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5 March 1952

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95-8-2/8/95
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Col. Kenner Hartford
Director, Office of Test Operations
Santa Fe Operations Office
U. S. Atomic Energy Commission
P. O. Box 5100
Albuquerque, New Mexico

Subject: PROJECT 4.5

Dear Col. Hartford:

Attached is an outline of approved Project 4.5, Operation
Tumbler/Snapper, which was submitted to this office on
4 March 1952. Part of this experiment involves the use of
human subjects in which there is a possibility that per-
manent eye damage may result.

In Operation Buster/Jangle there was a similar experiment con-
ducted by the Air Force, wherein the observation was made from
an airplane and at that time this office requested the military
organization involved to furnish by document release of AEC re-
sponsibility in the event of permanent eye damage to the indivi-
duals.

It is my opinion that similar arrangements should be made with
the military organization for Project 4.5 Tumbler/Snapper. If
you agree, please advise me as to whether you consider this
request should come from the Test Director's or from the Test
Manager's Office.

~~This material contains information affecting
the national defense of the United States
within the meaning of the espionage laws,
Title 18, U. S. Code, and the trans-
mission or communication thereof in any
manner to an unauthorized person is pro-
hibited by law.~~

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Very truly yours,
J. C. CLARK
Deputy Test Director

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CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

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Distribution:
Copies 1&2 - Col. K. Hartford (w/1 enc)
Copy 3 - J. Clark
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Copy 5 - J-Sequence
Copy 6 - J-Division

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OUTLINE OF PROJECT 4.5

REPOSITORY	LINAL/ANL-11023
COLLECTION	RECORDS OF J-DO
BOX No.	A-91-048
FOLDER	# 95-8

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NEED: Except for the information obtained by the Air Force in Operation Buster, there is no accurate information of the effect of the flash of atomic explosion on the eyes of human beings. When the human eye is subjected to a brilliant flash of light, the retina becomes temporarily non-functional in the areas exposed. This results in a scotoma or "blind spot". Usually the eye recovers in a period of 4 or 5 minutes. However, if actual damage is done to the eye, then the area of blindness may remain a long time or even permanent. Should the central vision of a soldier or airman be temporarily disabled and the visual acuity reduced below 20/400, he becomes useless as a fighting man an easy prey to the enemy and potentially a danger to his own forces.

PURPOSE: It must be determined accurately what temporary or permanent effect the flash of an atomic explosion has on the human eye. The time and degree of incapacity of a fighting man must be determined. Since the dark adapted eye (pupil dilated and retina conditioned for night vision) is over 500 times more sensitive to light than the light adapted eye, the tests must be conducted under simulated night-time conditions. The eyes of animals should be exposed to the flash and then examined to determine permanent effects of the exposure.

METHOD: It is proposed to divide this project into two phases: (1) Human observers; and (2) Animal exposures.

(1) Human Observation: It is proposed to build a light-tight, semi-trailer van in which all the test equipment will be installed. This van will be parked at a site approximately nine miles from the zero point. There will be no obstruction to vision between the point of explosion and the van. In the sides of the van will be ports equipped with shutters for exposure of the eyes of the observers. Within the van, seated along the side facing the explosion, will be ten observers. The interior of the van will be in complete darkness for a period of 45 minutes preceding the explosion. Each observer will place his face in a hood. Within the hood will be a small red fixation light at which he will gaze with his right eye only. The left eye only will be behind the shutter device which opens to the side of the trailer directed at the explosion. At, or 1/50 of a second preceding, the explosion, the shutters will open exposing the left eye only to the flash. (The fixation light will be placed in such a way that the area of the retina exposed will not be the area of the retina utilized for central vision. In the later tests, if it can be determined that the retina received no permanent damage from previous exposures, some of the observers may be caused to expose the central retina.)

Two of the tests will be done with the shutters open (light adapted eyes) and the remaining five done with dark adapted eyes.

Immediately after the explosion the observers will be tested for visual acuity and visual field defects (blind spots) until their vision has returned to normal and no blind spots are evident. It is not expected that this time will exceed one hour. Accurate records of each determination will be made with record of the time from the explosion.

rec'd by J-Division

4 March

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Some of the observers will be equipped with protective devices. Among the protective devices to be tested will be the regulation smoked flying glasses, deep smoked glasses, slit and pin-hole glasses, and a photo-electric shutter apparatus devised by the Air Force.

Both before and after the experiments all the examinees will be given complete refractions, funduscopic examinations, and thorough visual field examinations. After each test the left eye of each examinee will receive a careful funduscopic examination to determine, if any, temporary or permanent damage has occurred (though none is expected).

The results will be compiled to determine loss of visual acuity and central vision in the daytime and at night and an estimate of the actual loss of efficiency of a fighting man resulting in temporary loss of vision from the flash.

(2) Animal Exposures: It is proposed to expose the eyes of dogs to the flash from the same location as the human observers. One of the eyes of each animal will be dilated with atropine to simulate, at least partly, the night adapted eye. The animal will be anesthetized and the eyes held open by lid speculum. Following the experiment the animal will be sacrificed and the eyes removed and shipped to the Army Institute of Pathology for sectioning and microscopic examination for evidence of damage.

Two tests of four animals will be tested in this manner.

PERSONNEL: The Air Force will furnish 17 officer personnel. Included among these will be the ten examinees and seven of the examiners. Three officer personnel are to be furnished by the army in addition to the project officer. Request one of the officers be assigned immediately to Randolph Field, School of Aviation Medicine, Randolph Field Air Force Base, Randolph Field, Texas. The other two officers should be assigned to Randolph Field Air Force Base not later than 24 March. These officers will receive training in the methods of testing to be used and will move to the test site with the rest of the project.

The two enlisted men should include one man who is experienced in veterinary medicine. These men should be assigned to the Ocular Research Unit at Walter Reed Army Hospital as soon as possible and move to test site directly for a maximum of three weeks during shots 3 and 4.

EQUIPMENT AND SUPPLIES: One semi-trailer van to be fabricated at the School of Aviation Medicine, Randolph Field, Texas. One small portable stall kennel for holding a dog during exposure. (Not to be constructed at test site).

Support from the Site: Quarters and messing facilities for 20 officers and two enlisted men. Kennel facilities for 8 dogs. Timing signal 1 second before zero. Radio/communication for alerting the personnel (if practical).

Site for Installation of Trailer-Van: About 9 miles from zero with unobstructed vision of test site. 110 volt current about 5 kw capacity.