

**SUBMITTING PROPOSALS ON DEFENSE NUCLEAR  
AGENCY TOPICS**

The Defense Nuclear Agency is seeking Small Business firms with a strong research and development capability and experience in nuclear weapons effects and nuclear weapons phenomenology areas. Proposals should be submitted to:

Headquarters  
Defense Nuclear Agency  
Attn: AM/SBIR  
6801 Telegraph Road  
Alexandria, VA 22310-3398

Questions concerning the research topics should be submitted to:

Sandra Young  
(202) 325-1078

The research categories proposed for study under this program are:

1. Nuclear Weapons Effects Calculation.
2. Response of Materials to Nuclear Weapon Effects.
3. Nuclear Weapon and Neutral Particle Beam Effects on Electronics and Communications.
4. Nuclear Weapon Effects Simulation.
5. Instrumentation
6. Directed Energy Effects.
7. Nuclear Hardening and Survivability.
8. Security of Nuclear Weapons.
9. Theater Nuclear Forces (TNF) Survivability.
10. Operational Planning and Targeting.
11. Underground Nuclear Testing.
12. Verification Technology Development.
13. Nuclear Weapon Effects on Propagation.
14. Tactical Application of Pulsed Power Technology.

These topics are further explained below. Additional information beyond provided herein may be obtained by request from the address given above.

DNA-001            TITLE: Nuclear Weapon Effects Calculation

DESCRIPTION: The accurate calculation of nuclear weapon effects is a major concern of DNA. Areas of interest include more accurate calculations, faster running calculations, and microcomputer versions to enable use by a wide audience. Nuclear weapon effects include air blast; ground shock; water shock; cratering; thermal radiation neutron, gamma and x-ray radiation; electromagnetic pulse; fallout; blue-out; blackout; red-out; dust cloud formation; and radiation effects on personnel.

DNA-002            TITLE: Response of Materials to Nuclear Weapon Effects

DESCRIPTION: Of interest is the response of materials, structures, and systems to nuclear weapon effects. Materials of interest include metals, ceramics, and composites. New materials capable of being used as structural members for aircraft, missiles, ships, submarines, and military vehicles are of particular concern. The response of underground structures such as missile silos, command and control facilities, and communications facilities are especially important. Concepts and techniques, which will improve the survivability (decrease the response) of these types of systems to nuclear weapons effects are required.

DNA-003            TITLE: Nuclear Weapon and Neutral Particle Beam Effects on Electronics and Communications

The nature and magnitude of the effects produced by the interaction of nuclear weapon produced radiation and neutral particle beams on electronics, electronic systems, opto-electrical devices and sensors in the phenomenology areas of a) Transient Radiation Effects on Electronics (TREE); b) Electromagnetic Pulse (EMP); and c) System Generated EMP (SGEMP) are of interest to DNA. Particular areas of concern include: methods by which designers of space, strategic and tactical systems can assess their susceptibility to TREE, EMP, and SGEMP; d) hardening technology to reduce proven susceptibilities of electronic devices (especially those with submicron feature sizes) and systems to acceptable levels; and hardness assurance 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 and neutral particle beam are required.

DNA-004            TITLE: Nuclear Weapon Effects Simulation

DESCRIPTION: International treaties preclude the testing of nuclear weapons in the atmosphere and hence it is not possible to test military systems in an actual nuclear environment. To compensate for this, other testing methods are used to simulate the effects of the nuclear detonation. Nuclear weapons effects simulation includes: high explosive testing to simulate the mechanical effects, EMP simulation, thermal radiation simulation, and nuclear radiation simulation. Simulation techniques should be as realistic as possible, relatively inexpensive to perform and comparable to the threat environment. One should become familiar with existing programs to see how they can be improved and/or combined in order to make the total process more realistic and more representative of the actual nuclear weapons effect being studied. Both destructive and non-destructive test methods are desired.

DNA-005            TITLE: Instrumentation

DESCRIPTION: Instrumentation is used for measuring nuclear weapons effects, phenomenology parameters and the response of test items exposed to real or simulated nuclear weapon effects produced by underground testing or in an above ground simulator or in a water shock test. The instrumentation should be capable of operating under very harsh conditions, such as might be encountered in underground nuclear tests, high explosive tests, or tests involving high levels of x-ray, gamma, or neutron radiation. The instrumentation should survive long enough to record the needed data and include recording, data transmission and data analysis capabilities. Innovative concepts are required for new instrumentation such as gauges that will survive in environments so severe that existing gauges fail or perform inadequately. Calibration facilities are needed to calibrate existing gauges in every environment where the gauge could likely be used.

DNA-006            TITLE: Directed Energy Effects

DESCRIPTION: The effects of directed energy sources on materials, structures and systems are of interest to DNA. Of particular interest, is the establishment of the correlation between nuclear weapons effects and directed energy effects, the identification of materials, which are capable of withstanding both nuclear weapons effects and directed energy effects, and mechanisms by which the directed energy sources actually interact with target materials/structures.

DNA-007            TITLE: Nuclear Hardening and Survivability

DESCRIPTION: Techniques for nuclear hardening and survivability of systems/structures against nuclear weapons effects and, where compatible, directed energy effects are required. These techniques should protect the structure of system against the combined effects of blast, thermal and nuclear radiation in the cases of structures or materials, and should also provide protection against electromagnetic and radiation effects wherever any electronic capabilities are involved. In particular, the ability to harden communications facilities and surveillance sensors against electromagnetic pulses is required. Systems include planned and operational strategic and tactical ground mobile systems, missiles, aircraft, spacecraft, and their subsystems and components.

DNA-008            TITLE: Security of Nuclear Weapons

DESCRIPTION: Measures to improve the security of nuclear weapons against all possible threats are required. This includes the design of security features both for the actual weapon and for the facilities in which weapons are either stored or transported. These security measures should protect against all known or predicted threats and should be done in such a way as to avoid making the protected item visible as a target. Also of interest are methods to ensure effectiveness and efficiency of nuclear weapon security programs.

DNA-009            TITLE: Threat Nuclear Forces (TNF) Survivability

DESCRIPTION: The prelaunch survivability (PLS) of the TNF is of vital concern. New and innovative concepts to improve PLS are needed to retain a viable nuclear strike capability and to enhance deterrence. The threats to the TNF include forces conducting unconventional, conventional, chemical and nuclear warfare during periods of peacetime, transition to war, and war. Long-range program thrusts include force movements, and operational survivability of theater nuclear systems (aircraft, missiles, and cannon systems). Survivability concepts are warranted for the period of the 1990's and beyond. Concepts should employ innovative ideas and make use of new and emerging technologies.

DNA-010            TITLE: Operational Planning and Targeting

DESCRIPTION: The nuclear employment planning capabilities of operational commanders in tactical, strategic and integrated warfare environments should be improved. Improvements desired include development of automated planning systems, techniques to determine target damage objective and criteria, post strike target damage assessment capabilities, and automated nuclear weapon employment codes.

DNA-011            TITLE: Underground Nuclear Testing

DESCRIPTION: Underground nuclear effects tests are used in situations for which no suitable above ground simulator exists. Areas of interest include improvements in the design and execution of tests (horizontal/vertical line of sight and cavity), the design of new experiments which extend the capability of current test beds, innovative test concepts to meet future needs, improvements to the mathematical methods used to perform various calculations within the test design and analysis program, new methods of characterizing existing materials which are used in critical portions of the test bed (such as the A box) and new materials for such applications, new approaches to the

geological problems encountered in the construction of the test beds and new methods for all test activities (excavation, fabrication, assembly in the tunnel complex, recording data, transmission of data).

DNA-012           TITLE: Verification Technology Development

DESCRIPTION: New alarms control measures are being negotiated which could drastically alter existing inventories of nuclear weapons. New verification technologies and methods will be required to accurately monitor compliance to the provisions of any treaties or agreements that could result from the on-going negotiations. The problem will basically involve being able to distinguish between permitted activities and prohibited activities where the technical signatures between the two could be very minor.

DNA-013           TITLE: Nuclear Weapon Effects on Propagation

DESCRIPTION: The Defense Nuclear Agency is interested in the basic physical processes, which describe the interaction of electromagnetic radiation with a nuclear perturbed atmosphere. Our basic missions to predict effects on and determine mitigation methods for DoD systems include but are not limited to satellite communications, VLF/LF communications, HF/VHF communications, radar systems and sensor systems. Areas of interest include mechanisms coupling nuclear weapon energy to the atmosphere; physical and chemical phenomena arising from nuclear detonations; natural analogs of nuclear environments and processes; predictions of the performance of communications, optical/IR/ultraviolet, radar and directed energy systems in the nuclear environment; techniques to mitigate nuclear effects on DoD systems as mentioned above; unique instrumentation to measure or simulate nuclear effects and MHD-EMP; and experimental proposals to study naturally disturbed atmosphere as it would relate to nuclear environments.

DNA-014           TITLE: Tactical Application of Pulsed Power Technology

DESCRIPTION: Recent advances in energy storage and switching now make possible the application of DNA pulsed, power technology to such areas as armor/anti-armor, mine-countermine, anti-submarine technology, high power microwave weapons, etc. Concepts proposed should be highly innovative and make full use of the emerging pulse power technology.