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MEMORANDUM FOR: A. C. Graves

FROM: W. E. Ogle

SUBJECT: RECENT CHANGES IN THE IVY PROGRAM

SYMBOL: J -12732

PROGRAM 1 - RADIOCHEMISTRY

Project 1.3 - Sample Collecting

Dr. Harold Plank is now making arrangements for comparatively simple back-ups on the air sampling for Mike Shot. He plans to arrange containers of some sort which will allow for the collection of radioactive water after the shot if there is difficulty with the airplane sampling. This water sampling would not be by remote control. He also plans to arrange for two blower-type air samplers, one to be on Bogallua, the other to be on Engebi. The details of these collectors are not yet available.

PROGRAM 2 - PROGRESS OF THE NUCLEAR REACTION

Projects 2.2, 2.3, and 2.4 have been greatly changed from the techniques originally planned. The same quantities i.e., time between the [redacted] However, instead of the signals being transmitted by light from the bomb to the recording station, they will now be transmitted by gamma rays. In order to transmit the signal that f[redacted] by gamma rays, it will be necessary to replace the air between bomb and recording station with helium. The rise of the reaction [redacted] will be observed by gamma rays formed in the uranium and iron of the bomb. The propagation of the reaction will be observed by Tenex-type experiments. Further details of this experiment are available in the J-Division monthly report for June.

Because of the replacement of air by helium, a Tenex-type experiment to measure the f[redacted] been added as Project 2.6. The project director is Dr. E. H. Krause.

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WITH DELETIONS
BY AUTHORITY OF DOE/OC
REVIEWED BY J. Diaz DATE 10/24/83 11/4/85
This document consists of 4 pages
No [redacted]

Ogle

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PROGRAM 3 - SCIENTIFIC PHOTOGRAPHY

Project 3.3 - Hot-spot Observations

Experimental work at Operation Snapper has suggested certain minor changes in the technique to be used on this experiment. In particular, the pipes will be lengthened from 20 to 35 ft, they will be filled with helium at the time of the shot, and at least two collimating baffles will be placed between the mirror system and the cameras on Bogallua.

Recent listings of the programs and projects of Ivy have neglected to indicate that there are project co-directors of Project 3.3: Mr. Berlyn Brixner and Dr. Gaelen L. Felt.

PROGRAM 4 - NEUTRON MEASUREMENTS

Project 4.3 - Neutron Spectrum - Nuclear Emulsions

Because of the addition of Project 2.6, this project has been dropped from the program.

PROGRAM 5 - GAMMA-RAY MEASUREMENTS

Project 5.3 - Fall-out Gamma Intensity

Plans are now being made to turn this project over to Livermore, a group at the Radiation Laboratory of the University of California at Berkeley. It is proposed that they finish designing and building the equipment necessary for these measurements and carry out the measurements in the field.

Project 5.4a - Fall-out Distribution and Particle Size
Project 5.4b - Close-in Particulate Cloud and Fall-out Studies

Project 5.4a has had the number of land sampling stations reduced from 8 to 5, and Project 5.4b has had the number of land stations requiring Holmes and Narver construction reduced from 33 to 12. However, H+N is being requested to provide labor to assist in temporary-type construction to house as many of the additional stations as is determined to be possible after the project personnel arrive at the site. These reductions in stations were made necessary because the present H+N workload precludes their construction in time to meet the M - 7 deadline. The number and placement of DAN buoys for Project 5.4a is still being discussed between the project officer and TG 132.3.

PRESENT STATUS OF THE LASL PORTION of the IVY EXPERIMENTAL PROGRAM

The following listing is an outline of the Ivy experimental program as it appears to date.

MIKE SHOT

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PROGRAM 1 RADIOCHEMISTRY - LASL-J-11 (R. Spence)

1.1 Yield Measurements - LASL-J-11 (R. Spence)

DELETED The determination of the radiochemical yield of the s still not in a completely satisfactory condition. However, it does appear that one will be able to measure the energy release to ten or fifteen per cent accuracy by determining (a) the total fission yield by normal radiochemical means, and (b) the total number of neutrons by observing the captures in the components of the bomb and in the nitrogen of the air by means of a gas sampling program conducted by AFOAT-1. If one knows the total number of fissions, knows ν for the fissionable material and the spectrum used, and the total number of neutrons, one can then determine the total number of neutrons arising from the thermonuclear burning. That number will then yield the energy release of the thermonuclear portion of the weapon. The sum of this and the fission yield will give the total energy release.

The major uncertainties in yield measurements are:

(a) The question of whether adequate samples can be collected,

(b) The question of fractionation, and

(c) The possibility of determining the total number of neutrons.

All these uncertainties look quite hopeful at this time.

1.2 Internal Nuclear Detector Measurements - LASL-J-11 (G. Cowan)

Various diagnostic quantities will be measured by the use of internal nuclear detectors. These are as follows.

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4.2 High-energy Neutron Threshold Detectors

Sulphur (n,p reaction, threshold effectively 3 Mev), iodine (n,2n reaction, threshold effectively 10 Mev), and zirconium (n,2n reaction, threshold effectively 12.5 Mev) samples will be placed at 100-yd intervals from zero to 1700 yds along the reef toward Bogallua. There is a tentative plan which is not yet firm to fasten all the above samples to a cable which would be pulled in by a winch at 1700 yds. Further cerebration may lead to a decision not to use the winch.

Zirconium samples will also be placed in line with the collimator holes from the collimator mentioned in Program 2, above, out to approximately 800 yds, if the collimation is not so tight as to forbid extra material in their line of sight.

It is presently planned that all counting with the possible exception of the epithermal neutron detectors will be at Los Alamos.

4.3 Neutron Spectrum--Nuclear Emulsions

No decision has as yet been made on this experiment. Because of the uncertainty as to the value of the measurements obtained, an investigation of the cost of using some equipment left over from Greenhouse and thereby doing a very simple and cheap experiment is being made. It is feared that the final decision from T Division as to the value of this experiment will not be available in time to allow a major effort after that decision. No definite plans are available to date.

4.4 Neutron Intensity as a Function of Time

Both slow neutron and fast neutron intensity as a function of time will be measured. using the techniques tested at Greenhouse, at a station on San Il de Fonso at approximately 1200 yds. These measurements will cover the range from 1 msec to approximately 30 sec.

In addition to the above measurements, a few samples of U^{237}, U^{238}, and U^{235} will be placed along the threshold detector line described above as measurements of intermediate energy neutron fluxes.

PROGRAM 5 GAMMA-RAY MEASUREMENTS - LASL-J-13 (J. Malik and N. Smith)

5.1 Total Gamma-ray Dose - LASL-H-6 (E. Storm)

Film badge total dose measurements will be made on two lines, one from Elugelab to the far end of Bogallua, the other from Elugelab to the far end of Engebi, both measuring at 100-yd intervals on land only. At each position there will be three film badges, one of which remains in position after the shot, the second of which drops at approximately 0.2 sec

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into a shielded position, the third of which drops at approximately 60 sec into a shielded position. The differences between these three measurements will give information on the early dose as compared to the late and also on the total fall-out in close-in regions.

The film dropping mechanisms are not yet procured because different types of mechanisms are being tried on the Snapper operation. Similarly, the amount of shielding required has not yet been set and is again awaiting information to be gained at Snapper.

5.2 Gamma Intensity as a Function of Time - LASL-J-13 (J. Malik)

Function of time measurements will be made at four positions, as follows:

At Cochiti, San Il de Fonso, Bogombogo, and Ruchi, measurements from 1 msec to 30 sec covering 6 decades of signal.

At Ruchi, measurements from [redacted] μsec to 20 μsec covering approximately 8 decades (it is planned that this measurement will also obtain the time [redacted], and measurements with 5 μsec resolution up to [redacted] μsec, covering again 8 decades.

The installation at Ruchi will require a small blockhouse, the requirements for which have been turned in to Campbell. The installations on the other islands will use the same type station as used at Buster, i.e., a self-contained unit.

5.3 Fall-out Gamma Intensity - LASL-J-13 (J. Malik)

For fall-out measurements, self-recording radiation monitors are proposed for the islands of Rigili, Parry, Biijiri, Engebi, and Runit, with telemetering monitors for Bogon and Engebi. These are to be ionization chambers driving ultimately an Esterline-Angus recorder or equivalent. Similar monitors are proposed for approximately ten other atolls in the neighborhood.

It is proposed that these fall-out measuring instruments be tried out on Snapper.

5.4 Fall-out at Intermediate Distances, Particle Collection and Analysis

No details of this program are available to this office at present.

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Gas collection "snap samplers" will also be used on these aircraft to obtain samples of the gases. It is hoped that both C^{14} and He^3 can be observed from these collections. Rain water samples will also be analyzed for tritium.

7.4 Propagation of Seismic Waves - AFOAT-1 (J. Crocker)

Remote seismic stations operating in the Atomic Energy Detection System will be used to obtain data on long range propagation. The data obtained will be used to supplement experimental work accomplished at previous operations.

7.5 Transportation of Airborne Debris - AFOAT-1 (P. Allen)

Theodolites and weather radar will be used to determine the height and movement of the visible debris for several hours following detonation. Samples of air will be collected from a network of stations in the northern and southern hemispheres for a number of months following the operation.

7.6 Detection of Fireball Light at Distances - AFOAT-1 (M. Oleson)

It is expected that two planes will be used at remote positions to carry light-observing equipment. There will also be four ground sites at remote positions. Exact sites are not yet available to this office.

For further details of Program 7, see Ltr, 18 Mar 52, Symbol AFOAT-1/OPNS, Major A. V. Arrowsmith, Asst Exec, AFOAT-1, to CG, Air R+D Command, subj: "AFOAT-1 Project Proposals for Operation Ivy".

PROGRAM 8 THERMAL RADIATION MEASUREMENTS - LASL-J-14 (L. Seely)

8.1 Integral Thermal Radiation - NRL (H. Stewart)

Total thermal radiation will be observed by ballistic thermocouples from Parry and Biijiri. Integrating black balls will be placed on Biijiri, Bogallua, Aitsu, Bokon, Kirinian, Engebi, between Engebi and Bogon, and on Bogon, as close measurements of the same quantity. The stations for the black balls will be identical to those used on Jangle. The thermocouples will be operated from Station 6B on Biijiri and from the photo tower on Parry.

8.2 Thermal Intensity as a Function of Time - NRL (H. Stewart)

This quantity will be measured by high-speed bolometers at Station 6B on Biijiri and Station 6B on Engebi. These instruments have a resolving time of approximately 25 usec.

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