERENCES:
(1) DNA EM-1, Capabilities of Nuclear Weapons
(2) Glasstone, The Effects of Nuclear Weapons

DSWA 98-029 TITLE: Human Response Models for Performance and Risk Estimation

KEY TECHNOLOGY AREA: Modeling and Simulation

OBJECTIVE: Investigate and identify methods to represent human behaviors (performance and risk) after exposures to nuclear, biological, chemical and/or radiological environments.

DESCRIPTION: Recent emphasis changes on casualty and risk priorites necessitate the creation of models to describe effects on humans for military and civilian populations from weapons of mass destruction not previously represented. This includes population demographics other than healthy, feeling fine military; secondary and tertiary blast; cognitive effects, and connection of risk to performance-based standards.

PHASE I: Identify promising methodologies/applications to represent human behavior, cognitive, performance and/or health risk to military and civil populations after exposure to the effects of weapons of mass destruction.
PHASE II: Implement the identified methodology(ies)/application(s) to create a model(s) to fill the void. Conduct verification & validation experiments. Connect to existing DSWA human response models that provide the basis for US doctrine.
PHASE III DUAL USE APPLICATIONS: Human response models that address a broad demographic range will be useful to any emergency response manager for applications to explosions, and to accidental or intentional releases of NBC material. There is a very high likelihood for joint funding from FEMA

in Phase III.

REFERENCES:
DSWA EM-1, Effects of Nuclear Weapons on Personnel, Chapter 14.
Glasstone, The Effects of Nuclear Weapons