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LAMS - 962

Series A

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October 10, 1949 This document contains 22 pages.

J - DIVISION PROGRESS REPORT

20 April to 20 May 1949

Progress Report - [redacted]

[redacted]

J- DIVISION PROGRESS REPORT

20 April - 20 May 1949

I. GENERAL

A. We are informed that Lt. Gen. E. R. Quesada, USAF, has been designated as Task Force Commander. An early meeting for discussion and planning is anticipated.

B. The definitive AECM Contract with Holmes and Narver was executed at Los Alamos on 17 May 1949, and forwarded to the Division of Military Application for an approval signature. Funds obligated to date on this Contract total $780,000, and an increase during the first week of June is contemplated to facilitate early procurement and the increase of personnel overseas. This will help get the work back on schedule.

C. Decontamination work at the Proving Ground is proceeding under the direction of Drs. Clark and Ray and Mr. Narver. The ambient dust level is lower than anticipated by the earlier survey. Removal of scrap metal and tower stump has reduced radiation to safe levels. Dr. Graves and Col. Cooney departed for Eniwetok on 23 May 1949 to be on hand for consultation and approval.

II. SUMMARY OF RESEARCH ACTIVITIES

A. Group J-1, Theory -- B. Suydam

1. Work on the correlation of gamma-ray measurements continued with only little progress because of the small amount of time available for the work during this period.

B. Group J-2, Radiochemistry -- R. W. Spence

1. Further work on fission yields in U^{235} when fission is induced by 14 Mev neutrons shows an apparent shift of the heavy peak toward lower mass

numbers. The Ba^{140} yield is lower than the thermal curve by about 20%; Ce^{143} is lower by about 25%, while Sb^{127} is higher by a factor of 17, assuming that the yield of Zr^{97} is the same for thermal fission as for 14 Mev fission. This latter assumption now looks unreasonable; it is likely that the entire 14 Mev curve should be lowered by 5-10%.

2. Another Van de Graaf irradiation has been done using about 1.2 Mev neutrons. The valley between the two peaks on the fission yield vs. mass curve rose by a factor of about 1.7. An irradiation with fast neutrons from the Fast Reactor (~0.4 Mev average energy neutrons) gave a rise in the valley of a factor of about 1.5.

3. One determination has been made of the ratio of peak to valley fission yields obtained when fission is induced by photons. X-rays from the betatron were used; the energy spectrum is not well known, but its average energy is estimated to be in the range 12-16 Mev. The valley of the fission yield vs. mass curve was higher than the corresponding thermal curve by a factor of about 30.

4. Irradiation of normal zirconium free from hafnium gave a 17-hour activity whose intensity was such that the ratio of activity from enriched zirconium to activity from normal zirconium was still about 11. The expected ratio was 15. The reason for the discrepancy is still unknown.

C. Group J-3, Neutron Measurements -- W. Ogle

1. Threshold Detector Method (Ogle)

a. Threshold Detectors (Brown, Biggers)

Work on the investigation of arsenic is finished but the data have not yet been worked up. An irradiation of columbium in the fast reactor has been made. Discussions with CMR have been going on on the subject of using

resin columns for soperation of impurities, and it appears that this may be tried in the case of columbium.

b. Collimators (Cowan)

It appears that iron is probably the best material to use for our collimators because of its large absorption of both neutrons and gammas. It is planned to use the Cockcroft-Walton to run a test on a mock-up collimator, and some preliminary yield measurements using sulphur as a detector have been made. The problem of interpreting the data obtained through collimators in a bomb test has caused some worry, and Reines is looking into this for us.

c. General

The outline of the geometrical layout of the threshold detectors has been decided upon. Approximately 90 samples per shot will be put out, 55 without collimation. Mr. Waddell from Sandia has joined the group and will be responsible for procurement and overall layout details.

2. Particle Plate Method (Rosen)

The spectrum of the fast reactor has been measured up to 15 Mev. Mrs. Sydoriak has started work on some J-Division problems, i.e., how long can the plates be kept in a vacuum, etc.

D. Group J-7, Experimental Subcontracts -- F. Reines

1. Bio-Medical Program

Dr. John Z. Bowers, of the AEC Division of Biology and Medicine, conferred with Dr. Graves and Group J-7, and they arrived at the following mutually satisfactory arrangement: All suggestions for medical biological experiments are to be forwarded to a panel of experts, consisting of Dr. G. LeRoy (Chairman), Dr. L. Jacobson, Dr. R. Zirkle, Dr. J. Furth, Dr. W. B. Armstrong, Dr. D. B. Dill, Dr. S. L. Clark, Dr. Sparrow, Colonel J. P. Cooney, Captain R. H.

Draeger, and Dr. Wright Langham, as J-7 representative. This panel will review the experimental proposals and will submit by 1 July 1949 a tentative program to Dr. Graves.

Dr. Austin Breus, because of pressure of other work, may not be able to take on the job of J-Division subcontractor for the bio-medical program, and efforts are being made by the AEC Division of Biology and Medicine to find a man to head up this program.

It is understood to be the delegated responsibility of J-7 to check on whether the experiments are feasible from the point of view of the expected test conditions and whether they can be fitted into the over-all test plan.

2. NOBL

a. Construction

The new bin blast laboratory building which is to be built with AEC funds is expected to be ready for occupancy on November 1, a month later than originally anticipated.

Detailed plans for a small blast field to be constructed at NOL have been drawn up. This field will be the main means of studying experimentally the optical measurement of shock wave velocity and the triple point trajectory and its relation to reflection factor.

b. Division of Responsibilities Between NOL and BRL

An NOL-BRL Conference was held on May 10 and 11 to apportion responsibilities on the Air Blast Measurement Program. The division of responsibility is as follows:

NOL	BRL
1. Optical deformation of free air shock velocity	1. Shock velocity measurements using microphones and blast switches

2. Photographic observation of shock wave intersection with water	(includes proposal for measuring free air shock velocity from tops of 6 towers 100 feet high within
3. Pressure versus time in Mach region	1000 feet of charge)
4. Crusher gauges in regular reflection region	2. Free air Doppler radar (to be investigated further)
5. Indenter gauges for low overpressure in Mach region	3. Foil gauges for high pressures in Mach region
6. Measurement of pressures near structures.	4. Determination of triple point trajectory

c. Instrumentation

It was decided to use two blast lines on two of the shots and agreed that about twice the present blast hut space would be needed at the end of each blast line.

Instrument mounting problems were discussed. The conference participants seriously considered a radial wall for mounting instruments, and proposed a tentative design with instrument intakes flush with sides smooth to 1/20 of microwave instrument intake over a region whose radius is 20 times the microwave intake dimension. The blast range would be paved smoothly all the way to the end to at least 25 feet on either side of the walls.

d. AFSWP Participation in Blast Measurements

The telemeter measurement of free air shock velocity has tentatively been assigned by J-Division to AFSWP. There seems, however, to be a misunderstanding between NOBL and AFSWP as to the responsibility of each in the measurement. Information is being requested from AFSWP as to that organizations' ability to carry out the experiment, and it is expected that the entire question as to the extent of AFSWP participation will be cleared up in the near future.

e. Wall Mounting of Blast Gauges

Hartmann and Lampson suggested that the mounting of blast gauges in a smooth wall might decrease disturbance of air flow in the neighborhood of gauges. Reines and Zadina gave some consideration to the subject and suspect that except for possible experimental convenience (e.g. installation of gauges, exclusion of rain and vehicle, protection of electrical lines, etc.) there is no difference in principle between a radially directed smooth strip of ground and radially directed wall with sufficiently wide, smooth strip on each side. The argument goes something as follows:

With or without the wall, we must be concerned with the effect on the pressure registered by the gauge of perturbations due to the gauge itself and those due to irregularities in the surface of the ground. The perturbation due to the gauge itself can be minimized by placing it in an infinite baffle, e.g. the ground.

Because of the fact that a shock wave travels subsonically with respect to the material behind the shock, it is possible for both the peak pressure and pressure-time characteristics seen by a gauge to be influenced by disturbances originating at some distance from the gauge. The magnitude of the effect depends, of course, upon the shape of the disturbing object, the ratio of its size to the length and shape of the positive phase, and upon the ratio of the size of the object to the distance from the gauge. These considerations apply either to a wall or to a paving. The total width of the cleared strip will be the same in each case. Hartmann's reactions to these agreements have been requested together with his criteria for significance of irregularities in the vicinity of blast gauges.

3. Naval Research Laboratory

The following report from NRL covers the period under review:

a. The major part of the effort during the last month has been directed along three lines: (1) improvement of the transit time electronic equipment; (2) study of gamma and neutron radiation detectors; and (3) the establishment before July 1, 1949, of certain contracts for research and development.

b. Transit time electronic equipment. The work described in the April report has been continued to the extent that it is now possible to display 1 microsecond markers on the spiral sweep during the time when data are being presented. Another development is that standard scopes such as the Type 5CP have been used to make satisfactory transit time measurements. This will allow considerable simplification in the design of the final equipment.

c. Study of gamma and neutron radiation detectors. As indicated in the report last month, a fairly strong effort is being made to learn more about these detectors. Progress to date has been slow and there is little of note to report. To further this study, three reports prepared by the Los Alamos Laboratory on photocells and photomultipliers and the report by P. King are much desired (these have been promised by Dr. Ogle). Four members of the Naval Research Laboratory group plan to attend the symposium on scintillation counters to be held at Oak Ridge during June.

d. Contracts for research and development.

(1) High Speed Cathode Ray Oscilloscope Tube.

Discussions with the Du Mont Laboratory have reached the stage where a proposal by Du Mont is now in our hands calling for the performance of the necessary research and development to produce a better cathode

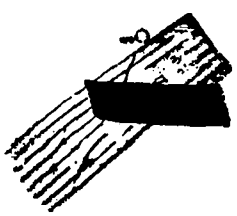
ray tube. (The performance specifications prepared by the Naval Research Laboratory under date of 5 May 1949 are on file in J-Division Office.) Du Mont has proposed to do the necessary research and development on a negotiation basis for $42,460. This work is to be completed by 1 January 1950.

(2) Bolometer, Magnetic Tape Recorder System.

Discussions have been held with Frederic Flader, Inc., of North Tonawanda, New York, and the Farrand Optical Company of Cambridge, Massachusetts, concerning the necessary development to produce a system suitable for chopping the light signal to a bolometer, amplifying and recording the chopped signal upon the magnetic tape. The performance specifications prepared by the Naval Research Laboratory under date of 17 May 1949 are on file in J-Division. Both of the above companies have been asked to meet those specifications and to prepare their proposals by the end of this week. It is believed that both companies are interested and that a contract can be negotiated with one of them. The first model of this system is expected to be delivered by 15 November 1949 with two additional models to be delivered in January 1950.

(3) A contract has been let to Baird Associates, Inc., 33 University Road, Cambridge, Massachusetts, for the construction of six bolometers as required in the above system. The amount of the contract is $1800.

(4) Preliminary discussions have been held with Dr. G. A. Morton of the Radio Corporation of America in regard to the possibility of contracting for the research and development necessary to produce a very high speed, very high intensity photomultiplier tube. These discussions have not progressed far at this time for two reasons, the first one being that the Radio Corporation of America is not too anxious to get started immediately on such work, and secondly the funds allowed to the Naval Research Laboratory by



the Atomic Energy Commission will be exhausted by other planned work and contracts.

e. It is believed that the forthcoming meeting between Dr. Ogle and the Naval Research Laboratory personnel in Washington will be of considerable benefit to the project.

4. Bureau of Standards

B. Watt visited the Bureau of Standards during May and has expressed the feeling that at least two full-time, senior people are required to carry out the Bureau's program. At present there are one full-time man and two part-time men.

Their research includes taking photographs of Co^{60} gamma rays (1.3 Mev) and they find that it takes about 2 mm of Al to reach equilibrium with the beam (i.e., to reach maximum blackening); further, that as one increases the thickness, first the intensity of β-rays on films goes up and then decreases. They will experiment further with different kinds of wedges, and are still considering the β-ray spectrometer for the gamma-ray spectrum measurement.

The possibility that Bureau of Standards might be the central unit to make dosage measurements for all the participating groups has not been discussed specifically with them but they are aware of the suggestion. An idea of the magnitude of the task is necessary before the proposal can be made to the Bureau, and two methods were suggested: first, that the Bureau supply each group with a standard film packet and a curve which would explain the results, each group doing their own film development and calculation of results; or second, that the Bureau distribute the packets, then develop them themselves and advise each group of the results.

The following report has been received from the Bureau:

"The activities of the Pulsed X-ray group for the period 20 April to 20 May are divided into three categories:

A. Investigation of the naphthalene scintillation detector as a dose rate meter for radiation of varying quality.

B. Preliminary design of a spectrum analyzer of the β-ray spectrometer type.

C. Construction of a test and switching panel for the range switching amplifiers to be used for the intensity vs time measurement.

Experiments have been performed to determine the ratio of the dosage rate at various photon energies and intensities to the photomultiplier current, and it has been determined that this ratio is constant within the experimental error ($\pm$ 2%) from 250 Kev to 1.2 Mev. Careful attention was paid to effects of fatigue in the photomultiplier and equilibrium in the scintillation material. It is planned to make experiments with the NOL 10 Mev Betatron to obtain a point at a higher energy, and a full report of the above work plus the betatron experiment will then be submitted.

Some progress has been made with the problem of spectrum analysis. We plan on using 180° magnetic focusing of the electrons produced in either a thin beryllium or aluminum foil. We are investigating the feasibility of using beryllium because pair production is about one third as great in beryllium as in aluminum at the higher energies. However, there is the question of producing beryllium in a thin foil. This is being investigated.

Using permanent magnets we have been able to establish a field intensity of 1400 oersteds between semi-circular pole pieces of 5-inch radius, and 1900 oersteds for a 6.5-inch radius using two permanent magnets in parallel.

The air gap was three-fourths of an inch in each case. This distance

is being increased slightly to accommodate the vacuum unit now being constructed to house the foil and recording film. We can study gamma rays up to 6 Mev in this manner and hope to be able to use permanent magnets for the full 1 to 10 Mev range. The photographic film will be replaced by scintillation counters as a final recording unit.

Spectrum analysis using an aluminum wedge is being pursued although results are not too encouraging at the present time.

The panel connecting the five separate range amplifiers to be used in the intensity vs time measurement has been designed and constructed. The panel includes all the power and signal distribution wiring, plus means for monitoring the output, balancing the amplifiers, and zeroing and calibrating the vacuum tube voltmeter."

5. Edgerton, Germeshausen and Grier, Inc.

Wyckoff and Davis attended a meeting at Wright-Patterson Field and discussed the photographic program as it pertains to the formation and rise of the radioactive cloud.

EGG has given a detailed proposal for location of photo equipment for the next tests. The following is taken literally from their comments:

"This proposal suggests the use of four sites at which the majority of the photo equipment would be mounted for recording the Brimstone tests. These locations are so chosen that the first and second sites serve the first detonation, with the second and third sites for the second detonation, and the third and fourth sites for the third detonation. Sites one and four would then be used once each while the second and third sites would each be used twice. Special additional sub-sites might be required for specific measurements such as the spectrographic recordings or the cloud rise measurements. These sub-sites

might make use of the zero islands and the unused 300' towers. Stereoscopic recording is proposed for the Brimstone Tests, reducing the necessity for 90° views.

. . . . . The following positions have been chosen using two nautical miles as the optimum distance, then modifying this to accommodate ease of construction and site accessibility. All of the given distances are approximate. . . . . .

. . . . . .

Chart 1 gives the chosen islands, together with the approximate distances, and indicates the type of installation (stereo or single).

CHART 1

BASIC PHOTOSITES

Island Name	Test Used	Nautical Miles to Zero Tower (approx.)	Type of Installation
Teiteiripucchi	(X_B) 1	2	stereo
Bokonaarappu	(X_B) 1	2-3/4	single
	(Y_B) 2	2-3/4	single
Piiraai	(Y_B) 2	2	stereo
	(Z_B) 3	2-1/2	stereo
Artificial Island	(Z_B) 3	2	single

Chart 2 is a representation of the relative positions of the zero and test islands, taken from H. O. Chart 6063 2nd Ed. March 1946.

Chart 3 consists of a series of sections from Charts 6656 K, L, M and N, and 6657 A to show some of the aspects of the islands and sites.

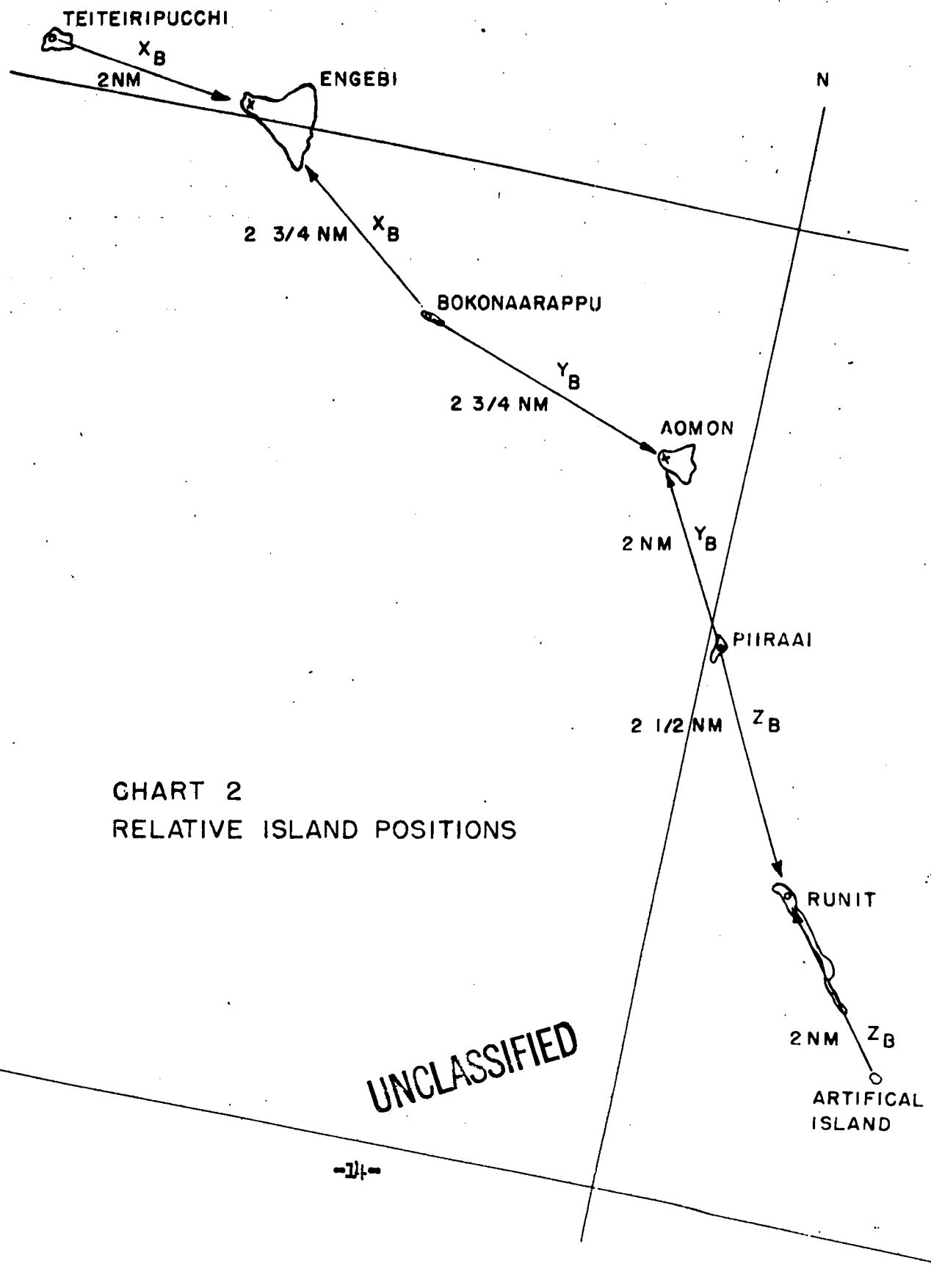
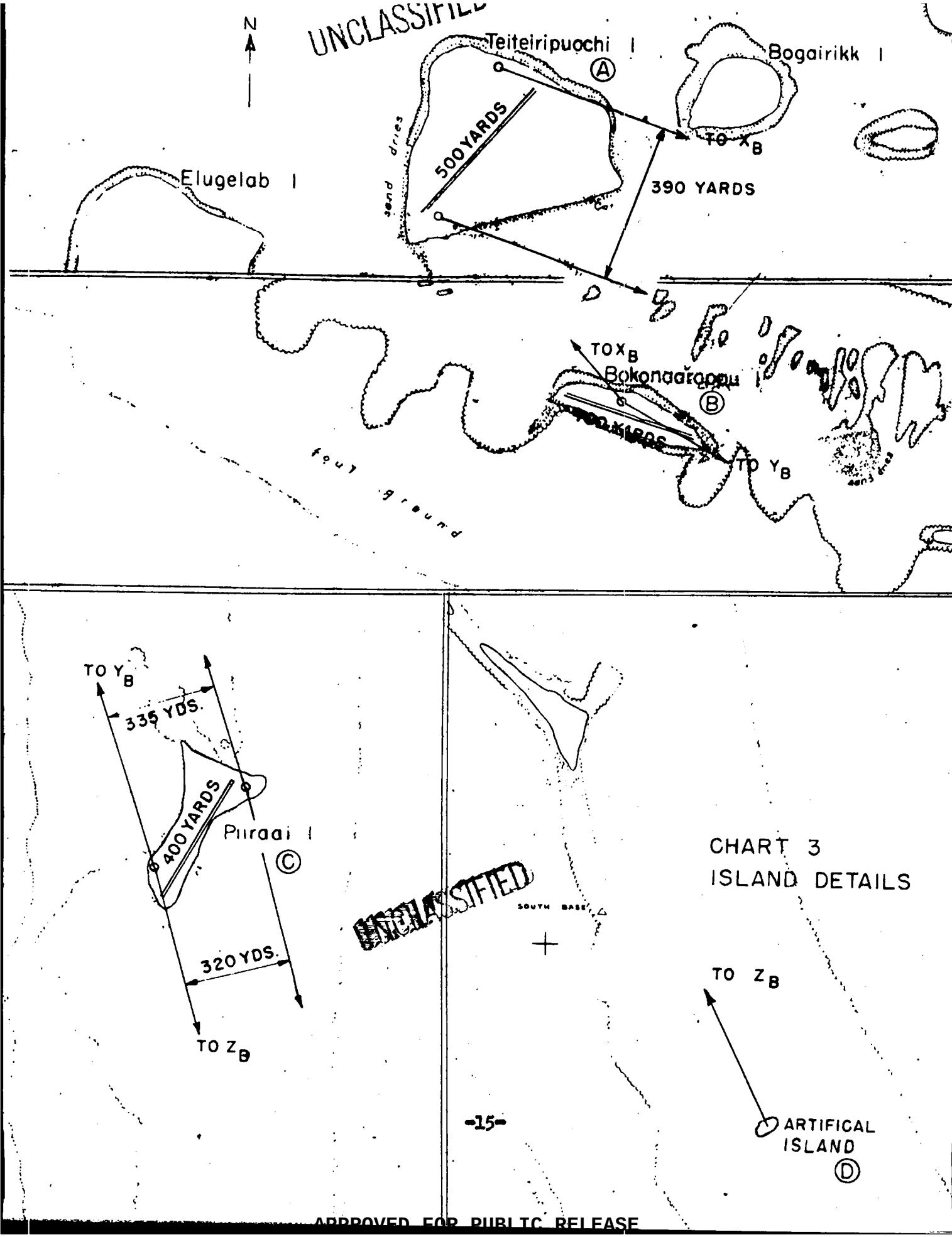


CHART 2
RELATIVE ISLAND POSITIONS



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Teiteiripucchi Ⓐ and Piiraai Ⓒ Islands appear from the map to be capable of taking 500 and 400 yard landing strips facing very nearly into the prevailing winds. Bokonaarappu Ⓑ appears capable of taking a 400 yard landing strip at right angles to the wind. It is suggested that a light airplane with a cross wind gear be employed for the Brimstone photo operations thus making this island a useable air strip. The artificial island Ⓓ would in reality be a station built upon the coral reef. This will require either a boat landing and walkway or a long walkway, depending upon the exact positioning of the tower and its associated platforms.

A camera view along the reef, or over great lengths of land causes photographic troubles when the ground-air temperature differentials are great. . .

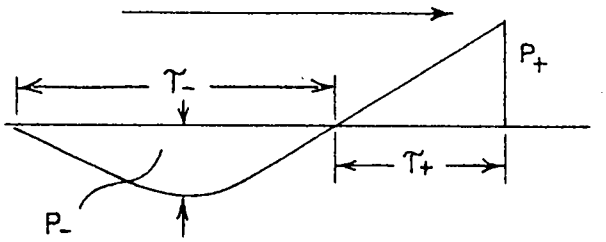
The selection of these sites need not alter the air recovery of film plans. The aircraft recovering the film may reach the Islands beyond the Zero Island by flying upwind from that island, thus never crossing the danger path of the radioactive cloud. Recovery from the artificial island would require the use of an LCM."

6. Los Alamos Activities

a. Information for Aircraft Analysis Group

Information as to the pressure levels at various distances from an atomic bomb was forwarded to S. Burriss for transmittal to the Air Forces agency charged with the problem of the distance of closest approach of an aircraft to an atomic bomb explosion. The statement of the pressure-distance characteristics for a nominal 20-kiloton bomb (this refers to the total yield) is as follows:

[redacted]



The figure indicates the characteristic shape possessed by the blast front. τ_+ is the duration of the positive (τ_- of the negative) phase, p_+ is the peak overpressure in the positive (p_- the minimum pressure in the negative) phase.

(20 KT)

p (psi)				
p_+ (Positive Phase)	p_- (Negative Phase)	R (miles)	τ_+ (sec)	τ_- (sec)
1 1/2 1/4 1/10	(~1/2-1/3) p_+	~2 - 3 ~3 - 4 ~7 - 8 ~9 - 10	~1.5 ± 0.5	~2 ± 1

As can be noted from the table, the distances from the bomb, R, and the length of the positive and negative phases are stated only roughly. At present, knowledge regarding these questions is inadequate, and we are engaged in a program designed to improve these numbers. It will be noted that the above data are meant to apply to a tower-burst bomb. A bomb burst under combat conditions (~>2,000-ft altitude) may produce two waves at the airplane (i.e., incident and reflected) because they have not yet fused to form one. The second wave may be somewhat like the first in this case.

b. Nuclear Development Associates

It has been learned from Nordheim that NDA would be interested

in participating in theoretical work but not in an experimental program.

c. Behavior of High-Velocity Material Going Down a Tube

F. Willig has suggested an experiment in which shocks or jets pass down evacuated tubes. He is preparing a report in which the object, as well as present ideas as to the experimental details, will be discussed. Mr. Willig has been attempting to cause thermonuclear reactions by the use of colliding jets and it appears that the velocities which might possibly be obtained near a nuclear explosion would produce a detectable number of neutrons from a thermonuclear reaction.

d. Density-Time Measurement

It appears that an optical scheme exists for measuring the density versus time in the shock wave, based on the absorption of light. It may be that this scheme is simpler and capable of higher accuracy than the β-ray absorption proposal previously considered.

E. Group J-10, Military Liaison -- S. W. Burriss

Spence, Newman and Burriss, together with Wyckoff and Davis of EGG, attended conferences at Wright-Patterson Field on 12 and 13 May. Conferences were on the subject of drone instrumentation and operations during future tests.

No firm commitments were made; however, the mechanics for insuring such commitments at a reasonable date were established.

It was understood by all concerned that the primary purpose of drone plane operations is sample collection for J-2, and that all proposals involving drones must be considered with respect to their possible effects on successful and timely drone operations.

The preliminary meeting on radiation measurements was a straightforward discussion of radiation instruments to be placed in the eight drones

employed for the J-2 sample collection.

All branches of the NME have put forth proposals involving drone planes in one way or another. In most cases the three services made proposals having similar objectives. These will be coordinated into single proposals by the services themselves and the responsible service branch determined. It is evident that the value and necessity of some proposals is questionable and that further screening will be necessary.

The conference on gust and blast pressure measurements strongly emphasized the fact that considerable theoretical work must be done by the Air Forces before a sensible instrumentation program can be planned. The AMC agreed to start immediately on a theoretical program to determine what they should know in order to design aircraft to withstand blast pressures at varying distances from the point of detonation. The AMC further agreed to coordinate their instrumentation problems with those of other groups, through Los Alamos.

As an aid to the aforementioned theoretical program, Los Alamos agreed to furnish the best data presently available on overpressure versus distance.

The total number of drone planes proposed is 12. This is 4 more than were used at Sandstone. The drone control and operations experts were of the opinion that the operation of 12 planes might be detrimental to J-2's interest in obtaining a sufficient number of samples. It was stated that this opinion was based on the assumption that there would be no great technological advances in drone control and operation between now and early 1951. The validity of this assumption is an Air Forces internal problem and they agreed to make further studies and report on whether or not 12 planes could be handled without effect on the primary purpose of the original 8 drones. The AMC will also report on the possibility of reducing the 72-hour reactivation period in case of a shot

postponement after the planes were airborne.

It was pointed out that in the last analysis the limitation on the number of drone planes that can be handled might well be the limited real estate available on Eniwetok Island. The AEC agreed to keep in touch with J-6 on this matter.

In connection with the gust and blast pressure measurements, there was some discussion of the accuracies to which plane position could be determined by radar beacon or tracking techniques. The AEC will investigate and report on this point.

III. ENGINEERING AND ADMINISTRATION

A. Group J-4, Procurement, Logistics, and Property — H. S. Allen

1. Arrangements are being made to remove J-Division property from Lookout Mountain which has now officially become an Air Force installation.

2. An elaborate SOP to take care of shipping and property transfers of AEC material is in preparation.

B. Group J-5, Administration — H. I. Miller

1. Contracts

a. The definitive contract with Holmes & Narver has been prepared and executed. It has been submitted to DMA for approval. The cash obligation on Holmes & Narver work has been increased to $780,000.

b. A formal proposal has been prepared for submission to the Chemical Corps to cover development work on and production of vinyon pads for Group J-2.

c. Budgets for 1950 will be complete and allocations made on 1 June 1949.

2. Personnel

a. An interim review of RA and SH salaries was conducted.

b. The regular semi-annual reviews of SCP and ASC classifications were completed and recommendations made for increases, effective 1 July and 1 August 1949, respectively.

c. New Employees

William Hoffmann, Division Office and Group J-5.

d. Prospective Employees

A job offer has gone forward to:

Samuel Jones -- Department of Chemistry,
Cornell University, Ithaca, New York.

e. Terminations

Carl Hedberg, P-Division and Group J-6.

3. Security and Classification

a. Recommendations on the classification of various types of information have been prepared, cleared with the Laboratory, and forwarded through channels.

b. Efforts are continuing to obtain a Security Officer for the operation.

4. General

a. A draft operation plan is being prepared and will be completed on or about 1 June 1949.

b. A meeting will be held with CinCPac on 6 June 1949, to establish logistic plans for the period July 1949 through June 1950.

C. Group J-6, Engineering and Construction -- J. C. Clark

1. Holmes & Narver Activities

[redacted] UNC[redacted]

a. Shot Island Decontamination

Mr. D. Lee Narver is at Eniwetok with Drs. Clark and Ray to break the decontamination bottleneck. Progress reports are excellent. Removal of scrap metals from the zero islands reduces radiation to safe levels. Ambient dust appears to be low. Dr. A. C. Graves and Colonel J. P. Cooney departed from the West Coast for Eniwetok on 23 May 1949, in connection with this work.

b. Schedules on personnel and materiel are being pushed forward as far as available funds permit, in order to make up for time lost because of the decontamination delay. The procurement at Guam has been completed, but lists have not as yet been received.

c. Preliminary building layouts for technical buildings at Parry have been received and checked out by J-Division personnel.

D. Group J-11, Documentary Photography -- L. Gardner

1. Work is progressing satisfactorily on Sandstone reports.

2. Layouts for a photo lab at Parry are being worked on.

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