[redacted]

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SERVICES COMMITTEE

DEPARTMENT OF DEFENSE BUDGET ESTIMATES, FISCAL YEAR 1965

Statement Before the House Armed Service Committee,
Sub-Committee on Research and Development.

MAJOR GENERAL ROBERT H. BOOTH, USA
DEFENSE ATOMIC SUPPORT AGENCY

Research, Development, Test and Evaluation, Defense Agencies
(Military Sciences)

BRIEF BIOGRAPHICAL SKETCH

Major General Robert H. Booth was graduated from the United States Military Academy and was commissioned a Second Lieutenant in the Field Artillery on June 12, 1930. He attained the rank of Major General in July 1956.

During the period between 1930 and 1943 he served in various assignments both as a student and an instructor, the last of which was with the Department of Mathematics, United States Military Academy.

In January 1943 he was appointed Assistant to the Assistant Chief of Staff for Personnel, U.S. Ground Forces. In July 1944 he went to the Pacific Theater of Operations, serving in combat with the Seventh Infantry Division first as Executive Officer of Division Artillery and then Division Chief of Staff until August 1945. He was named Assistant to the Military Governor of Seoul, a commissioner of the American Delegation of the Joint U.S., U.S.S.R. Commission at Seoul.

Jan 1964

In January 1947 he was assigned to the Office of the Chief of Army Field Forces at Fort Monroe, Virginia, as Assistant Chief of the Plans Section, New Weapons Group. In June 1948 he became Assistant Chief of Special Operations Division and in March 1949 was appointed Secretary. In July 1950 he was graduated from the National War College and the next month was assigned to the 8th U.S. Army, Korea, as Chief of the Operations Division, G3 Section.

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Defense Atomic Support Agency, FY 65 Estimates

In August 1951 he returned to the National War College as an instructor. In September of the next year he was transferred to Germany as Artillery Commander of the 2nd Armored Division in Europe. In June 1953, Artillery Commander of VII Corps in Germany.

Returning to the United States in June 1955, he was assigned to Fort Benning, Georgia as Artillery Commander of the Third Infantry Division. In August 1956, he was named Chief of Staff, First Army.

In August 1958 he was named as Assistant Deputy Chief of Staff for Operations, Plans, Training, U.S. Continental Army Command, Fort Monroe, Virginia and on October 9, 1959 became Commanding General, 2nd Region, U.S. Army Air Defense Command, Fort George G. Meade, Maryland. In January 1961 he was named Chief, Defense Atomic Support Agency, Department of Defense, Washington, D.C.

Mr. Chairman and Members of the Committee:

The Defense Atomic Support Agency is a joint organization of the Department of Defense staffed by civilians and members of each Service. As Chief of this Agency, I report to the Secretary of Defense through the Joint Chiefs of Staff.

The mission of the Defense Atomic Support Agency is to assist the Office of the Secretary of Defense and the Joint Chiefs of Staff, the Military Departments and the Military Services within those Departments and the Unified and Specified Commands by providing technical, logistic and training advice and services in the field of atomic weapons and to supervise the Department of Defense atomic weapons effects test and atomic weapons effects research activities.

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To carry out this mission the Defense Atomic Support Agency is organized with a headquarters and Joint Task Force-8, the joint test organization, in Washington, D.C.; a Field Command at Sandia Base, Albuquerque, New Mexico [redacted] located geographically about the United States. (CHART 1). The Defense Atomic Support Agency composed of these eight activities, has a total authorized strength of 7,120 personnel, 2,012 of whom are civilians.

In Fiscal Year 1965, in the areas of Research, Development, Test and Evaluation, the mission of the Defense Atomic Support Agency correlates with the safeguards of the Nuclear Test Ban Treaty in the areas of responsibility of three major program elements; Nuclear Weapons Effects Test, Nuclear Weapons Effects Research, and Nuclear Weapons Development.

Over the past several years, there has been marked fluctuation in the areas of nuclear weapons effects research and nuclear weapons effects tests as a result of major changes in National Policy regarding the conduct of atmospheric nuclear tests.

In August 1961, immediately following the Soviet announcement to resume nuclear testing, we initiated an underground test program with the limitation that there be no fallout. Shortly thereafter, on 24 October 1961, as the Soviets continued to test in the atmosphere, Presidential approval was announced for the

immediate resumption of atmospheric and high altitude nuclear testing.

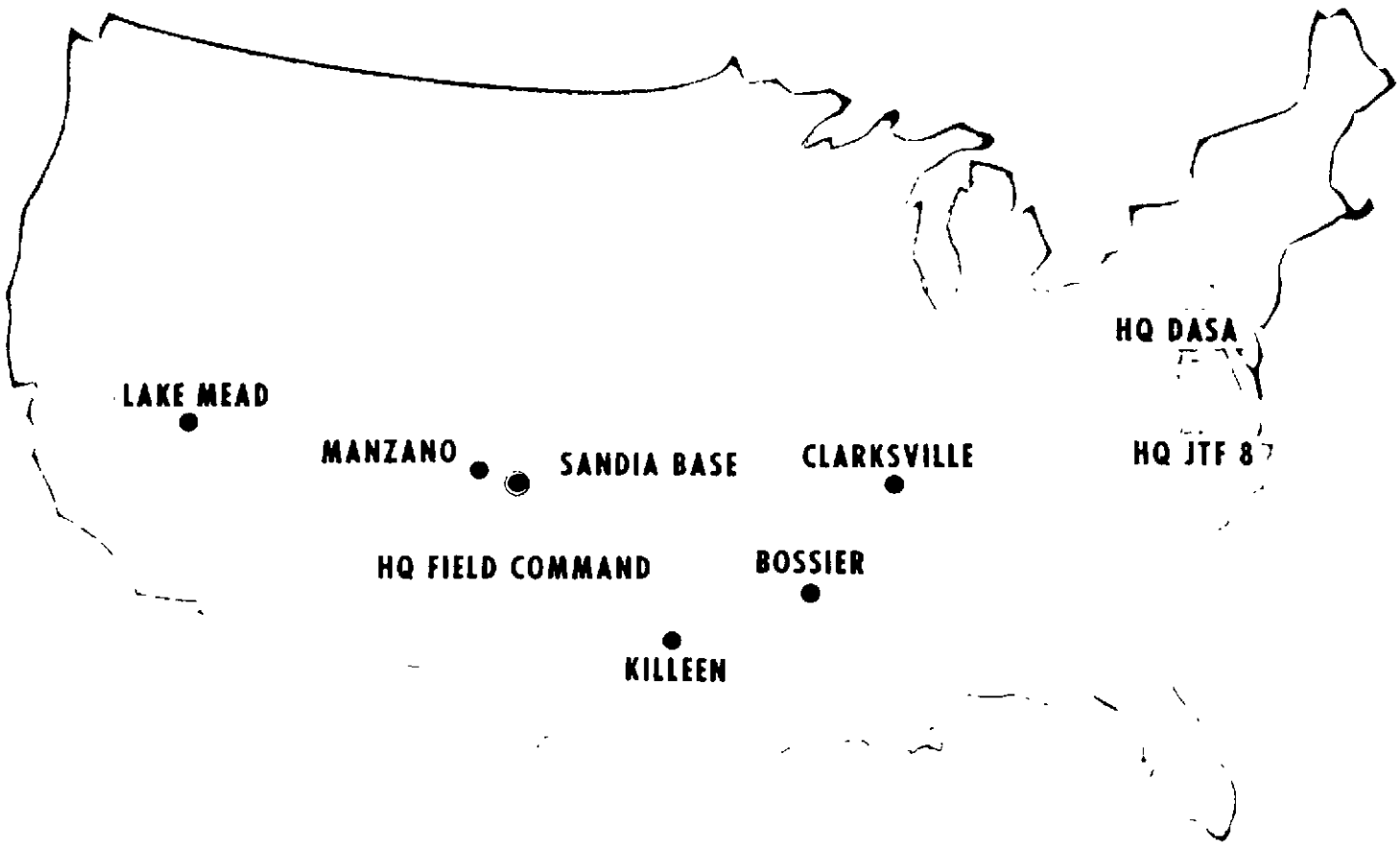
National Policy precluded advance planning and preparation for such tests but, the Defense Atomic Support Agency embarked on a test program and fielded a series of high altitude, atmospheric, underground and underwater events within a six months period. At the same time a continuing nuclear weapons effects research program was maintained, utilizing both Service and other government laboratories as well as educational institutions.

Then in May 1963, in view of the impending Nuclear Test Ban Treaty, a Presidential decision was again made to suspend all but underground tests. Since the ratification of the Test Ban Treaty, the Defense Atomic Support Agency, within the resources available, has realigned both its test and research programs to best satisfy three of the national safeguards. Our 1965 Research, Development, Test and Evaluation Budget reflects this realignment.

In the program we are covering, the Defense Atomic Support Agency is also responsible to the Secretary of Defense for assuring that nuclear weapons effects information is obtained and disseminated.

To further explain these programs, I have prepared a short briefing which I would like to present to you at this time. May I introduce Colonel William J. Penly, my Chief of Staff.

The DASA COMMAND



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Statement Before the House Armed Services Committee,
Sub-Committee on Research and Development.

Research, Development, Test and Evaluation, Defense Agencies
(Military Sciences)

Detailed Briefing of the Defense
Atomic Support Agency, Research,
Development, Test and Evaluation
Budget for Fiscal Year 1965.

BY

COLONEL WILLIAM J. PENLY
Defense Atomic Support Agency

Mr. Chairman, Members of the Committee:

I will first discuss the Nuclear Weapons Effects Research Program.

Defense Atomic Support Agency has requested $36 million to support the Nuclear Weapons Effects Research (NWER) Program in Fiscal Year 1965. This represents an increase of about 10% over our Fiscal Year 1964 program level ($33 million). This program is conducted in the Department of Defense Laboratories, together with supporting research organizations. (CHART 1).

With the treaty prohibition of all except underground nuclear tests, and the consequent curtailment of the previously planned Fiscal Year 1965 test program, greater emphasis is now being placed on the

use of simulation techniques to obtain some of the required information. The major emphasis in this program has shifted in the last few years from the effects on standard structures and items of military equipment to effects on advanced weapons systems and basic phenomena measurements in new environments.

This knowledge is particularly needed for the design of hardened re-entry vehicles for defense against anti-ballistic missiles -- for design of hardened missile launch complexes, and command and communications centers -- for assessment of vulnerability of advanced weapons systems and installations; and to guide the development of strategic and tactical doctrine for both offensive and defensive use of our military forces and for passive defense of our civil population.

To provide for efficient program formulation and management, our program is subdivided into nine areas of weapons effects information. These project elements are as indicated in the Defense Atomic Support Agency program books.

The first project area is Air Blast. In Air Blast, the primary effort is being directed toward the development of blast effects information on re-entry vehicles. This is in support of both the anti-ballistic missile program, and the development of hardened re-entry vehicles for our own systems. The project element also includes the use of high explosive simulation of nuclear weapon blast waves for effects on or near the surface and at high altitude. (CHART 2).

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This is a representative group of areas being investigated in this project area. (CHART 3).

The second project element is Nuclear Radiation. This includes studies on improved methods of measuring the initial nuclear radiations, and on shielding against them. The ultimate aim of this portion of the program is an improved capability for tactical exploitation of small nuclear weapons as well as the development of procedures for defending against their use. The shielding studies, in addition, have important applications in defense against large yield weapons, including Civil Defense applications. This program also includes investigations into the Transient Radiation Effects on Electronics (TREE). This work emphasizes a better understanding of the interaction of radiation with electronic components and circuits. This will insure proper function of our own electronics systems in a nuclear environment by improving our electronic component design capability. (CHART 4). This is a representative group of areas being investigated in this project area. (CHART 5).

The third project element, Underground Protective Structures, provides information needed to assess the vulnerability and improve the design of hardened underground missile launch complexes, communications centers, and command posts. The principal area where information is needed is in the region close to a nuclear burst where the crater, debris from the crater, and very high pressure levels exist.

(CHART 6). This is a representative group of areas being investigated in this project area. (CHART 7).

The fourth program element is Biomedical. This includes investigation of the effects of nuclear weapons upon biologic targets, primarily human beings. Lower animals are used experimentally and the data is extrapolated to man. The effects include ionizing radiation, blast and shock, and thermal. Much effort has gone into the establishment of the Armed Forces Radiobiology Research Institute where the radiation aspects of nuclear weapon detonations can be simulated. This capability is of inestimable value, particularly during the test moratorium. A prime effort is now being made in the study of dose rates of radiation exposure in the production of instantaneous lethality, incapacitation and recovery. These studies will lead to far more reliable casualty prediction criteria and possibly significantly affect weapons development and field operational doctrine. (CHART 8). This is a representative group of areas being investigated in this project area. (CHART 9).

The Underwater project element is designed to develop information on the underwater and above water blast effects resulting from underwater nuclear explosions. The major project emphasis is the development of information needed for the design of shock hardened submarines and ships. (CHART 10). This is a representative group of areas being investigated in this project area. (CHART 11).

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The Electromagnetic project element has two principal areas of interest, radar and communications blackout--and the electromagnetic pulse (EMP) effect. From the viewpoint of offense, research is aimed at understanding the interaction of nuclear detonations with the ionoshere and the earth's magnetic field so as to permit the development of tactics to use such detonations as penetration aids. These tactics could deny the enemy, the radar and communications coverage necessary to employ an effective anti-ballistic missile system. From a defensive point of view, this work will lead to a basis for minimizing the vulnerability to nuclear effects of the very extensive communications systems upon which the positive control of our nuclear deterrent is vitally dependent. In the area of Electromagnetic Pulse, there is vital need for sufficient knowledge to minimize a potential Achilles heel in our own advanced systems, such as hardened Minuteman missile launch complexes. (CHART 12). This is a representative group of areas being investigated in this project area. (CHART 13).

The Fallout project element is designed to develop information on the effects of radioactive fallout of military significance. This program effort is directed toward improving the military fallout prediction systems. (CHART 14). This is a representative group of areas being investigated in this project area. (CHART 15).

The eighth project element includes both Thermal and X-ray effects. The advent of very large weapons increases the possibility of very large numbers of casualties from either thermal burns or secondary fires.

Laboratory efforts are concentrated on gaining a better understanding of the thermal energy potential of the Anti-Ballistic Missile; the critical energy levels required to produce ignition in kindling materials; and the atmospheric attenuation which might reduce damaging effects, particularly at large distances. X-ray work aims at consolidating and applying the information gained from recent tests so as to permit improved design of our own missile systems and to exploit X-rays as a means of destroying enemy satellites. (CHART 16). This is a representative group of areas being investigated in this project area. (CHART 17).

The last project element is Integrated Effects. It is designed to provide required information on those nuclear weapons effects which, when acting in combination, may result in significantly greater damage than that resulting from any single effect. This research seeks understanding of the manner in which separate effects combine, and the utilization of this information in predicting target vulnerability. (CHART 18). This is a representative group of areas being investigated in this project area. (CHART 19).

This completes our Nuclear Weapons Effects Research Program. I will now discuss the Nuclear Weapons Effects Test Program.

This portion of the Research, Development, Test and Evaluation budget is $72 million. The main areas of effort, tailored to support one or more of the safeguards, are; a Preparedness Base, an expanded

Underground Program, and a Readiness to Test Effort in other environments (CHART 20).

The Preparedness Base is made up of these three separate categories. (CHART 21).

The first category is directed primarily toward the development of test instrumentation to support our test programs, both those authorized under the Test Ban Treaty, and those for which we are achieving readiness. This development program involves a large and continuing laboratory effort which has a threefold objective:

1. To improve existing instrumentation previously developed and used in recent test series.

2. To develop new instruments to measure data (a) under extreme environmental conditions (b) and at extreme limits in range (of magnitude).

3. To incorporate in all instrumentation the capability for very rapid reduction and evaluation of raw data.

In this project instrumentation is developed only through the prototype stage. Actual procurement of instruments, once developed would be charged to the technical funds of the test series in which used. This development effort is directly related to the first three safeguards. (CHART 22).

The second category in the Preparedness Base is Extra-Military Expenses. These costs are requested to operate Joint Task Force

EIGHT: to operate and maintain facilities on Johnston Island, and to provide the extra-military support needed for the underground effects shots at the Nevada Test Site. (CHART 23).

The High Altitude Sampling Program (HASP) has been included here. The objective of the High Altitude Sampling Program is to determine information on the inventory and movement of weapons debris in the atmosphere A significant amount of recent weapons test debris will be present in the atmosphere during FY 1965. (CHART 24).

Next the Underground Program. The objectives of our underground program falls into two categories.

First, to obtain the data that we would normally seek from contained underground shots. These include:

1. The test of design concepts for super-hard command and control structures.
2. Ground shock.
3. Phenomena of different soils and rock.

The Second category is to obtain as much data as possible that would normally be obtained by tests in environments which are now prohibited by the Test Ban Treaty. In this category are the following:

1. X-ray coupling and effects on spacecraft components.
2. Cratering prediction and effectiveness.
3. The investigation of transient radiation effects

on electronics.

4. Electromagnetic pulse mechanism and effects.

A continual effort is being made to expand and improve the underground test program. As new ideas which are feasible and profitable are developed, they will be incorporated into the program. (CHART 25).

The *Readiness to Test (other environments) category is directed* toward the achievement and maintenance of a readiness posture that will enable us to institute prompt nuclear tests in the atmosphere should they be deemed essential to our national security. The objective of these test programs is to seek important data that is denied us by the Test Ban Treaty and which cannot be obtained from an underground program. Included in this category, are the following:

1. Re-entry vehicle vulnerability under dynamic re-entry conditions.

2. Effectiveness of nuclear burst as penetration aids.

3. Survivability of hardened sites against electro-magnetic pulse effects and strong ground shock.

4. Underwater effects.

5. Tactical nuclear weapons effects.

6. Improve design criteria and reliability for more effective and economical ballistic missile defense systems.

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We have asked for $13,330,000 in this area. You will note that the smallest amount has been requested in this important area. The reason is that some of the programs in this category were previously funded and are on their way toward the directed readiness posture, and will require only periodic updating and holding costs. (CHART 26).

This complete the Nuclear Weapons Effects Test Program.

The last program element is concerned with Nuclear Weapons Development for which we are asking $1,400,000 to continue research to improve safety in four areas of atomic weapons vulnerability. (CHART 27).

The objective of the DASA Fragmentation project is to determine the vulnerability of the components and new materials being used in nuclear weapons to hypervelocity fragments, bullets, and special shapes likely to be encountered in accidents or from anti-ICBM or anti-aircraft defenses. Such information will permit us to increase the effectiveness of our anti-missile systems, as well as to decrease the vulnerability of our warheads to enemy anti-missile systems. This work will be coordinated with work performed by other agencies in this field. Also included is the Dividing Wall Program, a Joint Services-DASA Test Program which is determining the risk of accidental High Explosive propagation between weapons stored in the various types of structures now in use.

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The objective of the Fire Project is to assist the Services in the improvement of safety procedures to be used when nuclear weapons have been exposed to fire during their transportation, storage, handling, or deployment and to help design future weapons which are less vulnerable to fire. Using the results of past tests, we anticipate that we can predict response of new weapons to fire without resorting to expensive full-scale testing.

The objective of the DASA increment of the Impact Project is to provide data to decrease the vulnerability of nuclear weapons to impact and crushing resulting from accidents, and to improve safety procedures during storage, handling, transportation and employment. This information is also expected to be helpful in the design of future weapons. We believe that sufficient information now exists from model and full-scale tests of existing weapons to permit the development of this program.

The objective of the DASA increment of the Electronic Countermeasures and Accidental Electronics Interference Program is to determine the vulnerability of nuclear weapons to Electromagnetic Radiation (EMR) and to develop techniques and instruments to measure Electromagnetic Radiation intensities in the field, as a basis for defining Electromagnetic Radiation danger zones to prevent damage to nuclear weapons. This project is being closely coordinated

with the Navy's Hazards of Electromagnetic Radiation to Ordnance (HERO) program.

We shall try to answer any questions or to elaborate on any of the programs within the areas of our responsibility.

THE

DEFENSE ATOMIC SUPPORT AGENCY

R. D. T. & E. BUDGET

FY '65

DASA RDT&E BUDGET

NUCLEAR WEAPONS EFFECTS RESEARCH (NWER)

FY 1965 FUNDING $ 36,000,000

1. AIR BLAST $2,105,000

MAJOR OBJECTIVES

RE-ENTRY VEHICLE BLAST KILL (ABM)

RE-ENTRY VEHICLE HARDENING CRITERIA

1. AIR BLAST

AREAS OF INVESTIGATION

BLAST KILL OF RE-ENTRY VEHICLES

BLAST EFFECTS ON MISSILES

BLAST ON ADVANCED GROUND SYSTEMS

BLAST WAVE PROPAGATION

AIR BLAST MEASUREMENTS

BLAST WAVE SIMULATION (LARGE H.E. SHOTS)

2. NUCLEAR RADIATION $7,035,000

MAJOR OBJECTIVES

RADIATION MEASUREMENTS

SHIELDING

TRANSIENT RADIATION EFFECTS ON ELECTRONICS (TREE)

2. NUCLEAR RADIATION AREAS OF INVESTIGATION

RADIATION DETECTION AND MEASUREMENT

SHIELDING AGAINST NUCLEAR RADIATION

EFFECTS OF RADIATION ON ELECTRONICS

IMPROVEMENT OF SIMULATION EQUIPMENT

RADIATION TRANSMISSION

SPECIAL NEUTRON EFFECTS

3. UNDERGROUND PROTECTIVE STRUCTURES

$5,000,000

MAJOR OBJECTIVES

ASSESS VULNERABILITY

IMPROVE HARDENING

3. UNDERGROUND PROTECTIVE STRUCTURES

AREAS OF INVESTIGATION

SHOCK VULNERABILITY OF HARDENED SITES

SHOCK PROPAGATION THRU SOIL AND ROCK

INTERACTION OF STRUCTURES AND SOIL AND ROCK

UNDERGROUND SHOCK RESEARCH INSTRUMENTATION

EFFECTS OF STRUCTURE MOVEMENTS ON CONTENTS

LAB SIMULATION OF SOIL SHOCK LOADING

4. BIOMEDICAL $4,600,000

MAJOR OBJECTIVES

EFFECTS ON MAN OF IONIZING RADIATION, BLAST, THERMAL.

4. BIOMEDICAL

AREAS OF INVESTIGATION

BIOLOGICAL BLAST AND SHOCK EFFECTS

THERMAL INJURY

PROTECTION AGAINST THERMAL INJURY

RADIATION EXPOSURE VS. DEGREE OF INJURY

RADIATION HAZARDS OF NUCLEAR WEAPONS

RADIATION PROTECTION TABLET

COMBINED RADIATION EFFECTS

CASUALTY HANDLING

5. UNDERWATER

MAJOR OBJECTIVES

DESIGN INFORMATION FOR HARDENING SUBMARINES AND SHIPS

5. UNDERWATER

AREAS OF INVESTIGATION

BLAST VULNERABILITY OF SHIPS AND SUBMARINES

FORMATION OF WEAPON-GENERATED WAVES

BLAST AND WAVE VULNERABILITY OF WATERFRONT STRUCTURES

FACTORS AFFECTING BLAST AND WAVE INTENSITY

BUBBLE EFFECTS FROM UNDERWATER EXPLOSIONS

SIMULATION IMPROVEMENTS

6. ELECTROMAGNETIC $9,310,000

MAJOR OBJECTIVES

RADAR AND COMMUNICATIONS BLACKOUT

ELECTROMAGNETIC PULSE (EMP)

6. ELECTROMAGNETIC

AREAS OF INVESTIGATION

R/V FUZING AND GUIDANCE VULNERABILITY

HIGH AND LOW ALTITUDE DISTURBANCES

RADAR AND COMMUNICATIONS DISTORTION

DEVELOPMENT OF SPECIALIZED RESEARCH INSTRUMENTS

SIMULATION EQUIPMENT AND TECHNIQUES

DATA RECOVERY AND EXPLOITATION

7. FALLOUT $1,455,000

MAJOR OBJECTIVES

IMPROVEMENT OF FALLOUT PREDICTION SYSTEMS

7. FALLOUT

AREAS OF INVESTIGATION

PREDICTION SYSTEM IMPROVEMENT

FACTORS AFFECTING FALLOUT AMOUNT AND LOCATION

SIMULATION FOR FALLOUT PREDICTION

DATA UTILIZATION

8. THERMAL & X-RAY $2,815,000

MAJOR OBJECTIVES

THERMAL ENERGY POTENTIAL FOR ABMS

CRITICAL ENERGY LEVELS FOR FIRES AND BURNS

ATMOSPHERIC ATTENUATION

EXPLOIT X-RAYS FOR R/V KILL

8. THERMAL

AREAS OF INVESTIGATION

X-RAYS AND THERMAL VULNERABILITY OF R/V

IGNITION AND THERMAL TRANSMISSION

SIMULATION TECHNIQUES

THERMAL PREDICTION SYSTEM

9. INTEGRATED EFFECTS $680,000

MAJOR OBJECTIVES

COMBINATION OF EFFECTS

DETERMINATION OF EXTENDED KILL RADIUS

9. INTEGRATED EFFECTS

AREAS OF INVESTIGATION

SATELLITE VULNERABILITY

DAMAGE ENHANCEMENT DUE TO COMBINED EFFECTS

DASA RDT&E BUDGET

NUCLEAR WEAPONS EFFECTS TEST (NWET)

FY 1965 FUNDING

PREPAREDNESS BASE	$36,082,000
UNDERGROUND TESTS	22,588,000
READINESS-TO-TEST (OTHER ENVIRONMENTS)	13,330,000
TOTAL	$72,000,000

PREPAREDNESS BASE $36,082,000

DEVELOPMENT OF TEST INSTRUMENTATION

EXTRA-MILITARY EXPENSES

HIGH ALTITUDE SAMPLING PROGRAM

DEVELOPMENT OF TEST INSTRUMENTATION $ 18,405,000

IMPROVE EXISTING INSTRUMENTATION

DEVELOP NEW INSTRUMENTS

CAPABILITY FOR RAPID REDUCTION AND READOUT OF RAW DATA

EXTRA - MILITARY EXPENSES $16,877,000

OPERATIONAL EXPENSES

JTF-8

JOHNSTON ISLAND

NEVADA TEST SITE

HIGH ALTITUDE SAMPLING PROGRAM $800,000

DETERMINE INVENTORY AND MOVEMENT OF WEAPON DEBRIS

UNDERGROUND PROGRAM $22,588,000

OBJECTIVES

UNDERGROUND EFFECTS DATA

- DESIGN CONCEPTS FOR SUPER-HARD COMMAND & CONTROL STRUCTURES
- GROUND SHOCK
- PHENOMENA OF DIFFERENT SOILS & ROCK

EFFECTS DATA NORMALLY OBTAINED IN OTHER ENVIRONMENTS

- X-RAY COUPLING & EFFECTS ON SPACE CRAFT COMPONENTS
- CRATER PREDICTION & EFFECTIVENESS
- TRANSIENT RADIATION EFFECTS ON ELECTRONICS (TREE)
- ELECTROMAGNETIC PULSE (EMP) EFFECTS

READINESS TO TEST (OTHER ENVIRONMENTS) $13,330,000

OBJECTIVES: INFORMATION DENIED BY TREATY

R/V VULNERABILITY UNDER DYNAMIC RE-ENTRY CONDITIONS

EFFECTIVENESS OF NUCLEAR BURSTS AS PENETRATION AIDS

SURVIVABILITY OF HARDENED SITES VS. EMP EFFECTS & GROUND SHOCK

UNDERWATER EFFECTS

TACTICAL NUCLEAR WEAPONS EFFECTS

IMPROVE DESIGN CRITERIA AND RELIABILITY FOR MORE EFFECTIVE AND ECONOMICAL BALLISTIC MISSILE DEFENSE SYSTEMS

NUCLEAR WEAPONS DEVELOPMENT $1,400,000

OBJECTIVE: IMPROVE SAFETY

FRAGMENTATION

FIRE

IMPACT

ELECTRONIC COUNTERMEASURES AND ACCIDENTAL ELECTRONICS INTERFERENCE