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Headquarters
TASK GROUP 7.1
Joint Task Force SEVEN
P. O. Box 1663
Los Alamos, New Mexico

J3-GO-59A

12 August 1955

TO: Distribution

FROM: Commander Task Group 7.1

SUBJECT: MINUTES OF THE PROJECT OFFICERS' MEETING HELD IN LOS ALAMOS JULY 27-28, 1955 (U)

The first session of the Operation REDWING Project Officers' Meeting was called to order in Delta Building by Duncan Curry, Jr., Deputy for Administration for Task Group 7.1, at 9:15 AM, July 27.

The following were present at one or more of the sessions:

TASK GROUP 7.1 AND ASSOCIATED PROJECTS AND ORGANIZATIONS

LOS ALAMOS SCIENTIFIC LABORATORY

J-Division	Alvin C. Graves	George A. Cowan
	William E. Ogle	Francis K. Tallmadge
J-1	Armand W. Kelly	Lt Col Robert B. Cruise
	John C. Tervo	LTJG Robert C. Beiler
	Samuel R. Whitaker	Capt G. M. Billings, Jr.
J-3	Duncan Curry, Jr.	Lt Col Robert H. Gattis
	Col W. T. Kerwin, Jr.	Maj John J. Onderko
	Carl Lyon	CDR Reuben N. Perley, Jr.
	LCDR E. P. Barkley	LCDR Owen A. Roberts
	ENS A. J. Couvillion, Jr.	Josephine Gilligan
	Maj Willis A. Cude, Jr.	Frank G. Ranieri
J-4	Harry S. Allen	Lt Col Paul T. Smeltzer
	Lt Col John W. Lipp	
J-6	Robert H. Campbell	Rea Blossom
	Robert Newman	Jack H. Poole
	John M. Harding	LCDR A. P. Mirwegen

55-9

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T. S. Shipman

[redacted]

Att 4

J-10	Joseph Mullaney	Donald Westervelt
J-11	Jere D. Knight	Charles I. Browne
J-12	R. Lee Asmodt Leon J. Brown	Donald Phillips
J-13	John S. Malik	Roger Ray
J-15	Gaelen L. Felt Robert Fitzhugh	Capt Lew Allen, Jr.
J-16	Ralph E. Partridge Marvin M. Hoffman	Neel W. Glass
D-Division	Leslie M. Redman	
H-Division	William S. Johnson William R. Kennedy Roy Reider	Ellis Stout James G. Stearns Maj Gordon L. Jacks
W-Division	David W. Smith	Edwin L. Kemp
Graphic Arts	Loris M. Gardner	Robert C. Crook
NRL	LCDR John A. Dudley	Lt Col Joseph R. Steele

UNIVERSITY OF CALIFORNIA SCIENTIFIC LABORATORY

Gerald W. Johnson	Forrest Fairbrother
Walter Gibbins	Clifford M. Bacigalupi
Alfred C. Hausmann	Raymond H. Jaeger
Arthur Werner	Robert L. Turnbull
Joseph A. Lovington	Roger G. Preston
Louis Wouters	Bernard H. Coleman
Ervin C. Woodward	Floyd Truitt
Harry B. Keller	Harry Perl
Robert H. Goeckermann	William Nolan
Elisha J. Daly	

HQ, FIELD COMMAND, [redacted] SANDIA BASE

	Col H. E. Parsons	Maj Henry T. Bingham
	Col Lester L. Woodward	Maj Lawrence P. Bischoff
	Col Kenneth D. Coleman	Maj Jack F. Calnon
	Col David T. Griffin	Maj John A. Chiment
	Lt Col T. D. Collison	Maj George P. Forsyth
	Lt Col W. A. Fackenthall	Maj Elbert C. Jenkins
	Lt Col Herman S. Heaton	Maj William C. Linton
	Lt Col Wade H. Hitt	Maj Bill J. Ravey
	Lt Col Jack G. James	Maj William M. Sheahan
	Lt Col John J. Haley	Maj Edward M. Thornbury
	CDR Milton K. Dahl	Capt C. R. Gilliland
	CDR Waldron M. McLellon	Capt L. E. Killion
	Maj Clyde W. Bankes	ENS Richard J. Culp
		CWO Paul D. Williams
AFCRC	Lt Col James A. Fava	R. L. Dresser
	Lt Russell G. Walker	Edward E. Lewis
AFSAM	Capt David V. L. Brown	Everett O. Richey
AFSWC	Col E. A. Pinson	Col Karl H. Houghton
	Col Paul R. Wignall	Capt Paul L. Crumley
ARDC	Lt Col Carl E. Trexler	
BRL	Julius J. Meszaros	Glenn L. Roark
	Charles N. Kingery	Ralph E. Reisler
BuAer	LCDR A. Julian	Ralph Zirkind
BuShips	Capt G. G. Molumphy	Woodrow Armstrong
CRL	Elmer H. Engquist	B. Barnett
	Carl Heidt	J. Mahoney
	Manfred Morgentham	Joseph Maloney
CORPS OF ENGINEERS	Ernest H. Dhein	
ERDL	Capt Frank E. Deeds	John G. Lewis

ESL	Peter Brown	Arthur K. Harris
NASWF	Bob Smith	Lt Philip S. Harward
NOL	Joseph Petes	Peter Hanlon
NRDL	Albert L. Baietti Michael M. Bigger Raymond H. Heiskell PHC John R. Nichols Heinz R. Rinnert Terry Triffet	Capt Albert R. Behnke Richard P. Day Lt Col Charles H. Murden William B. Plum Richard R. Soule Louis B. Werner
NYOO	Robert L. Graveson	
SIO	T. R. Folsom W. C. Van Dorn	J. D. Isaacs P. L. Horrer
WADC	Manson L. De Vol Capt Robert E. Grubauch Col James O. Cobb Edgar M. Munyon Francis J. Janik	Eric H. Wang George K. Sinnamon Glenn C. Miller Lt Joseph Cosenza

SANDIA CORPORATION

L. E. Bothell	H. E. Hansen
Richard A. Bice	A. Dean Thornbrough
D. B. Shuster	W. H. Gustafson
James H. Scott	Thomas Cook
Robert E. Hepplewhite	C. U. Broyles
F. E. Thompson	Norman A. Littrel
T. C. Looney	

EDGERTON, GERMESHAUSEN & GRIER, INC.

H. E. Grier	W. A. Ward
B. J. O'Keefe	J. K. Knight
R. D. Patten	H. L. Smith

OTHER ORGANIZATIONS

JTF SEVEN	Capt Wilson M. Coleman Maj Frank G. Richie	Maj John J. Policastro
DIVISION OF BIOLOGY & MEDICINE, USAEC	Charles L. Dunham	
SFOO	Ernest Wynkoop	James A. Sugden
H&N	Claude L. Corey	Maynard R. Born
TASK GROUP 7.4	Col John S. Samuel	
AFSWP, WASH., D.C.	CDR Charles C. Hoffman	Lt Col Leonard A. Eddy

Dr. Alvin Graves, J-Division Leader and Deputy Commander for Scientific Matters of the Task Force, welcomed the group on behalf of the Los Alamos Scientific Laboratory. He stated that the purpose of this meeting was to enable participating groups to become acquainted with the personnel of the Task Group 7.1 with whom they will be working on Operation REDWING; and that the function of Task Group 7.1 and its staff sections was that of a service organization to make your job easier. Its members are to help you solve your problems.

The following schedule has been submitted to the Atomic Energy Commission for their consideration and for presentation to the Joint Chiefs of Staff and the President. The AEC has tentatively signified that this schedule is acceptable to them, but as yet no action has been taken to present it to the higher authorities. This schedule embodies a new philosophy of trying to run three separate operations simultaneously with a starting date tentatively set for May 1, 1956.

DATE	OPERATION I	OPERATION II	OPERATION III	AFSWP REQUIREMENTS
May 1				DELETED
May 2	DELETED	DELETED		
May 7				DELETED
May 15	DELETED	DELETED		
May 22				
June 5	DELETED			
June 19		DELETED		
July 1	DELETED	DELETED		
	DELETED	DELETED		DELETED

On May 22 - Barge shot in cove off of Romurikku (Fox) at Bikini Atoll near Aomoen (George).

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Operation I essentially controls the length of time we are there. The designated dates are earliest probable dates - ready dates - for firing and the dates on which you should be ready with your experiments, if possible. Changes can be made in the field.

Operation II is a series of shots in the Eniwetok Lagoon which are pretty well tied together and reasonably independent of the Bikini shots; therefore, in a sense this is an independent operation. Shots may be made in both places on the same day.

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point will be somewhere in the Eniwetok Lagoon. Zero

DELETED DELETED DELETED This will be a surface shot on the Island of Runit (Yvonne).

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Operation III - shots in the region of Eberiru (Ruby) and Aomon (Sally) are independent from shots listed previously, and different people will work on them. Two may be fired on the same day.

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DELETED DELETED All should be prepared to fire a week or 10 days earlier than May 1 if at all possible.

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This is going to be a long hard operation. Each of us has to retain a maximum amount of flexibility in order to fire possibly two shots the same day in widely separated areas. We cannot plan on taking instrumentation or materials from one area to the other for use, but will have to have enough to operate completely independently and be sure we have enough at the right place to do the job.

Too, construction requirements are greater than ever before and we are getting them in later than ever before. Please get them to the AEC and Holmes & Narver at the earliest possible time.

This is the most ambitious program ever attempted - it consists of more shots, will require more people and more housing, but the latter facility will be extremely limited. Therefore it is mandatory that you be sure you need the people you take out and then be sure that as soon as they are through with their jobs that they go home. Even then, we shall be forced into a "hot bed" system of living, eating and sleeping in shifts.

L. M. Redman spoke in behalf of Ralph Carlisle Smith for Classification, as follows: "We still are not sure who will be classification managers for the Task Force or for Task Group 7.1, but in this interim period and until a new Classification Guide for REDWING is prepared, use the CASTLE Guide as originally prepared but not as amended. It is hoped that a new classification guide will be issued in the fairly near future after responsibility for classification is decided. Specific problems can be referred to us at Los Alamos or to your own organization's Classification Officer meantime.

For Security we shall be dependent on Task Group 7.5 for basic Security educational material, but the right to review this material by Task Group 7.1 is reserved.

One of the most common security violations during previous operations has been the question of leaving classified documents exposed and I have been asked to caution you about this. For this meeting there has been some confusion regarding categorical access clearances, for some of you have Alpha 11 and some have Alpha 18. Alpha 18

applies only to effects and not to the development of the weapons themselves. The Alpha.18 category should be respected in this meeting."

W. E. Ogle, Commander Task Group 7.1 spoke as follows: "I, too, would like to welcome you to this meeting, and to what I suppose is essentially the beginning of Operation REDWING. Al has described to you quite completely, the general concept of the operation from the point of view of the number of shots and where they go and the problems involved in firing them, so that I don't think I will have a lot to say. I would like to add a few comments, however. The first, just so no week will go by without some change, in particular this week, I understand that there is at least a fair probability that the primary for this, which is a two stage device, will have to be fired separately, from a tower, which changes our schedule now. What was it, 15 minutes?"

Al Graves: "I would like to point out that this is a remote possibility, however."

W. E. Ogle: "I will point out that a lot of this stuff was remote a week or so ago. I would also like to echo Al's comment about the support sections of 7.1, the J-1 to J-6 groups. Their purpose is to help you. If you have problems, either now, or at any time to the end of the operation please feel free to take them to them. They obviously, in helping you with a problem, must consider everyone else's problems, but their object in life is to help you as much as they can, consistent with not throwing everyone else out of their beds.

This is an extremely nasty program. As Al says, you can list certain dates here but I myself, feel that the odds on firing the last shot on July 1 are quite remote. I will point out that there are, between May 1 and May 15, around eight or ten shots which is a shot every day and a half or some such thing as that. There are requirements that are common to all these shots, and I think we will have an extremely difficult job getting the first two weeks done, let alone the first two months.

One reason for the schedules being made up this way is due to troubles we had during CASTLE. As most of you know, during CASTLE, we had to fire shots dependent upon the experimentations being ready where that experimentation was the minimum required to get what you absolutely had to get out of the shot and dependent, other than that, on the weather. This lead to the difficulty, that in many cases, although projects and organizations wanted to know the answers very badly, you said maybe we can live another year without this answer; and projects occasionally had to fall by the wayside because we had to shift schedules around, move bombs from one atoll to another, and this sort of thing.

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And, while I wouldn't be at all surprised to see some schedule changes between now and six months from now - certainly, by the time we get into the operation, we will make every attempt not to advance a shot - so that projects planning to work on a certain shot, will not

be faced with the possibility of having to be ready a week earlier than they intended, or of losing their efforts.

On the other hand, I do feel that I should again warn you that this does not mean that a lot of these shots may not be later. If you are planning to work on a shot, here, and another shot over here, you certainly should not plan along the lines of saying we will buy equipment and have people to do this shot and when we get through with it we will move the equipment over to do this shot; because you will certainly have the possibility of having the order reversed or at least having the shot not go off any sooner, and not having enough time to move equipment. In some cases, this may not be possible and, where it isn't, we will have to live with it.

I think, since a large portion of the rest of the meeting will be presentations of individual projects, it might be worth while taking just a few moments to try to give you a picture of some of the experimental effort as it applies all across both atolls.

There are many things fairly common to all shots and it is fairly obvious that on any shot one must measure the yield of the device. The yield in general will be measured by radiochemistry and fireball - radiochemistry, by means of taking samples with airplanes and then bringing the samples back to the United States for analysis; and fireball - by means of cameras in various positions on both atolls where those cameras are arranged to cover several shots. There is not a separate camera setup for each shot.

DELETED DELETED DELETED Alpha stations for this are on Runit, somewhere around Acmon, and up on Bogon close to Helen; on Enirman and Acmoen and Namu in Bikini Atoll. These are fairly large stations.

A number of devices are two-stage devices on which one must measure the time interval so that various groups at both UCRL and LASL will be involved in measuring the time interval between the primary and secondary. The experimentation to do so varies from shot to shot.

DELETED DELETED DELETED Hence, the conditions for firing have been arranged to get the most fallout data that one can from such a shot, and it was particularly designed to have the height of burst slightly higher than the fireball radius. Fallout measurements will be made for this shot with ships surveying the water, with rafts, etc., and also on a few other shots to serve for comparison purposes. There is a large blast program on that shot also, and on several others with structures being built along the reef on the north side to investigate the effects on those structures from an air drop.

In order to do a schedule like this, there are many places we are going to have a lot of trouble. We have to fire the shot, which means, in the first place, that we have to get the bombs out there. A great proportion of the bombs go to Parry

Island to start with, and then are distributed throughout both atolls as needed. So, the people taking care of the bombs are obviously going to have a very difficult time, because, they normally have to know at least a few days ahead of time that they are going to have to fire a particular shot. They will have to arrange things to be extremely flexible.

We intend to fire the shots with two timing distribution stations, one on Enyu, and the other on Parry Island; and the people taking care of those stations, plus the timing wires and radio signals going all over the place, are going to have quite a little time being able to switch from one shot to another; and to do one shot, make dry runs, and be able to fire another a day later, or the same day. This does not at the moment appear impossible, but it is going to be quite a thing. The timing signals for the air drops also go through these two stations where the sequence timer can also be started by radio signals from the plane.

We have, presumably, the ability to sample clouds on at least two shots essentially simultaneously. I have a feeling again we are going to run into trouble when we start doing 10 shots in two weeks. All in all, I think I have just time to say here that there are many groups, and I have mentioned some, that are going to have a great amount of difficulty in being able to do all of these with the uncertainty in schedule that we have to have there. We have to have it because if we put all of these down on a definite date, in series, the operation would go to Christmas, and might anyway. There are many shots here which are small, these six, and there are essentially no weather requirements on these shots at least none with respect to fallout. We presumably still have to have a clear path to take pictures, and a few things like that, but the requirements are comparatively simple. On the other hand, some of the large shots on Eniwetok will have to be treated very carefully, weatherwise, because we cannot afford to get sufficient fallout down on Parry and Eniwetok that we have to evacuate the place.

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I think we can do this - it is obviously very ambitious - but whether we can or not depends wholly on you people. I think the problem has been presented, and perhaps even over-emphasized, and we will try wherever we can to make it as easy as possible. We might even be able to build at least one or two extra tents. I have a feeling we will also probably have a Fourth of July party out there. I think I have nothing else I want to say and it's perhaps worthwhile to get on with the meeting. If there are any questions I would be happy to try to answer them."

After the Coffee Break (from 10:05 to 10:25), Duncan Curry introduced the Task Unit Commanders and key staff personnel who would not be speaking, and he explained the task group organization chart, which had been distributed with the brochure. He stated that in the preparatory phase the DOD programs function under AFSWP while the laboratory programs function pretty much within their own normal administrations. The entire organization is designed to support the four major task units in doing the four experimental programs.

Armand Kelly presented the functions of J-1 as follows: They prepare personnel for overseas shipment (shots, orders, badges, identification cards, security indoctrination, etc.); they arrange their transportation to the FA; they receive arriving personnel in the FA and assign quarters for working and living; and, when their work is completed, they return all personnel to the ZI. They also perform personnel musters before shots in the FA, and assist in emergency evacuations, should such be required. Budgetary matters for TG 7.1 also come within the scope of J-1.

Colonel Lipp spoke in behalf of Harry Allen for J-4. He stated that J-4 is concerned with transportation and supply, staffwise and in an operational manner. Staffwise, they accumulate material from status reports, consolidate and send it to JTF SEVEN for incorporation into their requirements for ships, aircraft, etc., for movement overseas. The Transportation and Shipping Section in the FA is ready to send supplies and equipment to the proper site where it is needed. Cargo ships will stop directly at Bikini Atoll and drop off materials there which are marked for Bikini; therefore, on the next status report, please be sure to show exactly where you want your cargo sent. Supplywise, J-4 is responsible for procuring necessary supplies for use overseas, and for getting military supplies for the task group as a whole. A manual of shipping instructions, dated July 1, 1955, has been issued by J-4; if you do not have your copy and would like one, please contact J-4. We are also issuing a catalog which will show all stock items in the Bikini-Eniwetok Area and all the technical supplies we will carry in the FA - on Parry, and in the two J-4 trailers spotted in the Bikini Area. The SOP of Supply Management will be included in the Administrative SOP, J-4 Annex, for the task group.

Bob Campbell presented the J-6 functions as follows: We are responsible for ALL construction overseas (tents, towers, phones, fences, etc.) and we have a year's work ahead to be done in the next eight months. We will find out what you need in the way of services and facilities out there and somehow translate them to the engineers and contractors so that they are built when you get there. It is therefore essential that you get your construction requirements in as soon as possible. Mr. Campbell also supplied the grid coordinates for the Cherokee Air Drop as N 172,172' and E 82,082'.

Col Kerwin gave the following J-3 functions: J-3 has a primary responsibility in the field of plans and operations, and they need to know: (1) What do you need? (2) What can we do to help you in the FA? J-3 has published the Task Group Concept of Operations (J3-50, dated 12 April 1955), which includes the shot schedule, operational support in the FA, general movement, weather support, etc. They are concerned, too, with major military support items (ships, carriers, boats, helicopters, aircraft, etc.). J-3 is also finding out what you need; how you are going about doing the job, and how you intend to work overseas; your transportation requirements overseas, your needs in the way of communications (radio and phone), off-atoll support, and evacuation and recovery requirements, sample return, etc., as well as your needs for obtaining additional operational support items.

Col Kerwin stated that the Interim Phase will end about March 1, 1956. At that time J-3 will be at PPG in force and will have 18 LASL, six UCRL, and possibly some AFSWP personnel to look after their interests. At Eniwetok we will establish the

main office on Parry (Elmer) and a subsidiary on Rojoa (Ursula); at Bikini the main office will be on Enyu (Nan) at the other end of the air line, with a subsidiary on Eninman (Tare) to look after the UCRL problems there.

In the Operational Phase, J-3 has the supervision of the actual operation itself - maintenance of the shipping schedule between atolls, movement within and between atolls, phone and radio communications, vehicle support, special support requirements (boat, ship, aircraft, barges, etc.), and sample return.

Roy Reider summarized the following points on Safety: Safety administration on a test operation is a command function - therefore, it is the responsibility of all supervisory personnel to see that high standards of safety are maintained in their work. So far the safety record for LASL personnel has been good - and this is attributed to the long planning and sound preparations, rehearsals, etc. No special manuals on safety are issued by this group; however, standard safety rules and manuals of the laboratory at home are used for guidance.

Through J-1 it is possible for LASL personnel to obtain special safety glasses with especially hardened lenses ground to prescription, and it is urged that you obtain a pair.

There are many hazards in connection with low voltage electricity in a humid climate; therefore, you are urged to take extra caution for properly grounded equipment when handling electrical equipment of any kind.

All personnel will have physical examinations before departure - and in selecting people to go overseas, it is urged that you not only pick them for their ability but also for their agility; intra-atoll transportation is very rough on Bikini Lagoon and personnel require vigorous activity for this travel. Should accidents occur, standard accident reporting forms are used in reporting to the home stations.

Major Gordon Jacks, Commander Task Unit 7, reported for TU 7 on radiological safety. This unit has the responsibility for radiological safety. They will do radiological sampling of water supplies and soil samples, check personnel and equipment entering and returning from contaminated areas, maintain and supply photo-dosimetry badge records, decontamination services, protective clothing, etc. Because this is a widespread operation, we have had to set up essentially two individual organizations. We will establish two centers - one at Bikini and one at Eniwetok. In each center we will have what we call a Control Group under which the project monitors will be controlled as far as entry and return from any of the contaminated areas are concerned. Both of these centers will be essentially organized the same, but there will be a difference in numbers of personnel. Bikini Center will be such that it can operate afloat or ashore, whichever is feasible. Eniwetok Center, of course, will be maintained on Parry Island. Check points will be maintained for Rad-Safe control of entry into the area at any place where a party might originate to go into a contaminated area.

The project monitoring load in past operations on TU 7 has been such that our present intent is to cut down that tremendous load. We would like to have all projects, wherever possible, provide their own monitors, as radiological safety is a command function and responsibility. We will provide schooling so that people can be properly briefed to follow prescribed procedures; and provide the proper instruments, clothing, film badge services, etc., for the group monitors. A school will be set up stateside sometime in January for the purpose of getting monitors trained during a four-five day course, and overseas a review one-day course before the operation starts should enable monitors to brush up on proper procedures. Should project leaders desire to train their own monitors they may do so, but it is desired that they certify to me, by name, as to the competence of the monitors they choose; and it will be their responsibility to see that proper radiological safety methods are carried out. (Note: All monitors will be required to take the one-day review course overseas.) It is requested that you specify in your next status report the number of monitors you want us to train for you, so that plans for the school may be initiated. It is expected that people who serve as monitors will be in the FA in other working status, and that monitoring can be done in connection with their other services.

Bill Ogle urged people to do two things, one to take advantage of the project monitoring program because it has proved so valuable to the projects in the past, especially in having your own people, people you know rather than strangers, to help you in your program. Also, if you have more than one monitor, you have greater flexibility, especially if you are involved in more than one shot, or you may use up the dosage allowed to some of your people. The second point is that because of the housing shortage we would much prefer you use people who are there in other working status as monitors, rather than bringing people specifically as monitors, if at all possible.

Major Jacks came back to say that the monitor pool will be present there as in the past but not to count on that as their primary source of monitors. They will be there for such things as pre-entry surveys, and in the event of emergency, if your people are burned out, I can provide monitors for you, but I certainly hope you don't come running to me all the time for that.

Loris Gardner spoke for the Documentary Photography Unit as follows: Task Unit 8 is a service group devoted to supplying untimed technical photography coverage - limited in this operation to LASL. Another group from UCRL will do for them what we are going to do for LASL, and Lookout Mountain Laboratory will undertake to cover for the Department of Defense. Task Unit 8 will be based primarily on Parry in Building #210, where there are dark rooms and work rooms. We will have a photo truck on Bikini near our office tent. The storage problem for film is solved by a walk-in icebox in Building #210 and, in addition to this, we have found it necessary to provide storage reasonably secure from fallout. We have been provided with an underground storage vault which is not too satisfactory, and we plan tentatively to store a supply of sensitized materials of the record type in Hawaii so we will have a backup there. So far have not definite requirements from LASL so have not planned personnel-wise; however, we will take care of the LASL needs, as requested, for aid

in processing, etc. Also, we will plan to have on both sites a sufficient number of people to take care of those untimed technical jobs as requested. We will also provide duplicating facilities for small orders, as we will have a Verifax machine and a small photostat machine on Parry Island.

Mr. Curry pointed out UCRL will also have its own photographic unit.

(Note: At the time of the meeting it appeared that Lookout Mountain Laboratory, operating under TG 7.4, would do DOD documentary photography. Requirements for such photography have proved to be so small that we now plan to have two AFSWP photographers, temporarily assigned to TU 8, handle it.)

PROGRAM I

Project 1.1 - Basic Blast Measurements - Charles Kingery - BRL

The primary object of this project is to obtain basic blast measurements; this will be in the form of air blast pressure time records, dynamic pressure time records from various yield detonations. We will instrument six of the following series: Cherokee, Pueblo, Zuni, Yuma, Lacrosse and Mohawk. The BRL self-recording 'Pt' gauges will be used throughout and be installed at ground level at various distances from GZ. All surface stations on islands will be installed by BRL personnel. The BRL self-recording "q" gauge will be installed 3' above the ground surface on all land stations and 3' above the mean tide on all the reef stations. The main effort will be on Cherokee where we expect to make a total of 30 "Pt" measurements and 11 "q" measurements. Zuni will be the next major effort; will have gauges on the Tare complex and Uncle Island; we expect to take a total of 24 "Pt" and 10 "q" measurements. The "q" measurements will be along stations where we plan to put jeeps to measure the dynamic pressure present at those positions. On Pueblo, Mohawk, Lacrosse and Yuma will have limited number of stations and blast lines will be installed on each to obtain pressure distance curves. We plan to cover on all of these pressures which are of military importance. There will be 12 people in the FA - eight civilian and four military.

Project 1.2 - Thermal Effects - A. D. Thornbrough - SC

To determine if a precursor is formed from a medium-sized surface burst. The project will measure overpressure and dynamic pressure at several distances from GZ. Wiancko pressure gauges and pitot tubes will be used as on past operations; the recording system will be similar to that used on Operation CASTLE. A total of 10 channels, six Delta "P's" and four "Q's" will be instrumented for the Lacrosse shot on Yvonne Island. We will share the shelter with Project 30.1.

Project 1.3 - Shock Photography - Peter Hanlon - NOL

We plan to participate in four shots - on Cherokee, Pueblo, Zuni and Mohawk - with emphasis on Cherokee on which shot we plan to measure free air pressure distance at burst height and in the regions above the burst point, and to study the effect of surface heating of the air near the surface on shock wave propagation, and to check scaling, and determine the blast yield of a Mt weapon free from influencing surface effects, and also to make an effort to study the effects of non-homogeneous atmosphere on blast transmission.

For Pueblo and Zuni, both of which are land shots, we intend to make a determination of the pressure both along the surface and vertically above GZ and to study the effects of the surface and surface heating on shock propagation. On Mohawk a function is to study the effect of a vegetated surface on shock growth.

Instrumentation planned will be purely photographic and we would utilize rockets to set up background grids. This is actually the technique that has been used numerous times in the past and it is presently being amended to include a high velocity, high capacity rocket which will give us additional coverage which will be necessary on the two Mt shots planned to be instrumented. The effective range, which worries chiefly Program 5, I can't give at the present time but this data will be forthcoming shortly. With respect to construction requirements, we have more or less settled everything for this project; fortunately they are at a minimum. We require only the building of a reef station SW of Namu, roughly 24,000' on the reef, but this has been discussed with DWET. We plan to have seven men in the field from March 1 thru the required shots. In response to questions from the floor, Mr. Hanlon stated that on Cherokee 5" rockets will be fired from Able at -15 seconds, and that 5" rockets and the Deacon rockets (long-range rockets) will be fired from a point approximately 12,000' SW of Able. On Zuni the rockets will be fired from the south side of Uncle, about in the middle, and they will be fired north and south, with a few Deacons being fired in a northerly direction. On the other two shots we have not yet firmed up position of the rocket stations. The maximum altitude of these rockets cannot yet be stated as they are still in the design stage, but when they go in the vicinity of GZ at a point 8,000' west of GZ, in this case, the highest rocket will be roughly at an altitude of 30,000'. These emit a smoke trail which is merely a background. The photographic requirements will be consistent with the Mack station which will be available.

Project 1.4 - Free Air Pressure at Altitudes - Lt Col James A. Fava - AFCRC

The objective of the project is to obtain additional experimental data on the effects of altitude on the propagation of a shock wave. In order to accomplish our objective we plan to have 16 parachute borne canisters spaced over GZ for shot Cherokee, which is the air drop. These canisters will be so spaced that they will measure overpressures in the range of 20 psi down to one psi. This means an altitude of approximately 16,000' up to 40,000'. We hope to drop them from either a B-36 or B-47, this has not been determined as yet, from an altitude of approximately 45,000'. They will be in a vertical array above GZ. The information will be telemetered to a ground station located on an LSD 50 to 100 nautical miles away. We hope to use a frequency of from 215 to 230 mcs. We will have three K-35 trailers and three K-52 trailers to be shipped from the west coast to Eniwetok Atoll, and then off loaded from the prime mover to an LSD. The canisters themselves we hope to fly aboard the drop aircraft. We will have approximately 2400# 400 cu ft to be air lifted to Eniwetok by MATS. There will be approximately 17 to 20 personnel in the Eniwetok area, this is exclusive of air crews. They will be in the area from Cherokee -20 days to Cherokee +20 days. Construction-wise, we have put in a construction requirement to AFSWP, which we asked for at Kwajalein where the aircraft was to be based, but I now understand it will be at Eniwetok, but we can change that. For preliminary positioning we have used the Ledsham - Pike method of scaling to plot an overpressure versus slant range curve. We have a photographic requirement for location of canisters at zero time.

Project 1.5 - Drag Characteristics of Various Shapes - Ralph Reisler - BRL

We plan to: one, investigate the aero-dynamic drag characteristics under transient loading conditions of actual and idealized shapes; and two, we want to investigate the response of drag-type targets and continue the statistical evaluation studies on military vehicles. The actual shapes to be used will be standard full-scale wide-flanged "I" beams 10' long, and standard angle iron sections 6' long. The idealized shapes will be 3" and 10" spheres. These items will be exposed at the 3' level on Cherokee. Two of the "I" beams and angle iron stations will be on two planned man-made islands of Project 3.1, at a pressure of 8 - 6 psi. Two 3" spheres and one 10" sphere will be included with the "I" beam and angle iron located adjacent to the Island Dog Station of Project 3.1 - at a pressure of 3.5 psi. Also, a complete drag station will be located on Island Able in the 20-25 psi region. Under present plans, 50 channels of information will be obtained. Recording will be done by the BRL Structures Instrumentation Project 3.10. To carry out the second objective, jeeps will be used as response gauges and will be placed adjacent to the basic medium stations. Damage evaluations will be made on all vehicles exposed. Participation here will be on Zuni and Lacrosse with a maximum of six stations being established for each, covering a pressure range of from 5 - 15 psi. We will have a total of seven men in the field - four civilians and three military.

Project 1.6 - Drag Structures - Joseph Petes - NOL

This project is very similar to 1.5 of BRL with drag measurements being made on various targets. The primary difference is 1.6 measures drag loading on model targets. On REDWING we plan to continue the work started on TEAPOT. The ultimate objective is to be able to predict on actual targets under specific field conditions, drag loading, on the basis of laboratory wind tunnel and shock tube tests. Therefore, on REDWING most of our models will be simple geometric forms in order to simplify the problem of comparison with previously conducted wind tunnel and shock tube tests; and we will also have some models which will represent actual targets such as bridge members, and we hope to be able to instrument some models which will represent scaled models of structures used on previous operations. The models which we contemplate using will be spheres which we had on TEAPOT, three 10" spheres essentially, mounted on stings. We hope to put out infinite length cylinders, circular and rectangular cross sections, cubes, and some scaled versions of previously used full scale structures. We plan to participate on shot Erie, which will give us two conditions which we would like to investigate, one, a clean Mach region, where we plan to put our gauge stations, approximately 10 models in about five psi static level. These measurements will give us direct correllation of such factors as drag coefficients, dynamic pressures, and drag forces, with wind tunnel and shock tube tests. We plan to put 10 models in a precursor which we hope to obtain on Erie. The instrumentation consists of force gauges which will measure force in three logarithmal components. The recording - transmission system is FM and the recording will be on magnetic tapes. The construction requirements were submitted last week to DWET, and I understand there are no existing structures

available on Runit, so the possibility exists of sharing a structure with some project on Runit. If not we will have to build some kind of instrument shelter. We have plans for these. We have details of the gauge mounts for approximately three-fourths of our stations, the other quarter remains yet to be designed. We plan to go out into the field with six to eight people. The models will be on the island approx 1500' and 3,300' from GZ.

Project 1.8 - Crater Measurements - John G. Lewis - ERDL

Project 1.8 will make crater measurements on the ground surface shots of the operation, on Huron, Zuni and Lacrosse. Will make early mapping runs over the craters after bursts. Cameras are tied in with altimeter, giving scaling control. No ground construction is necessary for this part of the experiment. In addition sounding for depth of crater will be made as soon as radiologically possible after each shot. Sounding is the extent of J-6 support. There will be one person in FA.

Q: Who will make these soundings?

A: We plan to make soundings on 3 diameters, 5 soundings per radius, or about 30 measurements per crater. We are conducting this for AFSWP. Picture taking will be done by Program 9.

Project 1.9 - Water Wave Studies - John Isaacs - SIO

The main object of this project is to understand the surface water waves generated by nuclear weapons. There are two modes of generation: one, by direct impulse on the water in a central region; two, air-coupled wave which builds up with distance to considerable ranges and has equal parts of energy. The information we gather from these shots (the large shots, that is) will not be much of anything new, but will only better the information we have now; unless we can persuade AFSWP to put a high priority on a small kt shot in the deep lagoon which will be a good model of a Mt weapon in deep water and will, I believe, solve a great problem as far as what the generating capabilities of a Mt weapon on the surface or slightly under the surface of deep water. Dr. Van Dorn has been studying air-coupling waves that are generated. He intends to continue his studies on this operation.

We will have four land stations at Bikini, Enyu, Airukiiji, and Chieerete. We will activate the proper land stations for all shots in the Bikini Atoll. Will use floating stations for the larger shots. There will be a station at Parry Island, outside the lagoon, and one inside the lagoon. We will have one station at Sifo on Ailingnae. Would like to have photography of the waves coming over the islands. The distant stations are - Guam, Canton, Wake, Eniwetak, Ailingnae. One man will be on Eniwetak and six men will be in Eniwetok - Bikini area. This does not count the men in the distant stations. In conclusion, Colonel Kerwin asked Mr. Isaacs to drop into the J-3 office, and the reply was in the affirmative.

Project 1.10 - Vegetation Studies - A. D. Thornbrough - SC

To determine the differences in overpressure, dynamic pressure, and sound speed over cleared sandy land and over vegetated areas. Project will measure overpressure, dynamic pressure and sound speed at equal distances from GZ over cleared sandy land and over land fairly well covered with vegetation. We will use Wiancko pressure gauges and Pitot tubes with the addition of the whistle gauge used on past operations. The recording system will be the same as used on Operation TEAPOT. A total of 17 channels - nine "P", four "Q" and four sound speed will be instrumented. These will be instrumented for the Ruby shot with instrumentation on Pearl. There will be a shelter built on Pearl, and there will be a total of five men in the FA from April 1 thru the shots.

PROGRAM 2

Project 2.1 - Gamma Exposure vs Distance - Peter Brown - ESL
2.2 - Gamma Dose Rate vs Time

The objective of 2.1 is to measure the total gamma dosage from the initial and the fallout radiation. We will use film badge techniques and, in the cases where there may be neutrons present since these do affect the film, we will use ionization chamber types of dosimeters as backups. The calibration source that we use here will be a 200 curie cobalt 60 source, and I would like to know where I can put it. Maybe Rad-Safe can help me out. In addition to those two techniques, we will probably use phosphate glasses to measure the very high rates in close to large weapons or large devices.

The objective of 2.2 is to measure the gamma rate vs time at various locations. We will measure the fallout gamma rate with ionization chamber types of instruments located at various spots on Bikini and possibly on one or two of the shots at Eniwetok. I do not know if that is firm as yet. The initial or one of the main things we want to do on the fallout station is to measure the decay rate. We will measure the initial gamma rate on the large devices at Bikini, using a scintillation type detector that is a phosphor and a photomultiplier tube. We will use light to calibrate these to very high levels and will use cobalt to calibrate these to the very low levels. We will probably have about 18 people in the FA for the two projects combined. We will have a variable photo dosimeter processing laboratory, probably located at Eniwetok. Any questions?

Q: Yes sir; Where will your initial stations be on Bikini?

A: We are going to locate them as close as a mile, and probably anything beyond three miles would not give us much information. I realize the risk. This makes three probably on Able, Tare and Charlie; in other words, I think there is going to have to be an artificial built-up combined station at Charlie for the Chemical Corps and our projects.

Q: How about your fallout stations?

A: These will be about 20 in number with the Chemical Corps layout; they will be at various locations on the Bikini Atoll - probably around Dog, Nan, and those islands in the lower left portion of the Atoll.

Q: Are your projects participating in all shots?

A: No sir; the large shots on Bikini and the air drop are the most important on the initial, and the small shots at Eniwetok which are too large to be held at Nevada will fill in the gaps in information not now available.

Q: I presume you have talked to Rad-Safe about the safekeeping of the cobalt source?

A: No sir, but I certainly will.

Q: You seem to have a comparable job with Rad-Safe; have you discussed with them the possibility of combining the developing of film units with the work done on film badges at the Rad-Safe film badge development trailer?

A: Yes sir; I do intend to discuss this with them, as we have done this on previous operations.

Project 2.4 - Decontamination and Protection - J. C. Maloney - CRL

The primary object of the project is to provide the data required for the formulation of criteria for the decontamination, protection and recovery of military bases. To accomplish this objective, it is proposed to determine the relative contaminability of building materials by exposing panels of construction surfaces - mounted on special frames at various pitches and orientations - to high intensity fallout on the bow of the YAG ships. We will also evaluate the effectiveness of decontamination methods and the practicability of such techniques for industrial recovery. We want to evaluate the relative effectiveness of protective measures; such as the painting of surfaces and the simplification of structures or shapes, to cut down the contamination levels both before and after decontamination, and to ascertain the effective scope and retentivity of the contamination of surfaces. Operationally, we plan to take sets of panels of different building materials and put these sets of panels on a frame. The frames will then be put on the bow of the liaison ships for exposure to fallout head on, more or less. After the event the ships will be taken back to Parry Island where H&N will take the frame off, and we will go thru with processing them (ionic decontamination). There will be certain chemical and physical tests on the surfaces - and an attempt to determine the depth of penetration of the contaminant. We will participate in Cherokee, Zuni and Navajo. There will be six men in the FA - four civilians and two enlisted men. Construction requirements on H&N will be small for the CASTLE facilities are to be rehabilitated.

Project 2.5 - Neutron Flux Measurements and Shielding Studies - Benjamin Barnett - CRL

This project answers the requirements of DOD for neutron flux measurements as a function of energy and distance. We are going to participate in all three types of operation, I, II, III, (The three operations that you have on that attached sheet.). These will include Cherokee, Osage, Blackfoot, Yuma and Kickapoo. We will put out a number of detectors, gold, tantalum (perhaps), iodine, zirconium, and fission detectors. On Cherokee, we plan to have two stations on Able, two stations on Baker, one on the edge of the Bravo crater, and one on the

tip of Charlie. On Yuma and Kickapoo, there are stations up to the tower. These are tower shots and on Blackfoot we have plenty of room, so we plan to go out several thousand yards on these and Yvonne is a good island. However, in the case of Osage, where it is apparently being planned to be a low air drop over the central part of the lagoon, because of the lack of land out there we would like to suggest that, as far as we are concerned, it should be shot over either Yvonne, or in the Sally group of islands, Sally, Tilda, or Ursula.

Q: Have you taken into consideration that you have other installations on that group of islands?

A: Well the only solution I have is that we will have to have more discussion of closer stations for Osage or use more floating stations.

Another problem that is important for us is the symmetry of the weapon. We have to know if we need single lines, or two lines or three lines, and in some cases we may have more plans for more wires. In the tower shots we also need to know if there is any interference in the path of the line of sight of instruments at our stations. Our construction requirements are fairly good except for Osage. We plan to have seven people in the FA. Any questions?

Q: Will you please come into the J-3 office to discuss the sample return requirements?

A: Yes, I'll do that.

Project 2.6.1 - Rocket Sampling of Fallout at Early Times and High Altitude - R. Soule - BuShips - NRDL

The first objective of this project is to proof test a system using rocket-borne detection units and telemetering transmitters to explore the spatial distribution of radioactivity in the stem and cloud resulting from a nuclear detonation. The second objective is to measure gamma intensity along several continuously known trajectories passing through the cloud and stem at 10 to 30 minutes after detonation. It is planned to participate in Cherokee, Zuni and Navajo. A 6" diameter rocket capable of attaining 170,000' altitude, bearing a radiation detector and telemetering equipment, will be used to achieve the specific objectives. A launching revetment will be constructed on an island at a distance of 10 to 18 miles from the shot point (this indicates the island of Bikini). A receiving and tracking station will be set up on a ship to be stationed at about 40 miles from the shot point on a line at right angles to the flight path of the rockets. It's planned that up to 14 rockets could be fired in two salvos of seven simultaneous firings for each of these three shots. The complete rocket, including the telemetering head, and the radiation detection device, is to be supplied by a contractor. This contractor will also fire the rocket in the field, receive the information, reduce the data, and supply it to us. On the other hand NRDL, in consultation with other interested persons, will indicate the volume that the rocket should traverse,

and the time of firing. NRDL in consultation with AFSWP will convert the data and will provide logistic support, in liason with other military establishments. We will have seven persons in the field, two from NRDL, five from the contractor. Construction requirements are firm, and have been turned in informally.

Q: How about the fuel for the rockets?

A: This rocket uses solid fuel and is the single-stage missile-type rocket which has no guides attached to it as it leaves the launching platform.

Q: How about the frequencies?

A: The frequencies that the contractor uses in his rocket are the commercial 215 to 235 mcs. The power seems to be on the order of five watts.

Q: Where is the launching site?

A: The launching site for the three shots would be in the central portion of Bikini Island.

Q: How about storage requirements?

A: The storage requirements I think would best be met by having the motors that aren't actually being emplaced in the launching revetment on the ship that is to carry the telemetering gear.

Q: Would you mind coming in to the J-3 office sometime this evening?

A: Thank you! I will come in.

Project 2.6.2 - Fallout Contours by Oceanographic Analysis - J. D. Isaacs - SIO

We do have quite a little data on inundation experience from CASTLE. Some people may be interested in that and I'll try to get it together. It's pretty hard to predict what the inundation would be from the Zuni shot; otherwise, I think it's quite clear. This project is essentially a fallout survey. It is a continuation of the type of thing that was done by Dr. Folsom last year in Project 2.7. The direct purposes are to determine isodose lines of fallout, total material, date of capture of fallout material by oceanographic methods. This is in conjunction with another elaborate cooperative effort between the NYOO and NRDL and it is a little bit difficult to separate the interest. Scripps interests are principally to assist and to cooperate in all ways in obtaining basic information for knowledge of fallout which can be related to land and knowledge of fallouts which can be related to models that are under consideration. Scientific interests and specific oceanographic scientific interest are slightly different and we have a great deal of interest in the nature of the mixing of these products, and uptake by biological organisms, and transport, an interest that is supported by AFSWP funds.

In addition to interpreting this [redacted] fallout, there is some direct interest in just fallout on water surfaces, particularly as cities such as Milwaukee and Chicago are contemplating more and more interest over waters. Our other interests are that Scripps is also attempting to obtain basic information on the way the ocean disturbs this picture so that in the future these types of surveys can be done on somewhat simplified plans. The NYOO has a method of determining the delineated fallout area by aircraft. Essential to this is the knowledge of the nature of the mixing processes. We will try to relate this to oceanographic factors and will have to measure these carefully, so that the aircraft data can be interpreted adequately. We hope, perhaps, that the next time such fallout studies can be made in a much abbreviated way.

Basic to all this is a very considerable knowledge of the way the ocean operates, particularly the way it distorts the pattern. Consequently, on this program, we intend to have an oceanographic vessel out there some weeks before the event, under the leadership of Horrer, and intend oceanographic information to be taken so that this can be accomplished with a high degree of certainty.

Operational procedure than is tied in very closely with the NYOO and with NRDL. We hope to establish a central plot. I think this may be better done (I'll just briefly mention this) if the three participating agencies have both the incoming and outgoing information at some central source, presumably afloat, with good communications to the ships. Particularly important in this and in the preceding oceanographic survey is some precise navagational control. This is under discussion at this time. This is very essential both to the aircraft and to the ships. We have asked for two destroyers for late D-Day probably and until D+2 to assist us in the oceanographic vessel in delineating the area at something that approaches a synoptic survey and in obtaining some early information on penetration. Penetration information will also be gotten from YAGs. The oceanographic vessel, being slower, will go in slowly and get later information on the penetration and cover the area for some days depending on the schedule.

In addition to this we are putting out some deep-moored stations. We think we will put out approximately 16 up to the north of Bikini Island and these will go out to a radius which has not been determined, but somewhere between 20-50 miles out, and they will be scattered out up there. Those, we hope, will survive during the entire operation of these big weapons. They will be similar to the type of deep-moored stations that were put out for IVY and WIGWAM, except they will be designed for longer life. NRDL will have fallout collectors on them and we will have simple penetration measuring devices that will determine at least the arrival of the mixed fallout products at several levels. There is, I think, some duplication of effort here, and there is no doubt that some part of this program, if everything went well, would accomplish the objective without the complete participation as planned.

I believe it is the feeling that this is a problem of sufficient exigency that it has to be backed up; hence, we are most anxious to get the destroyer information. We want to put ourselves in a position, if there is a delay of two days getting in there for any unforeseen operational reason, to be able to get the best information that can still be obtained. Present plan is for participation on Cherokee, Zuni and Navajo by these three agencies; I think there will be no participation in any of the

small shots. Scripps will have two people in the central plot, wherever that might be, and 8 to 10 people on Enyu Island and on our ship, the HORIZON; plus some 20 crew members, on the ship who have to be accomodated but only so far as recreation and food is concerned.

Project 2.6.3 - Collection and Characterization of Fallout - Terry Triffet - NRDL with Time at Operation REDWING

No doubt you already noticed the fallout problem is characterized by three numbers of the program instead of two. These are indicated 2.6 projects. These run from 2.6.1 through 2.6.6. This whole program is complicated to a very great extent by the fact that our data has to be collected over between 5 and 10,000 square miles of ocean. For this reason, Dr. Isaacs has pointed out, it requires a very closely integrated effort between all the projects. In general the projects that we will be interested in are Cherokee, Zuni and one of the barge shots. To give you an overall picture of what might be happening there at early times, Project 2.6.1 will be firing rockets through the stem and cloud. At somewhat later times, another project conducted by the AF will be conducting early cloud penetrations with aircraft. While the fallout is actually going on there will be fallout collections and gamma and beta measurements being made on the islands by the Chemical Corps and the ESL. There will be a preliminary survey first and another rapid survey a little bit later. In addition to this Scripps Institution will then conduct a somewhat lengthier, although still a fast survey, using oceanographic means, of the entire ocean area. NRDL's role in this Project 2.6.3, which is my own project, is a role of providing supplementary contour data and also providing control points or check points for this entire operation to enable the whole thing to be tied together at certain points whose coordinates are, hopefully, known accurately, and points where there is careful documentation of fallout at the time. We also have the additional problem of performing our collections in such a way that we can use the data to check current model theories. As you know there are a great many of these theories. Unfortunately, no one theory can be established conclusively since the data is insufficient. We hope to provide carefully controlled data whereby this can be done. The third aspect of our program features actually collecting as much fallout both in solid and liquid phase as possible in order to perform early time and later time chemical, radiochemical and physical measurements. These then are our three basic objectives. I hope I have made it clear how we hope to at least be helpful in tieing the whole project together, by the nature of these. Operationally we hope to accomplish this as follows. We will have fixed stations in the lagoon. These will essentially have total fallout collectors on them and also an instrument for measuring time of arrival. These will be rafts and barges that are provided and anchored by the Task Force. I really simplified that because on the barges we have a more elaborate array than just total collectors and time of arrival instruments. It will be the same array that is on the YAGs which I'll mention in a minute. Those are all in the lagoon. Out between zero and 30 miles, we

will have the skiffs that Dr. Isaacs mentioned. These will have total collectors on them, and time of arrival instruments. They'll also have an instrument for measuring intensity with depth, belonging to Scripps Institution. In the distance between 30 and 100 miles, we will be operating two ships (converted Liberty type) called the YAGs 39 and 40. Most of you are probably familiar with them as the "disappearing YAGs". On the nearest of these YAGs, (the one that is in the highest intensity fallout area), we will have what we call a "standard array" of instruments mounted. They will be up on the king-post to avoid spray and stack gases. The following instruments will be mounted on that: four open close collectors (to be opened just before fallout starts and closed just afterwards so that we can have undisturbed samples), two total collectors (these just simply collect everything), and an intensity time recorder which records gamma radiation. There will be an instrumental collector which collects fallout over pre-set timing areas. There will be an anemometer and that type of thing. We will have the whole platform shielded in order to avoid bias. These barges that I mentioned will have that array of instruments on them, and also both YAGs will have that array. Out 100 to 200 miles, we will have an LST operating, and this too will have a standard array of instruments. On the YAG 40, we will have a special instrumental collector that's designed to collect fallout and then, by a sort of dumb waiter system, to deliver this below deck to a shielded laboratory that we will have on the YAG. There we hope to make some early time studies that we feel are very badly needed - the "K" measurements and gamma spectrum. With time and personnel permitting, we hope to make similiar measurements on Baker. This will be done during fallout and samples that are delivered to the laboratory, will be during this actual fallout. Also, on the YAG, we hope to be making measurements that will complement Scripps' measurements in regard to water sampling and oceanographic survey. We hope to make both surface measurements and also measurements of intensity with depth. We hope that certain of these measurements will also be applicable to the aerial survey, since they measure intensity of an altitude and this is a function of the activity in the surface layer. We hope to give them information on that surface layer along with Scripps in order to tie their information together. The ships, in general, will be directed to near their locations about H-12, and then we have to keep in touch with a central command group that we hope to have in a central location with the Task Group Command ship. On the basis of later wind data, we can direct the ships to their final locations. It can be very great, of course, maybe 30 miles or something like that. At that location, they will then maintain position until the completion of fallout, perhaps some period afterwards. What we are attempting to do here is that in checking model theory, of course, contour data is absolutely fundamental. We hope to provide the supplementary contour data in the lagoon for close distances. However, there is another possible approach too. This is if one can collect at some known point in the fallout pattern, it is a function then of particle diameter. If these points are chosen properly, in the fallout pattern, we feel that it is possible to distinguish gross differences in model theories. In other words, all the theories apply the same basic laws of motion as aerodynamics of small particles, and somehow come out with different answers. This, of course, is because of different assumptions. These assumptions may result in gross differences of patterns that we hope to be able to distinguish by these fine collection

particles. Unfortunately, we'll need about 25 or 26 people, not counting enlisted men, in the area. These will be operating for the most part off the YAGs although there'll have to be some collection teams at Enyu and Parry. Our construction requirements are in. There is a slight modification with regard to beach area, but this is noted in one of the status reports. Any questions?

Q: Would you please stop in to see J-3 at your earliest convenience?

A: I'll join at the end of the line.

Q: Who do you have in mind to help you mount these platforms?

A: I have in mind that H&N might help us mount some of the equipment on there and perhaps with the anchoring as I'm not familiar with this procedure. The actual craft have been requested through BuShips.

Q: Will the YAGs operate their wash-down systems?

A: This answer has to be qualified somewhat. Other interests on the YAG would like to have the YAG operating with the wash-down on part of the time, so our plan is on one of the YAGs to have it operating all the time, and on the other YAG, to have it operating on at least two-thirds of the ship all the time. There may be one-third that we'd like to have with no wash-down particles.

Q: I understand you are planning to have large numbers of the YAG crews live ashore part of the time. Is that correct?

A: I'm not sure of the number of people in the crews of the YAGs; however, we are planning for them to live ashore part of the time, and I would imagine they would come to near 100.

Q: How about the packing and shipping of your sample returns?

A: We hope to process, at least as far as packing them for shipment, some of them during the trip from location back to Parry. However, we hope to have all samples go through our installation on Parry. And then from there, I really should have mentioned that we plan to have two trailers in which we perform some early time studies on Parry; therefore, some will be examined at that point and the rest will be shipped out.

Project 2.6.4 - Early Aerial Survey - Robert L. Graveson - NYOO

This is entitled Early Aerial Survey. "Early" is a qualified term which we will come to when we start talking about the schedule operationally. Basically, we have been using aerial survey techniques back as far as IVY on land masses. Towards the end of CASTLE we found, somewhat to our amazement, (Scripps was nowhere near as amazed), that the material which fell out in the ocean was dispersed

in this area, and remained suspended for quite some period of time. Actually, we made measurements as far out as D/3 and D/4, when material was still well distinguishable as a correlated mass.

Primarily, we want to find out two things by the use of airplanes for fast coverage: first, where the material is laid out, and second, how much. Where the material is, is really an operational problem. We plan to fly our aircraft so that we can find the gamma ray pattern from the sea.

One of the problems that immediately arises is the location of the aircraft; this problem is under discussion at the present time. We will always plan on an aircraft with navigators so that we can fall back on them as a final backup system. This is how we find where the fallout is located.

The amount of material is a correlation problem between the various projects involved. The gamma radiation measurements at a fixed distance above the surface can be correlated to the specific activity of the surface layer of water. The gamma ray rating at a fixed altitude can be determined by a correlation to an altitude factor. The altitude factor depends on where the plane is working. The equipment is tied in through a radar altimeter to automatically correct the data to a fixed surface level. These altitude factors bear further investigation. We have been investigating them for five years. We have a nice mass of data that seems definitely reproducible, but in some places it is not adequate. The data seem to follow air absorption.

We will analyze surface layer water samples and correlate them with other projects. This means picking up duplicate samples to correlate with the world-wide fallout program. In the field we will measure gamma. For early time studies at Parry Island we will measure rate of decay, absorption, gamma spectra and of course specific activity both beta and gamma. We hope through the spectrum measurements and some chemical techniques to partially delineate the material present. If we knew the materials that were here we could calculate everything out and it would be a lot simpler, but we don't, and we will only carry this on as an additional part of the study. If we reach a beta per gamma measurement through our surface measurements there still is a question of how much material is below this. This is based on two things, first, the Scripps' study of dispersion and material mixing. In addition to the time of arrival data for fixed points which we hope will be available from the YAG, we will know where the materials start to fall out, and the study of the dispersion based from this time, will give dispersion factors. This is the analytical phase.

Duplicate samples will again be returned to the New York Office so that our analytical procedure can be carried on over several months or longer to relate to the material that we find in fallout on a world-wide basis.

AFSWP is particularly interested in the study of the fallout from Cherokee, Zuni and a barge shot, possibly Navajo. On these shots we will correlate with the other projects. In addition we have a requirement to study the fallout patterns on a tactical basis, and we plan to cover the large Bikini shots.

Our flight pattern (and this is where the term "early" comes in) will be based on a report of the closest YAG when fallout has been completed. At that time we plan to circle around zero at approximately 20 miles out. This will give us the main fallout pattern. From our limited experience on CASTLE, which was a rush program at that point, we found a pattern which could be referred quite possibly to the stem, so this pattern will indicate both positive and negative information. The positive information is that it went where we think it did; the negative information is that it did not go in the other direction. In addition, as it is cleared, the roll-out of the fallout, the other planes will probably work a circle between 40 and 50 miles to correlate with the first YAG. Flight patterns will be carried out as long as possible on D-Day.

On D+1 we plan to completely delineate the area no matter where it may take us (even to Hawaii, I hope). On D+2 we want to repeat the pattern to study the dispersion horizontally of the pattern and also to correlate back to give us two measurements. Again, we would like to repeat this on D+4.

There may be a requirement (and operationally we want to be geared for this) that if the pattern is still markedly present we would fly a day or two before it was expected to fire another shot - in this case so we could see what was added on. The four day flight would tell us whether this is decaying down or dispersing; with this it might not be absolutely necessary to fly the pre-shot flight, but operationally, we want to remain geared to this.

If we find a stem pattern, one plane will be sent up to follow it. This aircraft will contain a radiation detector with altitude compensation and a telemeter to telemeter the radiation data instantaneously back to the plot center.

At the plot center this information will be received along with plane location to build up a progressive plot. In addition we want to put in the ship information and all information that is available to correlate at the time. Another radio channel will be used in common to the two navigators of the two aircraft we're working with to control their pattern. If we find an indication from an island station report we certainly want to get some aerial coverage down in this direction. This is more of a Rad-Safe requirement; however, it still does exist. This is primarily to provide tactical information as well as to coordinate the measurements with surface measurements so that we can in the future just fly the airplane.

We have two small phases of the program which are a study of instrumentation techniques. We want to correlate gamma spectra measurements made by helicopter with the same information from below the surface of the sea as measured by the YAGs. Any questions?

Q: How badly is your instrument hurt by contamination of the aircraft?

A: We shield the detector so that it only sees a 90° view. It is so located in the aircraft that it is as far as possible from any leading edge. This is where

the main contamination is picked up, on the leading edges and the oil cooler intake.

Q: Will you be able to correlate aircraft and surface water readings?

A: We know what we ran into on CASTLE. The lowest level we could read on the surface was one mr/hr. We want to be able to get data with sensitivity below this and, on this basis, we added shielding for the WIGWAM Operation where it turned out it wasn't necessary. We hoped it would increase this factor by a factor of five or six. We also hope to be very careful in flying. Thank you.

Project 2.6.5 - Land Fallout Studies - M. Morgenthau - CRL

Project 2.6.5 title is "Land Fallout Studies". The title indicates this process will emphasize collection on land spaces and it's being supplemented by information collected by all other fallout projects. The objective of this process is to prepare isodose contours based on the dose rate data obtained by this process in the atoll area-also from the rad-safe data, and also other projects. This project will collect samples and obtain characteristics of particles in order to help the picture, and to see what type of model is really the correct one. Time of arrival data and rate of arrival of fallout will be measured. Radiochemical measurements will be made in order to develop fireball models. We also have been trying to determine the arrival of the base surge and the rising of the base surge and if it contains activity. Project 2.6.5 will participate in Cherokee, Zuni and one water shot - probably Flathead. Of course on Navajo it is expected that most of the islands will be flooded. Operationally this project will implement 13 island bases in the Bikini Atoll. At these stations we will have intermittent fallout collectors which will collect samples at five minute intermittent intervals and 30 minute intervals, for a total of 11 hours. We also will have total fallout collectors which will open at the time of the shot and will remain open for 11 hours and then close. Furthermore, the time of arrival detectors and the station monitors will run for two days to be sure that all the fallout will have come down. We expect Signal Corps to furnish on these stations dose-rate meters to record the dose-rate accumulated. This project will also have two total fallout collectors at far distant stations, at Kusaie and Rongerik. In order to correlate with NRDL, we plan to have fallout collecters on the YAGs and the LST. In order to get dose-rate we plan to instrument two helicopters; probably Rad-Safe helicopters. Similiarly to what was done in TEAPOT, the helicopters will fly over the island at 1,000' and a probe will be lowered down to the island, a microswitch will indicate when the probe is 3' above the surface and readings will be taken in the helicopter. These readings will be as early as possible,and will be repeated at subsequent times to get actual field decay dosages. Construction requirements have been submitted. We will have approximately 28 people in the FA. Any questions?

Q: Will these helicopter readings be accurate?

A: A few times they have been able to do it and obtain the altitude pretty well

within about 10%.

Q: Did you say a helicopter would be as low as 3' over the island?

A: No. They will fly at a 1,000', but a probe will be lowered to the ground and a timing switch will indicate when the probe touches the ground.

Project 2.6.6 - Early Cloud Penetration - Col E. A. Pinson - AFSWC

The purpose of this project is to determine the radiation dose rate and integrated radiation dose which air crews might receive in flying through the clouds from Mt yield weapons at various times after detonation. This project has been undertaken as a result of a requirement established by the USAF and SAC. We think that the results that we hope to get will be equally applicable to other operational air commands. The aircraft which we hope to get for this project is the B-57B aircraft, a two place aircraft with an altitude capability in excess of 50,000'. We will have numerous types of instrumentation on this aircraft. We hope to have at least two, possibly three, independent, automatic recording dose rate meters on the aircraft in addition to a half-dozen types of integrating dosimeters on the aircraft. We expect to participate in all of the Mt yield shots, the five largest. The altitudes at which we will operate will be from 30 to 50,000', at times which we now think will range from 30 minutes to 90 minutes. We will employ two types of maneuvers in these penetrations. One, which we call the nip, in which we go into the cloud a reasonable distance, let's say a half-mile or so and back out as quickly as possible. Another type of penetration, which we call a bore-thru, where we will go directly thru the cloud. In the first shot that we participate in, in order to inject as much safety into the operation as possible, we shall make penetrations at the later times that I have indicated, and with the nip type of penetration which will keep us in the cloud the least amount of time. We expect to have approximately 12 technical people in the FA in addition to the people who fly and maintain the aircraft. Any questions?

Q: Will you have to have any special radiation dose in order to make penetration?

A: Yes, sir. We would have to have a special radiation dose in order to enable us to make penetration at the times which will be useful to us; and one of the problems we have with this type project is getting the approval of an established dose greater than let's say 3.9 R.

SAC has asked for bore-thru type penetration which would net up to 75 R. We have consulted with them and we were understandably hesitant to make penetrations at this time in keeping with the uncertainties of the dosage that one can get from a project of this sort. I think we can appreciate, from the TEAPOT work, error factors of up to three times are quite possible and if you multiply 75 by 3 you have got quite a dose. We talked with SAC about this and they, I think, would be satisfied if we could make penetrations up to the point where bore-thru penetrations would net 25 to 50R. In keeping with this, we will request approval for a 25R upper limit for our aircrews and perhaps a 50R limit on not more than six aircrew members.

Project 2.7 - Ship Shielding Studies [redacted] R. Rinnert - NRDL

Project 2.7 is concerned with shielding studies. This would essentially be a phase of a long range program of trying to establish shielding tactics for various compartments in areas on combatant ships. In order to help this type of study, we have to find out something about the relative importance of the various radiation sources that affect the various compartments. We know that one radiation source would be the ship's super-structure, decks, etc. Another would be the contaminant in the water, and surprisingly enough there seems to be a significant amount of radiation coming from the air surrounding the ship. We are planning to study this particular phase of the problem by using detectors which we have used in CASTLE and WIGWAM. We intend to shield some of these in such a way that some are essentially looking up only at the air. They are being shielded from the water and the deck. Others will be located below the water line and shielded so that they are looking out thru the shell of the ship at the water only. The rest of our stations will essentially look at all radiation. By means of this we hope to get some idea of the relative importances of the radiation sources. Another thing we want to do is essentially confirm and expand on the interruption studies made in the steel pipes at Operation CASTLE. We plan to have pipe thicknesses ranging between 1/4" and 6". We will have about eight of these of various thicknesses and one correlating station that would have no shielding whatsoever. The other stations would have identical geometry.

The detectors to be used in this operation are becoming somewhat marginal in reliability. They require quite a bit of maintenance, which will mean quite a few people out in the field in order to maintain and check. For this reason, there is a development study going on, or will be started pretty soon, for new detecting system that will be far more reliable, cheaper to use, and so on. We plan to use REDWING as a field test for some of these new detectors which will be developed by then, we hope. Another development that we are interested in is essentially a rotating shielded detector which would be so mounted that in rotating it would scan in succession the decks, the water, and the sky. This will help in the separation of effects for one part, and it also may find use later on to give the Captain of the battleship a quick idea of just where his radiation is coming from, especially in determining whether to turn the washdown on when you have contaminated water. You might just make the situation worse by spreading this all over the ship. About nine people are scheduled to be out in the field. A good part of these men would be mainly for the maintenance of the instrumentation. This maintenance, incidentally, would apply also to some of the detectors that will be used by other projects aboard these YAGs. The number of shots we participate in will essentially be controlled by Project 2.6.3. We plan to participate every time the YAGs go out and participate in any event. I believe the construction requirements should be in by now. This would involve mainly working spaces, which I would like to see coordinated with the other NRDL problems so we could save space and other requirements.

Project 2.8 - Ship Countermeasures Method Studies - R. H. Heiskell - NRDL

Shipboard countermeasures studies consist of eight problems. Seven of these

will be carried out on the YAGs and the eighth one at the Rad-Safe Center on Parry Island. These problems involve the study of the effectiveness of various protection and decontamination methods, hazard estimates, personnel protection, decontamination, and basic contaminability and decontaminability studies.

Problem one, removable radiological protective coatings - the principal objective in this program is to evaluate the latest formulation of the above water sensitive coating. This coating is being developed by the Mare Island Paint Laboratory to NRDL's specifications. It is designed to be applied over standard paint and to be removable at will with a pressurized stream of hot water. An alkali sensitive coating is also being developed and this coating is included primarily to study NRDL's surface destructive stepwise surface decontamination.

Problem two, chemical paint stripping - the objective of this study is to determine the effectness of chemical paint stripping system which was developed in the progressive rehabilitation of the YAGs after CASTLE. The system involves a spray application of a chemical solution and then flushing off the treating solution plus the paint down through the red lead primer with a fire hose. Additional information will be obtained which will contribute to the studies of decontamination.

Problem three, mechanical scrubbing methods - the value of hand scrubbing has been recognized for some time as a decon method, but it is time-consuming and arduous. The feasibility of using a mechanical scrubber on board ship will be investigated.

Problem four, protection of miscellenous shipboard materials - it was observed on Operation CASTLE that various shipboard materials, such as tarps, canvas, manila lines and etc., become highly contaminated and are virtually unaffected by standard decon procedures. A program will be carried out to study the possibility of protecting these materials.

Problem five, methods of reducing radiation from contaminated wood decking - wood decking becomes highly contaminated in all contaminating events and it becomes necessary to resort to surface removal techniques to clean it up, and there is a limit to how far you can go with such procedures. Basic information will be obtained which will contribute to the development of protective measures.

Problem six, skin decon and protection methods - the hands of many of the decon crew got highly contaminated on CASTLE and in one case it was impossible to clean up one man's hands after scrubbing for a period of three days. He was only able to reduce the level to 20 mr. A hunch was played and we tested out our waterless hand cleaner and we were able to clean his hands down to background in two applications. But, unfortunately, this incident occurred near the termination of the operation and we were unable to get sufficient data. In addition to conducting a detailed program on this decon procedure we will study the effects of barrier creams in minimizing the contamination problem.

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Problem seven, monitoring and hazardous assessment methods - studies will be made to develop more efficient methods of appraising rad-safe situations on board ship. Technical surveys will be provided by this group for the other YAG projects.

Problem eight, basic contaminability and decontaminability studies - laboratory development work is conducted on fallout simulants. The accuracy of these simulants is always in question. Studies will be made in an effort to correlate these simulants with radioactive materials. The C-D studies we're interested in include all three shots in which the YAGs participate, but in all of the other programs we're basically interested in the first contaminating event. The success of the program depends upon the contamination of the air. We're concentrating on using the forward part of the ship which requires that the wash-down system remain off during this first contaminating event. We're hoping that we'll obtain a level of at least 200 r/hr at one hour. We will have 10 civilians in the field, one officer and 20 enlisted personnel. These enlisted personnel are primarily concerned with the hazard assessment and technical survey. I believe our construction requirements are in our July Status Report. Any questions?

Q: Are the enlisted men to come from the Task Force?

A: Thats right, that is where we intend to get the 20 enlisted personnel, from the Task Force.

Project 2.9 - Standard Recovery Procedure Evaluation - W. J. Armstrong - BuShips
2.10 - Washdown Effectiveness Evaluation

I would like to touch on the projects briefly and then spend a minute, perhaps, giving you a picture of the operational cycle of the YAGs. Project 2.9 is entitled "Standard Recovery Procedure for Tactical Decontamination of Ships." Project 2.10 "Evaluation of Washdown Effectiveness" - and these really are support requirements for the YAGs even though we ask for permission to document this effort any time the ships are around.

The standard recovery procedure and the materials we will use are born of our experience in CASTLE and many years of laboratory work at NRDL. We are going to try to demonstrate to the Chief of Naval Operations, let's say for example that in a military situation we can receive radiological contamination aboard ships and recover each unit by itself without having to have shipyard availability; and thereby relieve some cost and tedious work in the rear area.

The experimental procedure will follow the actual recovery of the ships after each shot participated in. Participation is dominated by the fallout program of AFSWP and is a primary mission. We might point out that there are almost nine projects using the YAGs on these missions'.

As you probably remember from CASTLE, making these YAGs disappear is not a

very easy thing. We are trying to do it just a little more efficiently. Let me point out that towards this end we will not have what we call a hot ship as we did in CASTLE. They will all be washed down to the greatest extent practicable and we will cover all the areas of the ships that are not being used for other projects with strip coating material and take off all the appurtenances that are not necessary for the trip.

If I describe an operational cycle of these ships, it might give you an idea of how similar it is to Operation CASTLE. The requirements for most of the projects demand that the ships be at Eniwetok prior to participation. That means it takes about 16-18 hours to move to the FA. I might point out that the participation is for Bikini. The requirement here is to leave the Eniwetok lagoon at daylight and enter the lagoon at Bikini at daylight hours. At this time the crew will be stripped to a skeleton crew. The few people left will then move the ships out, also in daylight, and move toward a designated area which is controlled by the fallout predicitions and the forecasts. The area of operation at the particular point of interest is rather long, the crew aboard is very small, and this is a rather strenuous effort. There will be some project personnel aboard, and it might be advisable for the project officers to bear in mind that the people they select should follow some sort of specification so that they have a low metabolism rate; are not overly tall, short or fat; that they can go for long periods without eating; and that they don't show any undue emotional jags in periods of high stress or do not mind heat and humidity. If they survive the rocket programs and fallout, they will still have 25 hours to go before they come back. I'm sure they will be rather tired and we'll have a job.

We hope that it's almost 100% less tedious and exasperating to the support group than it was at CASTLE. We didn't know about this flexible time and we went to Bikini with three days rations and stayed 21, so I never realized we had to beg for food. This time we will have ample supplies up to about 100 days for the journey.

I believe our construction planning is in good hands. We hope to combine almost all the support facilities and constructions for these eight or nine projects concerned. They all seem rather pleased that this be done and we want to make a lesser burden on the FA. We are discussing this now. We have an appointment with J-3, I hope very soon and with J-4, J-6 and J-1 before Friday. I'm sure there are no questions.

Project 3.1 - Difference in Effect of Long and Short - Capt R. E. Grubaugh - WADC
Duration Blast Loadings on the Response
of Structures

The objective of Project 3.1 is to show the difference in effect of a long-duration positive-phase blast-loading pulse from a high yield weapon as compared to a lower yield or conventional kt weapon, on a drag-sensitive and semi-drag-sensitive structure. It has been theorized that if an elasto-plastic structure could be idealized as a single degree of freedom mathematical model, the peak pressure criteria for estimating structural damage would necessarily be modified in the case of a high yield weapon. Our second objective is to add to the body of information on loading and damage of prospective targets from a target analysis and weapons allocation standpoint.

Our structures will be the same as those in Operation TEAPOT since this is a second portion of that experiment. They will be 40' by 40' and 40' by 80', light steel, industrial type structures.

Our instrumentation will consist of 15 channels approximately per structure, which will include pressure-time curves, deflection and sheer in the columns, and acceleration time recordings - further, photography- one motion picture camera per structure, to give us a time history of deflection. The end product of our experiment should be a pressure-damage curve for the two cases or iso-damage curves.

Our operation plan involves only one problem since this is a passive type experiment. We wish to enter the area for a prolonged stay - approximately five to seven days - as soon as the radiation level has subsided enough to allow this stay in the area. We expect to have approximately eight people in the area for a period from D-2 months to D+2 weeks for shot Cherokee.

Project 3.10 - Structures Instrumentation - Glenn L. Roark - BRL

The object of Project 3.10 is to furnish, install, calibrate and to record instrumentation for Project 3.1. We also will record instrumentation for Project 1.5 and will conduct a diffraction study of two of these man-made islands that Capt Grubaugh just explained to you. These islands will be of two sizes and will have a diffraction study on one small one and one large one. The purpose of this diffraction study is to substantiate model programs involving a structure of somewhat the same shape as this island. Due to the fact that we don't know when the shot will go off in respect to tide, there's a good possibility that we'll have somewhere in the neighborhood of 6' front and sides all the way around the island; a question has arisen as to how this will affect the wave form on the island. Since Project 3.1 is interested in this wave form, we are conducting this diffraction study to help them substantiate their information.

To perform the majority of this instrumentation, we use a magnetic tape data recorder - essentially the same system we have used on UPSHOT-KNOTHOLE and on TEAPOT. This system is now undergoing modification to adapt it to high-humidity conditions and such that we expect on Eniwetok and Bikini. We'll have a total of 140 channels of electrical recording - we'll also have 14 channels of self-recording pressure-time gauges.

Operationally, we'll have men proceeding to the PPG approximately 40 days before Cherokee - if this is firmed up to indicate 15 April, which there is some indication might happen, this would be 40 days prior to 15 April - otherwise 40 days prior to 1 May. Approximately 30 days before Cherokee, the men will proceed to Fox, I believe that is where they are to be housed - yes, we will have 11 men on Fox. They will be operating on Dog, on Able, and on these three man-made islands.

In order to expedite transportation, we are requesting helicopters to transport these men to these islands - there will be space allocated on the islands for landing of helicopters. An "M" Boat will be required to move the equipment into these islands - the equipment will be approximately 1000# per island or a total of 5000#. After the equipment is moved in, we hope to accomplish all transportation by helicopter, except in the reverse of the situation when we move our equipment back out. On D-2, we'll have three men leave for Parry. On D+2 or D+3, depending upon Rad-Safe conditions, we will recover records, at which time we will have three more men move to Parry - the remaining five men will be operating on shipboard and will be there approximately 12 days after the shot to recover and in some cases do some recalibration of equipment. All our personnel will be out of the area by D+12, we hope.

Our construction requirements have already been submitted to Holmes & Narver. I might add that construction requirements for Project 1.1 and 1.5 have also been submitted to H&N. We're now awaiting the outcome of their design section to okay their designs.

Project 4.1 - Flash Blindness - Capt D. V. L. Brown - USAF School of Aviation Medicine

The objectives of Project 4.1 will be fourfold - firstly, the measurement of blink reflex time of rabbits and monkeys by high-speed movie camera following exposure to the intense bomb illuminations. Results will be compared to base-line studies on rabbit, monkey and man performed in the laboratory under various flash-bulb and strob units.

Secondly, an evaluation of the ability of the various specific portions of the bomb time-intensity curve to cause retinal burns. The bomb spectrum will be divided into ten millisecond increments and both rabbits and spectrographs will be simultaneously exposed to each fraction. Dr. Plum of NRDL has offered to help accomplish this. Knowing precisely which portions of the spectrum are capable of causing burns is vital to the designing of protective equipment for aircraft pilots and other personnel.

Thirdly, the evaluation of presently available colored glass filters of several densities and colors on both rabbits and monkeys.

Fourthly, and most important, the testing of several newly developed, high-speed mechanical and electronic shutter systems as protective devices.

In order to accomplish these objectives, we will expose about 400 rabbits and 40 monkeys to four or five nuclear devices with approximately 100 animals per shot. Tentatively, we will participate in Cherokee, Zuni, Erie, Flathead and possibly Mohawk, Pueblo or Lacrosse. Animals will be stored on Japtan Island; however, appropriate animals will be brought to Bikini a day or two in advance before the shots there.

As for exposure site locations, only one station for each shot will be required: thus, for Cherokee, we'll probably use How; Zuni - Nan; Flathead - How or Nan; Erie - Japtan; we'll be able to expose from the same island where we store the animals.

It's obviously necessary to consider the curvature of the earth in maintaining the line of sight exposure; however this may not be practical in the surface Mt detonation. Since the exposure of one eye to the flash requires the immobilization of the animal's head and the body confined in a tight box, it's necessary to keep the pre-shot confinement time to a minimum. Thus, late placement before shot time and rather early re-entry are essential. Exposures preferably should not be made in the direction of the predicted fallout.

We plan to have about 10 people in the FA. Construction requirements are, if we get them, a 20' x 40' animal shelter on Japtan. We hope that no other construction will be needed on the exposure island.

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Project 4.2 - Thermal Burns - Capt A. R. Behnke, Jr. - NRDL

I have a very modest proposal - I'm not going to bring out Noah's Ark with all the animals on it - I can't top Dr. Brown. I'm just going to bring out a few rats, if possible. The objectives of 4.2 are to ascertain the thermal radiant effects from Mt weapons on rats' skin as a basis for casualty estimation. Since the key personnel in this great show with its three main events running simultaneously are justifiably, and rightly so, physicists, chemists and engineers, and since the biologist generally has only a nuisance value, I'll say a few words of justification for this work. Since the epidermis of the rat's skin is less than a millimeter in thickness, what we're interested in is the critical radiant thermal energy necessary to cause a third-degree burn.

Now the rat's skin, that is the reactions of the properly prepared rat's skin are similar to those of human skin, so I don't think we can argue that point at all. Why conduct a field test? Why not just stay in the laboratory where we belong? Here's the reason. If we consider the critical energy necessary to produce such burns, then the radiant energy from a source, depending upon the wave-length band (extending from 0.3 micron to higher wave-lengths) at which the energy is transmitted, depends upon the total amount of energy in terms of calories - the true value necessary to destroy the tissue. For example, in this region of the spectrum, about four calories total energy are required to cause the destruction; and in the long-wave portion of the spectrum, about the same value; but in here, in what Dr. Plum terms the "window", about 28 calories are required. The reason is that in this portion of the spectrum, energy instead of being absorbed is reflected and transmitted, and since only one or two calories difference is the difference between a first and third-degree burn injury, and since with reference to the Mt weapon, this spectrum is changed during the event of the thermal pulse, and since the thermal pulse is much longer than with the kt weapon, it is necessary for the biologist to ask for a field test to determine this critical value.

Background, briefly: In Operation BUSTER-JANGLE, in 1951, it was determined that because of the short duration of the thermal pulse in the kt weapon, and because it was known that the spectrum is relatively constant over the short time period, it was determined that a carbon-arc searchlight in the laboratory simulated rather precisely the field source of energy. However, this is not true with the Mt weapon.

What is the experimental procedure? Briefly, it is this I may say with reference to the kt weapon, the "Q" value was approximately seven calories - maybe a little less. In the Mt weapon, it is expected that this value will be in the order of 15 calories since much of the energy is transmitted in this region, the red region of the thermal spectrum. With reference to the experimental set-up, it is proposed on shot Cherokee, to establish an experimental phase on George, a distance of eight miles - and there Dr, Plum will have the calorimeters and the radiometers and the physical set-up without which we are lost, to make the necessary measurements. And on George we expect to get at the high level, about 30 calories total of thermal pulse and then, by means of attenuating there, to get a distribution of energy down to about five calories, so

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that by using the rats we can get varying degrees of injury and determine this critical "Q" value.

For this experiment to be successful, it is necessary that the rats be anesthetized and that they be transported to this island at six hours before detonation time. What we would like to do is to go into an underground shelter on George, but there's no provision for such shelters, and there are good reasons why there are no shelters; therefore we shall probably operate from a ship and, by means of helicopters six hours before detonation time, transport the animals, set them up, and get out of the area not earlier than five hours before detonation time. Access to the area afterward will be in a matter of a few hours and not later than 24 hours.

Personnel required will be four and we'll make an effort to cut down that number since personnel requirements are critical. Construction requirements are minimal because we lean very heavily on our thermal phsyicist, Dr. Plum, and his co-workers for the necessary support. It is planned to make a second experiment in Zuni on May 15th, the surface shot, and that, we hope, will give us the information we require.

PROGRAM 5

Project 5.1 - In-Flight Participation of a B-47 Aircraft - Glenn C. Miller - WADC
5.2 - In-Flight Participation of a B-52 Aircraft
5.3 - In-Flight Participation of a B-66 Aircraft
5.4 - In-Flight Participation of a B-57 Aircraft
5.5 - In-Flight Participation of a F-84F Aircraft
5.6 - In-Flight Participation of a F-101A Aircraft

I have combined the presentations for 5.1 to 5.6. They're very similar. The objective is to measure the blast, gust and thermal effects of a nuclear detonation on an aircraft in flight. These aircraft are B-52, B-47, B-66, B-57, two F-84F's and one F-101A. With the data we hope to obtain, the criterion method used in preparing the Weapons Delivery Handbook may be verified or corrected. In addition, these projects will provide basic research data for the design of future aircraft, USAF or others, we hope.

Now it may sound like we're doing the same thing six times, but actually any one aircraft will respond in its own manner to a nuclear detonation, thereby demanding its participation in order to define its delivery capability. To accomplish this, we have to select and install numerous instrumentation panels, we must maintain and operate them at a test site, and reduce and report the data after return to the ZI.

To do this, we have obtained the services of several contractors. In the case of the B-52, B-66, B-57, and the F-101A, the aircraft manufacturer will be the prime contractor; in the case of the two F-84F's, and the B-47 - Cook Research Laboratories. The Directorate of Flight and All-Weather Testing at WADC will fly and maintain the aircraft in the FA.

The instrumentation which we will have installed prior to going overseas totals around 1,565 channels, with an average planned participation of around eight shots per aircraft. This totals around 12,500 data points as compared to the largest previous effort of 1,100 on TEAPOT.

Now the biggest problem, among many which we have at present, is to position these aircraft in space accurately. We have at present three systems, either available or in testing phase. For the B-52, B-66, and B-47, we have modified the airborne bombing navigational system in these aircraft. This has been used previously - a slight modification increases our accuracy and reliability.

In the case of the B-57, we plan on using their airborne shoran system. In the case of the fighters, we're really against the wall. It looks like we'll have to fly wing on one of the bombers, and compromise the desired position of the fighter to the extent that it isn't compatible with the desired position of the bombers.

We have a problem - we must locate these aircraft after the fact to be sure where they were, accurately. On CASTLE, we started with the Raydist equipment, and they modified this to a little better version for TEAPOT. We feel that this is reliable and accurate - we intend to use it to track all the aircraft on REDWING.

Our planned participation is an average of eight shots per aircraft. In the case of the B-52 and the B-47, these aircraft will only participate in the shots at Bikini, and we hope to participate in all of them, if we can. Huron is questionable - we may be able to get something out of this. The B-66, B-57, F-84F's, F-101A will attempt to participate in Pueblo, Mohawk, Lacrosse I and II, if there is a II, Huron, Zuni, Navajo, Apache, Flathead and Cherokee. This will be, I think, four shots at Eniwetok and all of them in the Bikini area. In all cases, it will be necessary for the aircraft to fly directly over GZ in order to obtain the desired time zero positions.

I have some totals which I'd like to give. Project-wise, we will require housing for a total of approximately 190 project personnel plus 85 personnel from a support standpoint - they are supporting us with the positioning equipment, MSQ, shoran, Raydist, communications and timing devices which we need for the aircraft, the data handling facilities and the instrument repairs. This does not include the flight test or the flying crew and the maintenance crew. Approximately 80% of them should be on Eniwetok Island. We require off-atoll support for six men at Wotho, four men at Rongerik. I understand Rongerik is a weather station. Wotho, I understand is uninhabited.(Note: Best information available indicates a native population of about 30.) We also require approximately 14,000 sq ft of lab and office space. This will be primarily on Eniwetok with some space on Parry.

We have five 10' x 20' concrete shelters we'd like to have on Bikini to hold the Raydist equipment. Tentatively, we'd like them on Elmer, How, Nan, William, Able and George. We need five 16' x 32' tents on Elmer, Glen, Bruce, Leroy and Wotho.

We have approximately 85 frequencies we need assigned. Something in the area of 75,000 cu ft of shipping space plus the F-101A and the two F-84F's. We need 500 sq ft of deck space aboard ship in the Bikini area for the Raydist master stations and antenna; this also includes housing for approximately 12 of the Raydist people. On the time zero transmission, I'm not an electronics expert, but I believe I can cover it with what information I have. For the MSQ we've requested 240, 240.5, 241, 241.5, 242, 242.5 and 243 mcs. These should conceivably be operating at time zero. The other part of the MSQ system is the APW-11 in the aircraft. We've asked for a flock of frequencies between 2700 and 2900 mcs. The Raydist system has quite a few - they've requested nine frequencies for the airborne transmitter. They have a transmission power of around 60 watts. There'll be nine of those in the 1.6 to 2.2 mc range. For the ground data links of the Raydist tracking system, we have 60 frequencies between 20 and 42 mcs. In addition, we have a shoran which we will be using on Bikini - I understand this is UHF, and five telemetering frequencies which we haven't pinned down as yet. These will be part of the Raydist positioning system.

Project 5.7 - Thermal Flux and Albedo Measurements from Aircraft - R. L. Dresser - AFCRC

Project 5.7 is very clearly tied in with WADC Projects 5.1 through 5.6, in that

approximately 100 channels are going to be used for thermal input data and Project 5.7 is concerned with thermal input data. The basic purpose of this project is to provide more information concerning atomic explosions to permit more accurate predictions of thermal flux at a point in space. More or less specific areas in which we are interested concern the fireball, its size, rate of rise, color temperature, blackbody quality and emissivity; the spectral distribution as a function of time; all of these as a function of time, yield and burst geometry. Another aspect which we are interested in is the contribution of reflected radiation from the earth's surface and clouds which may be present. We're interested in the effect on these reflecting surfaces of such things as shadowing of the earth's surface and obscuration by the fireball. We're interested in the phenomenon of reflection and of atmospheric scattering as a function of wave length and as a function of field of view. We're still interested in the degree to which thermal radiation is non-isotropic. Another problem which we have to look into is an evaluation of the requirement of the thermal curtain.

Instrumentation from which I hope this information will be obtained consists of approximately 100 channels and will be borne on WADC aircraft - the bomber type - B-47, 52, 57 and 66. The instrumentation is practically the same for all aircraft and would consist primarily of two stations. There would be 18 thermal transducers located in the tail station. These transducers would consist of two NRDL radiometers and 16 NRDL calorimeters. These instruments could be varied for varied fields of view and will be properly filtered to yield the maximum amount of spectral distribution information. The second station that will be borne by all aircraft is one located in the mid-fuselage. This will carry two thermal transducers which, as I recall, include a radiometer and two calorimeters. These instruments ideally will have a 180° field of view. In the tail station, we also will have six GSAP cameras oriented to GZ. These will be, in general, properly filtered and with proper choice of film to produce more than documentary type film.

It is hoped that the information obtained from this will give us indications as to spectral distribution and, in the case of the two lighter aircraft, two of these cameras will be equipped with a dispersion device which will operate in the visible regions - which we hope will give us some indication of the variation of spectral distribution in time. In the mid-station with the transducers we will also have two GSAP cameras with a very large field of view - I'm not exactly sure what the field will be, but the focal length will be approximately 5.3-mm. It is hoped that this will give us information with regard to the albedo history of environment at the time that the instruments were receiving the thermal energy. The two larger aircraft - the B-52 and the B-47 - will also carry some NRDL transducers in the cockpit to aid in the evaluation of this thermal curtain problem. The two lighter aircraft will probably carry passive indicators in the cockpit with the possibility of perhaps an independent self-recording thermal recording device.

We propose to participate on all shots where the aircraft fly. We intend to take four or five people to the FA with probably one located on Parry and probably four on Eniwetok. I'm very happy to say that we have no construction problems since we're more or less going along for the ride.

Project 5.8 - Evaluation of the A3D-1 Aircraft for Special Weapons Delivery Capability - P. F. Harward - BuAer

Project 5.8 is a Navy BuAer project, whose objective is to establish escape criteria for airborne delivery. This will be accomplished by measuring the thermal radiation at various yields. A secondary objective of this project is to prove the delivery capability of the A3D-1 airplane. Essentially 5.8 is an extension of TEAPOT Project 8.1 to give high-yield information. Consequently our participation will be only in the Group B Bikini shots.

Instrumentation of the aircraft is being accomplished by the Douglas Aircraft Corporation. In general, this instrumentation will consist of a 96 channel oscillograph recording to provide time-base data on the following: 45 channels of thermocouples to measure the time-temperature rise on the thin skins of the airplane; these thermocouples will be shielded with quartz and this will give a comparison for aerodynamic cooling effects. Twelve channels of thermal-input data of calorimeters, radiometers, etc., will determine the thermal radiation at the desired point in space, and this part compliments the WADC program of 5.7. Eight channels will record the jet engine instrumentation to determine compression surge and turbine temperature changes that result from gust and thermal effects. About seven channels will record overpressure and response to the gust velocity.

We have a similar positioning system to that Mr. Miller described for the AF planes. We intend to use for the pilot positioning of the plane the radar-bombing computer and a Tacan system that will be essentially airborne. We also intend to use the Raydist system which the AF is installing for the after the fact positioning. The transmitting frequencies we intend to use approximately one hour before time zero. Mr. Miller covered the Raydist frequencies with a high-frequency range of 1.6 to 2 mcs and the relay stations of 30 to 40 mcs. The Tacan transmitter will operate on 1,000 to 1,200 mcs, with a power output of approximately five watts. We will also need a UHF count-down frequency and the normal air-control UHF net. These frequency requirements are being coordinated with J-3 and I think they're well aware of our problem.

The time zero position desired to produce the thermal temperature rise that we'd like to have for our project will be within six miles of GZ at 30-35,000' of altitude, except on one shot, we'd like to make a low-altitude run of about 2,000' to simulate the low-altitude bombing run-out.

Our construction requirements and logistics will consist of the Raydist blockhouses and installing an eighth antenna along with the WADC program, a Tacan antenna and transmitter installation which we would like to have located on Enyu if we could.

We hope to ship all of our equipment by air. Presently we plan to send 30 personnel to Eniwetok - this will include the maintenance and flight crews and the Douglas engineers who will support the instrumentation and the data-reducing programs. We intend to have the airplane available approximately 30 days prior to the schedule for Cherokee so that we can participate in training and rehearsal flights.

Project 5.9 - Weapons Effects on Missile Structures and Materials -
Lt C. J. Cosenza - WADC

We propose to be on Erie shot. We hope we will have six stations, five of which will be TV towers the same as in TEAPOT. The first station will be cantilevered off of the shot cab. This is our test array. We will have steel specimens on the first three stations similar to TEAPOT. As for some of our other specimens, I have one that will be used throughout the test. It is what we call a composite specimen. It has a sphere, a cylinder, and a nose cone. This will be on all stations. It will be oriented head-on, tail-on and side-on. Also we will have different types of material at each station for the vulnerability of the different materials, since we only had two on TEAPOT.

In the nose cone will be an eight channel recorder similar to the one that we used on 5.10 - this is to give us a time history study of metal loss. Also we will have acceleration measurements. In one of these, or several of them possibly, we will bore holes, with a soft plug here, with a pin at this distance, and we will have in the same specimen approximately three or four of these. And from calculation of the amount of indentation of this pin we can determine the acceleration which was imposed on this specimen.

Also we will have overpressure measurements. At present, we are thinking of having just a cylinder which will be hollow, and this will be head-on and also side-on and from this we can determine the relative effects of the acceleration and pressure.

Another part of the experiment, another objective, is to simulate re-entry of an ICBM. This we will do as follows: We will have approximately seven mirrors on Navajo shot. These mirrors will be at a range of from 10 to 14 miles. The parabolic mirror with our specimen, approximately 3" in diameter, will be calibrated with possibly strain gauges and also for determination of maximum temperature; and we will have at this point cameras on each side. Also we will have cameras which will be calibrated to give us the rate of rise and also the size of the fireball.

We will need timing signals for our specimens at H-15 minutes and H-2 seconds and on our mirrors will need signals at H-30 and 15 minutes and H-5 and 2 seconds. We will have approximately 16 people in the FA. Two of those to be located in Bikini; the other 14 will be located at Eniwetok. The only need for photography is on the Mt shot.

Construction drawings are in now, and we have a few changes on them, but by the end of next week these will be corrected. For real estate on the kt shot, which is the specimens on the towers, we will need from the point of burst (shot cab) an area approximately 60° 500' from the tower. The last tower array will be 300' and the other 200' we will need for recovery of our specimens.

That is about all. Are there any questions?

Q: For the Navajo shot will the mirrors be on Bikini Island?

A: Possibly.

Project 5.10 - In-Flight Missile Vulnerability Test - M. L. Devol - WADC

Project 5.10 is complimentary to the one which Lt Cosenza just described, the objective being to determine the thermal and mechanical effects an intercontinental ballistic missile or any other missile might encounter at the fireball. The objective is to fire a salvo or a couple of salvos of missiles through the fireball - not directly through the center but off-center. They should strike the fireball, preferably a little before and a little after the time of breakaway. These missiles will travel at a speed of between 7000 and 10,000 feet per second; therefore, will be somewhat comparable to what a missile might travel.

The missiles themselves are the hypersonic test vehicle developed by the Air Physics Development Corporation and for those of you who are not familiar with it, it is made up of a number of Loki rockets with Loki's about 12" in diameter and 5' long. A cluster of seven of them will make up the first or booster stage. The second stage may be like that or may be smaller, maybe four. Then in front of the second stage will be what we call the payload.

The operation, we think, will look something like this: We are thinking of a tower shot, preferably the Erie shot, partly because we would like to have direct correlation with Project 5.9. We set up our launching platforms about 3500 or 4000 feet away from the fireball which could be on the end of Runit Island. We fire one stage, fire the second stage, and just after the burn-out of the second stage, that is the time we wish to enter the fireball.

We have talked with the photographic people about taking pictures before entry and after leaving the fireball and they thought they could take the pictures that we needed.

The point will be buoyant and we expect to locate it. The system we have been using in New Mexico with a radioactive source is so good that we think it is the best means for recovery. From the photography we will have data on trajectory. Also, recovery will give us additional confirmation of that.

We expect to make this of different materials and provide inserts of different materials, the same materials in many cases that are used in Project 5.9 so that we have a direct comparison of the differences in running through the fireball at 7-10,000' per second, and in just having the fireball hit it. We have been using a recorder in our tests, one which was mentioned by Lt Cosenza, for measuring temperatures. We will try in this test to measure temperatures in the wall of the head and also to get some measurements of pressure and acceleration. The recorder will withstand the hard accelerations involved, and we hope we can take care of temperatures. It may be influenced by radiation in a way which we cannot predict before the test. So we are planning to back this up as much as possible with instrumentation of the type of a couple of items that Lt Cosenza mentioned which will

measure temperature by melting of something or acceleration by the breaking of something.

This will not be a simulation in any sense of a missile going through. It will be merely the first instrumentation taken on something going through the fireball and some experimental evidence of what happened in the way of deflection and what happens to the thing going through. It will give us the first experience and give us a chance to make the first mistakes that are bound to be made when we try to shoot anything through a fireball now. This project was approved only a few days ago. Because of its newness, some of the information we would like to have here is still coming.

In regard to construction, the matter is relatively simple. We'll need a couple of launching platforms perhaps 40' x 70'. We need camera locations and those will be specified by the camera contractor. We'll need a timing buzz a few seconds before from which we can time our facts. In regard to personnel, we will need four or five people out there for a couple of weeks to get everything set up right before the test and perhaps for a week or so afterwards to recover and get everything wound up. Any questions?

Q: What are your chances of hitting the fireball in the manner in which you described?

A: There is no actual proof. We have only estimates which make us believe we can hit all of a salvo within a hundred foot circle. There will be 40 firings in the early fall from which we will get statistical data which will mean a great deal more. The AF requested the privilege, which was readily granted, if some of the things we hope will work out appear not to be working out, we will simply drop the whole matter. We naturally hope we can make it; but it is conditional on those tests and the way they come out.

Q: You're trying to locate these objects in space by means of photography?

A: Right.

Q: Will it be feasible to identify each missile by means of photography?

A: No - I won't say it's not feasible. They have not said that they can do it and we haven't found any way they can do it - which we wish we could. We may be able to track from the firing up to the fireball. If we do, we'll know which missile was where before it entered.

Q: There is no way I know of that you can identify a missile after recovery and tell where it entered. Can you identify the missile in reference to entry into the fireball?

A: Well, if we can track from the firing platform. (I'll have to check because I'm not sure if we can do this.) When we recover, here's missile #1 over here but

what happened between these two points, what the trajectory was, we don't know - and then there's a question of location which you mentioned. I forgot to mention one thing which we did plan - we plan to put at the recovery location some sizeable floats in the water that can be identified, at the latest time before zero that we're in there, to measure the ocean drift and get some idea of location. For example, if this were missile #1 here, and this were missile #2 down here, why, we could surmise that this is probably #2 but we'll never have any way to prove that, I don't believe.

Q: Are these landing in the ocean or the lagoon?

A: In the ocean.

Q: Have you made any arrangements for picking them up - ships, boats, personnel?

A: We need them. We think we'll need a helicopter - we thought we'd have radioactive sources in the missiles and we have been tracing these out in the desert by using a biplane, just slightly bigger than a Piper Cub. They will probably be rather "hot" and will have to be hooked onto a helicopter or dragged in the water rather than taken on by boat.

Q: How accurately can you time the firing of these missiles?

A: That is something that will come out in these tests - we naturally have to fire before the firing of the weapon itself and there is some question in the build-up stage and the pressure in the fireball. This is something we've had no experience in since in the New Mexico tests we were firing almost vertically rather than with the trajectory we will have here.

PROGRAM 6

Project 6.1 - Accurate Location of an Electromagnetic Pulse Source - Edward Lewis - AFCRC

The name of this project is the "Accurate Location of an Electromagnetic Pulse Source." The detonation of a nuclear weapon in air causes a low frequency pulse to be radiated. It is a pretty strong pulse which can be picked up at televised distances. If we have an array of ground stations synchronized with each other and each measuring the exact time it receives the pulse, we can compute the location of the detonation point. This information is desired by TAC, SAC, and AEC. The ultimate objective is to make fixes with errors of less than five nautical miles from distances up to 5,500 nautical miles from the detonation point. It is also required to report the fix within 30 minutes of shot time. During TEAPOT we conducted a program of basic measurements and obtained some very encouraging results. For REDWING we wish to proceed in the direction of a more practical operational form of equipment, and we would like to test two different types of arrays. One of these we call "short base line array." The receiving stations are fairly close together and are synchronized by means of line-of-sight microwaves. On the "long base array," the receiving stations will be separated up to 1,500 miles and will be synchronized by CYTAC transmissions. CYTAC is being developed by WADC and I think will be available in time for these tests. We would like to make one short base line array in the Hawaiian Group and another on the California Coast. We would like to have one long base line array based on the islands of Midway, Hawaii and Palmyra, another one in the ZI with stations ranging from Minnesota to Texas. The long base line work will be a contractor effort. We would like to have, well in advance, the shot time to the nearest second. Because part of our apparatus has very short recording time, six seconds, we have to hit it pretty close. We would also like to use the Navy antenna at Lualualei on the island of Oahu for a CYTAC transmitter. Other problems are communicating between the islands, especially from Palmyra to Hawaii, and the problem of transportation to those sites which are somewhat off the main track. We now have a field party in the Hawaii region making a preliminary survey. Any questions?

Q: How do you get your information on shot zero times?

A: We hope to do that in the same way we did during TEAPOT, as they would be scheduled in advance.

Project 6.3 - Effects of Atomic Explosions on Ionosphere - Arthur K. Harris - ESL

During REDWING, we hope to find the additional data necessary to give us a complete theory and explanation of these major upper atmosphere effects. The equipment that we propose to use is the same as in CASTLE - vertical incidence ionosphere recorders. This is radio equipment that sends principally in a vertical direction toward the ionosphere, pulses of radio frequency energy, and over a frequency range

of from one to 25 mcs. This entire range is swept in a period of about 15 seconds, and will be repeated in this frequency from time to time. After the shot we will do it more frequently. Then there is normal operation, which is five times an hour. The equipments will be located at the weather stations, on Rongerik Atoll, and at Bikini and at Kusaie. This will be the first time we have operated at the north or south of a shot. We expect this will give us some information concerning the effects as related to the earth's magnetic field, which has a large influence on movements of ions in the upper atmosphere. In addition, we have gotten the AFCRC to participate with us; they will provide a plane, which contains one of these vertical incidence recorders mounted in the plane. The plane will have to be based at Kwajalein because of no room at Eniwetok. Later we hope to move to Eniwetok, because it is nearer the center of operations, and will enable us to compare our data; that will be our center. The flight plan of the plane has not been determined, but we hope to cover an area to the north and east or to the south and east of the large shots at Bikini to enable us to find the extent of the effect. During CASTLE we had different results at Rongerik from the different shots at Bikini, and we hope to get enough information from these two graph stations and the plane station to give us this complete theory; that is one objective of our experiment. The other objective will be to get more data about phenomena which we found during CASTLE. During CASTLE, in addition to having a ground station at Rongerik, we had a ground station at Parry Island, and there the radio frequency signals from the ionosphere were completely absorbed for several hours after the shot, and we believe this absorption of the signals occurred in the region about 20 or 25 miles up, and the explanation that we postulated was that the radioactive particles from these shots which rose 100,000 to 125,000' were carried to the west by winds which prevail in those latitudes. High winds prevail in the order of 60 to 90 knots, and would be enough to bring those particles over Eniwetok in about two hours. For most of the large shots, we observed a complete blackout starting at about two hours, from the ionosphere. The absorption which would occur according to this theory is caused by the radioactive particles remaining in that vicinity, so another possible result of this experiment will be to find the extent of the area involved. In this absorption phenomena we expect to operate the plane during all the large shots, and the graph stations will be there anyway, so I see no reason why we shouldn't run during the small shots, and possibly get some information to corroborate the previous information about effects during kt shots. We expect to have about three personnel at Rongerik, and about three personnel at Kusaie, and our headquarters will be at Parry, and there we will have five personnel at some time or other. The recorders will record the information from the oscilloscopes on film and the film will be scaled by the personnel on Parry Island. In addition, there will be three scientific personnel in the aircraft. That makes a total of 14 people. This does not count the air crew which will run about 10 or 12, and will be stationed at Kwajalein and Eniwetok. The construction requirements were sent in two days ago. They just consist of clearing an area at Rongerik and at Kusaie, and setting four small poles at each location for the antenna.

Project 8.1 - Basic Thermal Radiation Measurements - W. B. Plum - NRDL
8.2 - Material Exposed to Thermal Radiation

Project 8.1 is "Basic Thermal Radiation Measurements". Our priority here is on the air drop - Cherokee; we plan to man stations at Dog, George and How. Our second priority is Zuni; stations on William or Victor and on Nan, Oboe and How. Next priority is a surface shot on Eniwetok Atoll; the only one we are able to cover at the present time is the one on Runit, Lacrosse I. We did want to cover Pueblo, but it looks like it will be fired before we are able to move our equipment from Bikini Atoll. The data that we are taking will be to measure the thermal radiant power as a function of time by means of two instruments, a bolometer which has a time resolution of 50 microseconds, then the radiometer which has a time resolution of 20 milliseconds. By our calorimeter we measure the total energy per unit area. We will also have broad band filters to measure the broad band distribution of energy per unit area, and correlate these data with all the data from operations beginning with GREENHOUSE. We are also making some field of view measurements where we will have our thermal instruments to measure field of view 11, 22, 45, 90 and 180 degrees. The byproduct of our field of view measurements and our three stations will be such that we will be able to get the total atmospheric transmission. Here we have the ideal case of a four pi source, and various fields of view from 11° up to 180°, to give us information to correct for field of view and also information as to the transmissivity per mile or per unit of the atmosphere. With the spectrometer, one on George and one on How, we get the spectral distribution, from which we can draw to compute the effect of color temperatures. We can also get the transmission coefficient for the various wave length bands since the two spectrometers will be identical. Together with another spectrometer, mentioned later by Dr. Zirkind, this will give us a correlation of data along a ground path and along an air path. The spectrometer and bolometer will give us time to minimum and the time to second maximum, and from the spectrometer and bolometer we can get the time to first maximum. I mention at this time we are giving technical support to 14 projects which have been approved, another project which has not been approved and another which is in the planning stages. For the project not approved we are getting 66 2/3% of the information which they want. On this operation we are expecting to get some points on our curves for the larger yield Mt weapons. We got quite a few points from 10 to 50 kt and quite a few below 10 on TEAPOT, and we find, as they develop their weapons and reduce the mass, they begin to fall in with the formula W to 1/2 power. One thing worries us a little and that is the relation between the thermal and the chemical yield. The equation for that is the thermal yield is proportional to the chemical but you have W to the .94 power. We want to know what happens to that W to the .06 power energy. It doesn't seem the equation is reasonable. It should be W to the one power. During this operation we will get a point far enough out on the graph so we can draw the straight line and get the answer. There are other unsolved questions which make Cherokee and Zuni priority shots. There is some question as to the color temperature of these larger weapons. There is also

a question as to the color temperature of a ground shot compared to an air drop or a tower shot, and so for my information with the spectrometer giving us the spectral distribution of energy, we hope to tie down the color temperature of a surface shot and the color temperature of an air drop. We will also be looking at the larger weapons from the air, and that's one nice thing about having Program 5 flying all these instruments and our working with them. We have the advantage of getting all the data so we can compare this data with the ground measurements.

On 8.2, in the laboratory we cannot change the color temperature from zero time to the end of the radiation. We have tried with filters, but using them we cut down the thermal radiance, so we need a field test like this to give us check points on all of our materials. In the field we have some standard papers which we have been able to reproduce. These have two thicknesses, and varying shades and grades from a black to a white, and we have two different densitites. What we plan is to have little boxes - 16 samples - some of these will be burned up and some will not be burned up, so this will be a goal for a noble proposition, and we will be able to count the number of pieces, and get down to the density, thickness, the absorptivity of pieces of material, and correlate that with the bomb energy. We will use attenuating screens, five attenuating screens to give us the effect of five distances from the point of detonation. We will need to put one calorimeter and one radiometer behind each of these screens. By coordinating all these activities we can put the animals from 4.2, the cellulose materials from Forestry Service, and the wood from NRDL all on one rack behind these screens and use one calorimeter to correlate all these data.

Project 8.3 - Evaluation of Self-Recording Thermal Indicators - J. C. Maloney - CRL

The title of this project is "Evaluation of Self-Recording Thermal Indicators". Its general objective is the testing and evaluation of detectors and recorders for determination of total thermal radiation flux. Special objectives of the test are to enable us to develop and decide on a more versatile instrument. We want an instrument that is relatively simple and inexpensive, or at least as many of these properties as we can test out and get. The instrument preferably should be self-contained and be made smaller and more readily adaptable to hanging on poles, ships, or airplanes. Preferably, the instrument should be independent of outside signals and one idea I am trying to put in is to make the instrument independent of using lead batteries. Now three types of instruments are being modified and worked on in the Lab; they are: (1) the thermistor calorimeter detecting instrument, either an electric recorder or a tape recorder. Incidentally, the main features of these instruments were tested in TEAPOT but we are trying to make some workable improvement in them; (2) the experimental thermal flux recorder, developed by the Kidde Nuclear Laboratories; this instrument uses a magnetic tape that is completely independent of an outside signal; (3) a passive indicator - which will be independent of pulse shape. Chemically treated papers will be used as recorders. It is also to be independent of an outside signal.

At present we are scheduled to appear on two shots - one of which will be Blackfoot. We have about 4,000 - 5,000' south of the present location which will be just about right for our instruments. On Cherokee, we will have stations located apparently on Dog, George and How Islands. There will be the same number of instruments used for both shots; we expect to use ten each of the three different instruments. There will be three persons in the FA, and our construction requirements have all been submitted. The latter consist of ten poles at each location at distances as yet unknown. Any questions?

Q: What range will your instruments cover?

A: We expect to be able to measure up to 70 calories per square centimeter per second, with a workable range of 2 to 60 calories without trouble. Our instruments have been tested to withstand 25 psi overpressure.

(Mr. Ogle pointed out that most of the yields are "advertised yields", and Maloney stated that they try to allow a plus or minus 50%.)

Project 8.4 - Thermal Response of Aircraft Structural Panels of the Bonded Sandwich Type - LCDR A. Julian - BuAer

Project 8.4 has dual objectives: (1) the documentation of the thermal tolerance of the sandwich panel; and (2) establishment of this unknown number for delivery aircraft. There is little doubt that the critical temperature for the sandwich is substantially lower than the 350° F postulated for sheet stringer. Important evidence to this effect was provided recently, in UPSHOT-KNOTHOLE as a matter of fact, by an AF experiment in which panels exposed to a Δt of only 200° suffered up to 35% separation - face to core. This structure derives all of its mechanical stability from the goodness of this bond so if we separate it, we don't have a load-bearing item any more. We think it is vital to particularize the panel response, especially in a long thermal pulse. Operationally, we plan to mount three panel groups at one station on Dog; this is a change from our plan of two days ago. We want to participate in Cherokee - and in Cherokee alone. We plan to instrument a total of 27 panels. We are going to put thermocouples for radiation incidence on this face as the exposed face and get down behind coring possibly and fasten thermocouples to the back face of the exposed side. This will be done mechanically for strength and for goodness of the electrical bond. We are going to measure temperature-time histories, using these thermocouples. Stations will be on Dog adjacent to NRDL thermal stations so that we can use their calorimetric data for correlations. We want to take pictures of the panels during the thermal pulse. We are going to restrict them in some such fashion as this at the edges here as a possible reasonable simulant to an aerodynamic load. This will be difficult to correlate but it will be better than the AF experiment which had no restrictions whatsoever. We think we can get a variation of about four to five in maximum temperature rise by using three face gauges and three paint colors, roughly a 100 to 400° F rise.

We plan to expose three types of panels: (1) a metal over an aluminum honeycomb core, which is the most usual; (2), aluminum over a balsa core; and (3) a phenolic laminate over a balsa core. We plan to make appropriate mechanical tests of both the pre-shot cuttings (when we furnish the panels we will furnish a pre-shot cutting - a cutting of that panel as fabricated and on which further tests will be conducted) and on the exposed panel itself. We hope to find a significant degradation in mechanical strength properties between these two samples and with correlation with temperature rise, temperature-time history, and the photographs, be able to document just how much of this we can stand in terms of temperature rise. Cook Research Laboratories will conduct the project for us.

Most of our construction requirements have been combined with those of Dr. Plum of Projects 8.1 and 8.2. The only remaining construction to be done will be submitted soon. We want to put the panels on Dog soon before Cherokee and, as soon as permitted, to remove the panels, mounting, and instrumentation. We expect to have a total of four men in the field. Any questions?

Q: What is the total thermal energy level?

A: Approximately 40 to 70.

Q: What will the size of the panels be?

A: 15" by 15" - which is the ASTM standard size.

Project 8.5 - Airborne High Resolution Spectral Analysis - R. Zirkind - BuAer

Project 8.5 is essentially an airborne version of the NRDL spectrometer system. We intend to get the same type of information in the air that Project 8.1 gets from spectrometers on the ground. In addition to this, we plan to participate in a yield range of shots so we can get the spectrometer data from about 50 kt to 5 Mt, so that such information would be available from spectrometers as compared to all previous events where only the calorimeters with filters provided wave length information. The events we intend to participate in are Cherokee, Zuni, Huron, Mohawk, and Lacrosse.

What we propose to do is mount the spectrometer on an aircraft and fly over at time zero the furthest land station, or at a distance, if necessary, which would be compatible with the safety of the aircraft proper. It may be possible in the Cherokee shot that we will have to be at some distance, possibly a mile further away than the land stations. This will give transmission information and also data to correlate with the data on the ground. Furthermore, we will be able to compare with the black-body temperatures obtained by a refined wave length measurement and also a higher time resolution which is about a factor of 10 over that or 20 for the calorimeters.

In the Mohawk shot we would like to fly over ground zero and look straight down and see if there are any significant factors resulting from a shock wave

sweeping the fireball, which may be the case here and the fireball to be completely obscured with respect to the spectrometer. In other words, the spectrometer will be looking through a shock wave and the fireball has been completely swept by the shock wave. This effect should occur somewhere within a half angle of about 30° from vertical. In other words, the shock wave if it sweeps through will sweep about the distance of half a fireball radius.

Since Dr. Plum mentioned the light source, we had the opportunity of other speakers being able to see J-6 before I got on the platform, and what we had proposed to do was put a 10 to the 8th luminant source, which would be essentially a one pi source facing toward the land station of Dr. Plum and the aircraft. However, J-6 tells me that the diagnostic people would object to having a source of this intensity, at time zero and that the requirement would be that the source would have to be turned off about 5 minutes before. The power requirements for the source are about 7000 volts at two amps, and we intend to put a calibration at the source and we would like to have a channel to transmit this information along the other signal cables that are available. If we have such a source, we would then have absolute transmission measurements, both to the spectrometer at time zero and also in the 5.8 airplane. We would like to put in a narrow beam transmissometer in view of the fact that the calorimeters themselves are not sensitive enough to pick up the light source.

We have no construction requirements except for putting up the light source, if we are permitted to do so. The number of people we intend to have are four people associated with the project. We would like to put the light source as close to GZ as possible - 50' or 50 yards, as close as will be tolerated.

PROGRAM 9

Project 9.1 - Technical Photography - Lt Col J. G. James - WETD

Program 9 is essentially a support program. We have one project whereby we act both as program director and project officer. We are concerned with all DOD projects and their respective programs and experiments in providing them with necessary technical photographic support. We will also provide still photography for preliminary and final report purposes.

For the most part, the technical photography is conducted by EG&G with the one exception of the cloud photography. The actual aerial operation will be done in this forthcoming operation by one of the military services. The 9.1 cloud photography, or aerial survey as we call it, is essentially the same type of a survey that we ran on CASTLE with the exception that this year we'll use all high-altitude aircraft operating at long ranges, fixed positions at zero time, and a mission time possibly two and one-half to three hours depending upon how rapidly the cloud dissipates or is absorbed in with the natural cloud cover.

On CASTLE, we had three aircraft operating at 10,000, 12,000 and 14,000'. We were handicapped by having to work at close ranges inasmuch as we were sharing the aircraft with another program. We've been assured that for REDWING we will have three high-altitude, minimum 30,000' altitude, airplanes.

The crews will start their crew training sometime early in January, we hope, depending on modification of these airplanes and as most of you know who have been associated with the cloud photography studies the success of this mission is entirely dependent upon precise navigation. We can have the best photography in the world, but without knowing exactly where we are in space at each exposure, EG&G states that it is simply impossible to give either rate of rise or spread of the cloud or the stabilization point.

Doctor Fussel who is working on the project at this time believes that we will probably use a different system of cameras. We will change from the standard aerial type cameras to 70-mm cameras running in synchronization, probably four cameras, all with clock timing tilt and azimuth marks recorded on the film.

The film will be processed this year at Parry Island, and a quick preliminary analysis will probably be made at that time. The preliminary report data has to come at a considerably later date because it is a very long and tedious job to take each one of these negatives and scale it from detonation time until the last photograph, which we hope in this case will be when the cloud is no longer visible to the eye nor can be recorded photographically.

We have a number of projects who have requested the cloud survey data. Some of them are interested in it for meteorological aspects; others desire initial rate of rise. One or two projects have asked for complete photography from detonation until the cloud has completely dissipated. We hope that we will be able to furnish all

projects in the field the data they have asked for prior to the time that they leave the proving grounds - enough so that they can incorporate it into their preliminary reports.

I would like to make one mention to our project people that if you desire still photography in support of your preliminary report, we would like to have you get this into your next status report. In going through them, we find that some projects apparently have overlooked this. Since several project officers asked me about it yesterday, I know that they are going to need this photography. We will set it up for you. We can do either color or black and white, but we must know what your requirement is prior to going out to the FA.

Project 10.1 - Fireball Hydrodynamics - J. H. Mullaney - LASL
10.2 - Time of Arrival

The object of Program 10.1 is the consideration of fluid dynamics of the fireball, for the purpose of estimating the yield of an explosion. This program does no experimental work of its own but relies on Program 15.1, Fireball Photography, by EG&G, for its input data. These input data are reduced through some scheme such as the analytic solution or Mach number scaling to give approximate yield. These methods are both somewhat similiar to the Phi to the 5th scaling method used by EG&G.

Before Operation REDWING starts, Program 10.1 hopes to have finished, with the help of the Theoretical Division of this laboratory, a series of calculations done on the automatic computing machines. These calculations will attempt to describe the progress of a shock wave thru air starting at a time somewhat earlier than that used in IBM problem "M" which was done in this laboratory about 10 years ago. This new series of calculations will be done usingas realistic an equation of state of air as we can find and the series will cover a small range of densities of air. We hope to pick up whatever small departures exist from a simple atmospheric pressure and density scaling. The calculations should provide one other basis for scaling at least slightly different from those currently in use.

Some of the shots of this operation are rather low yield devices with relatively large associated masses, large shields, powder caps and so on. In the past, shots with low yield to mass ratio have caused some trouble. Our data reduction interpretation procedures give yield determinations that are in good agreement with those given by radiochemistry for high yield devices, but when these same methods are used in a simple-minded fashion on low yield to mass devices the energy release figures are much higher than those given by radiochemistry. Program 10 again with the help of the Theoretical Division is trying to put mass effect work done in this laboratory some years ago in such form that it can be used in the field.

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The yield of the bomb can be estimated also from time of arrival of the shock wave. Using hand-held stop watches, the interval between the flash and arrival of the shock wave can be measured, and then, through use of problem "M" listing, or

perhaps with new calculations, the time of arrival can be correlated with the yield of the bomb. The larger the yield, the sooner the blast wave gets to you.

Projects 10.1 and 10.2 will participate in all shots. They are very modest projects and will require approximately two people in the FA.

Project 11.1 - Radiochemical Analysis - Jere Knight - LASL
11.2 - Sampling

I am going to discuss both parts of Program 11, the first part for Rod Spence and the second in place of Hal Plank. Program 11 in general designates the work of LASL Group J-11, which is concerned with the collection and the radiochemical analysis of samples of bomb debris, mainly from the cloud.

Project 11.1 - Radiochemical analysis for REDWING - These radiochemical analyses are to be done back here at Los Alamos; we will not maintain a lab on Parry. As in previous operations this will cover measurements of fission products of unburned fuels, where possible, and a fairly wide assortment of other elements, which were either inside or near the bomb and might have been activated by radiation from the bomb. From these we get yield and certain other performance parameters of the bomb where there is complex design, and we get a little information on the neutrons that escape from the bomb and into the environment, say those that are caught in salt water, or something like that.

The statement on the yield and the efficiency should be modified a little bit; we get this exactly only for fission devices. For those which have thermonuclear components, we can get the fission part, and on the other part we can only get indirect information that requires a good deal of interpretations.

Now, as to the experimental procedure, I'll just take the operations in sequence, and the beginning of the 11.1 sequence, you might say, goes with the removal of the sample papers from the wing tank filter units by trained AF teams. These are loaded into lead pigs and then aboard fast AF transports which are standing by - two of them. These transports usually take off at about H+6 hours. They do this as quickly as possible so that the samples are then transferred to Carco at Albuquerque and we get them up here at Los Alamos between 30 and 35 hours after the detonation.

After we get the papers, it takes an additional seven or eight hours to dissolve them and process them so that the final solutions from which the chemists can start their analyses on are ready at about H+40 hours. It usually turns out that around H+41 hours, we start getting calls as to whether we have any results.

I might say that the samples are divided, placing all the left wing tank papers in one plane and all the right hand in another so that if for any reason a plane is lost, or very badly delayed, we get a pretty representative batch of what the sampling planes brought down. We wouldn't want to lose some critical ones. Now, we usually have or try to have one monitor on each plane from Group J-11. This time, with the schedule as tight as it is, we think we'll probably have only one monitor per shot. His job is something as follows: First, to bring back all the information he's been able to pick up, say on Parry Island at Pogo headquarters, and it's pretty essential to get this as there are a lot of changes that take place which you don't

find out about right away and through the TWX's which are a rather unsatisfactory way of getting information back here; second, to watch over the samples themselves to see for one thing that there are no bungles of any kind and secondly to sort them out since we, for our shots, give some samples to other cooperating labs, such as UCRL (and vice versa when they shoot). He is to make the decisions as to which samples this is to be done on and to see that they are properly sorted out when they get back here to Albuquerque.

About two or three weeks before the shot we send out two men. One of them is to visit with the AF team on Eniwetok, the men who remove the samples, to see to the details of packing, sorting, etc. of the samples so that nothing goes wrong at the last minute. He also makes arrangements so that we pick up from the controller of the aircraft and also from the officer who receives from the pilot the flight records (the data on just what altitude and position these planes flew in) which we like to have before we decide what papers to combine in our samples back here. The second man, whom we call the resident representative, is more likely to be on Parry Island, and he has one specific job and that is to place our tracers around the bomb. Around some of these bombs, we put fairly substantial quantities of alpha active tracers which we measure small amounts of in the samples and get a measurement of the fraction of the bomb collected. These have to be placed in the right position and at the right time so the resident representative has the responsibility of taking custody of these things from the time they arrive at Eniwetok and seeing that they are put on properly and that the records are kept. He also is the man who stays around and keeps up, we hope, from day to day on what is happening in the plans at the main office. As far as yields are concerned, we usually have some data after three days and then three weeks later, figures which are more accurate.

As far as people in the FA are concerned, there can be the two that I mentioned, for 11.1, plus the monitors that come out there. With the schedule as it is, there are likely to be two or three monitors on hand at any given time. There will be a maximum, we think, of five men.

Project 11.2 - In general, we would like to get on these bombs 10^{15} or 10^{16} fissions equivalent per airplane. This is really a description of the AF sampling unit itself. I'll describe later what our function is in it. The first object is, of course, to get the size of the sample required, the second is get for other information a fairly good distribution of samples from various parts of the cloud at different times to see how the isotopic ratios vary; whether there is fractionation, and other information of that kind about what the cloud did or what the radioactive materials in the cloud did. There are to be available for this operation some six B-57B's and 10 F-84G's, the latter including provision for two spares specified by TG 7.4. Now on the large shots which are defined as better than a few hundred kt, we plan that there will be four B-47B's and two F-84's plus one B-57B control aircraft.

The schedule of penetrations I won't go into in any detail. In general, these are not very early samples - the F-84's go in usually about H+2 to H+3 hours and the B-57B's go in as late as H+4 hours. The F-84's get up to from 30,000 to 42,000'

and the B-57B's up to 50,000' or so. We say then, that for the large shots we collect six samples, a sample being defined as two papers, one from each wing-tip tank. The control airplane will have a civilian controller who will look at the cloud and on the basis of what he sees will decide where to ask the sample aircraft to go to make their penetrations. For the weapons of less than 100 kt, basically a TEAPOT problem, there will be, as a rule, six F-84G samplers and the B-57 control aircraft.

Project 12.1 - Threshold Detectors - Lee Aamodt - LASL
12.2 - Phonex

Program 12 is concerned with neutron measurements and Project 12.1 in particular, with threshold measurements; but this shouldn't be confused with measurements of neutrons on an extensive scale. We are just making some neutron measurements on a fairly small scale for diagnostic purposes where we use the neutron measurements to tell us something about what is actually going on inside the devices. DELETED DELETED DELETED These measurements will be fairly simple, just some cable with threshold detectors on them and these detectors will be sent back probably on the day of recovery, which would be the day of the shot, for counting back here. An attempt will also be made to count in the field, but this will probably be stopped sooner or later by fallout - so we will have to plan on counting them back here at LASL.

The number of people involved will probably be two plus a couple of H&N people who will be borrowed out there to help in placing and recovering samples.

Project 12.2 is a similar neutron measurement which is done by means of photographic plates in a 30-ton collimator using recoil protons and the purpose here is to get an accurate measurement of neutron spectrum for diagnostic purposes. The shots concerned are Erie and Blackfoot, with stations at 300, 450, 600, perhaps 750 yards on Erie and on Blackfoot, because yields are a little smaller, at 300, 450, and 600 yards.

This will involve something like two or three people in the FA for from April first to June first, and two or three H&N people to help with the recovery. One thing we are going to need on these shots is a clear line of sight, and this is where most of the conflict has come in on other operations.

Project 13.1 - Eniwetok Alpha - Bob Patten - EG&G

Grier has mentioned the participation of EG&G in the alpha program; I will elaborate on this. Project 13.1 is the participation for close-in measurements of alpha at Eniwetok and Bikini. We have two large blockhouses; one is located at Eniwetok on Runit (Yvonne) and the other one is located at Namu in the Bikini Atoll. Three shots will take place on Runit; Erie, Blackfoot, Lacrosse I. One shot, Cherokee, will be at Bikini. The Runit shot is a straightforward alpha measurement which consists of detectors located up in the tower cab, base of the tower and along the line back to the blockhouse. On Runit we will have an average of 10 detectors and 28 oscilloscopes for each of the three shots.

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The two types of detectors which will be used are photomultiplier detectors, the scintillation photomultiplier unit, and the coaxial photo-diode detectors. These send signals down the transmission lines into the blockhouses, and into three basic types of oscilloscopes. We hope to try out a new type of oscilloscope to increase the range of our measurements in each detector so we can cover a factor of 20,000 with one detector.

The main problem we have at the moment is the one on Namu which is a measurement of the alpha of the first stage of the gadget. Now, alpha is a measurement of the rate of reaction or the rate of rise of the neutron reaction. We measure this by detection of the gammas from the bomb. On the Namu air drop, the 5,000' altitude is based primarily on whether we can detect the primary gammas from the reaction. The fireball is expected to come down and almost touch the ground, so at the moment the best place for the station, from an experimental standpoint, is right at GZ. The station will be a small station at GZ which should take the blast, we hope, and we hope to recover data from the station. Recovery of data will depend on how well the reaction takes place. If the bomb goes as expected, data will not be recovered immediately. If it doesn't go as expected, a quick recovery is under consideration. On Runit, the station is standard and no problems exist there.

Herb Grier has already mentioned the participation of the EG&G personnel which will be shifted around for the various projects.

Project 13.2 - Remote Alpha (Scintillation) - John S. Malik - LASL
13.3 - ENS Measurement

Most of the field work of Program 13 is done by EG&G, Bob Patten in this particular case. Measurements in this operation will be more than the usual straight alpha measurements in that we also intend to, in most cases, go up over

the peak. This entails a little more than we normally would be doing - at least more than was done on the CASTLE Operation. Originally we had planned to do the same sort of measurements as were done on the CASTLE Operation, using remote fluor techniques - a fluor on the barge, optics, and an optical collimation system in a blockhouse located some three miles away. To be able to get somewhat better data with less effort, both on our part and operationally, we are changing those plans somewhat and using Bob Watt's station on Yurochi, and using multiplier detectors, which we would be using anyway with remote fluor technique; and making a similiar measurement to that which Bob Patten would be making in the normal Nevada-type shots, and the same system which he is using on the Runit measurement.

This we hope will provide data of essentially the same accuracy which Bob would be able to supply with a standard system; and there is no requirement in this case for night shots, or fluors in the middle of the drink, or any of the night operational difficulties people had on the CASTLE Operation. This should be somewhat simpler from our standpoint, and I think the data will also be considerably better. We will not be using optics. The fluor and multipliers will be in contact this way but at 2,300 yards rather than to be doing it at three miles. It is essentially the same measurement which Patten will be making from Namu except that we'll be a little farther away.

That is essentially all I had for 13.2. As for 13.3, it is still up in the air, and one cannot say anything about it at the moment. It will probably be done, and any monitoring which will be done will most likely be by remote means, rather than the system which we have used in the past. On TEAPOT, for example, it was done remotely and this was satisfactory. I suspect that when Sandia does this, if they do, it will be done by the telemetering method.

Project 15.1 - EG&G Photography (Cloud, Fireball and Bhangmeters) -
Herb Grier - EG&G
22.2 - Remote Alpha Measurements
23.1 - Ball of Fire & Bhangmeter
23.2 - Cloud Photography

Our problems are two-fold; first, we're a service organization in that we do the timing and firing for the entire technical group, and second, we're experimenters in that we measure alpha on some of the shots, measure yield photographically, and do a lot of assorted tasks, which I think are of no real interest to a group this big.

I'd like to run over the odd tasks a little bit and then spread the good word on the timing system. The alpha task, I believe, will be covered later by John Malik so it suffices to say that we're measuring alpha on Cherokee at Namu. The station is not yet built and we don't know how to build it, but we have faith in Brother Campbell here. We're also measuring alpha on the Runit shots. There's a little side experimentation that goes along with that - not too complicated.

The photographic effort has always been a big one - it is one of the yield measurements and the yield is one of the characterisitics people want to know about. We're operating essentially three photo towers in Bikini and a station atop Gaelen Felt's bunker up on Aomoen. On Eniwetok, we're operating a photo tower on Piiraai, one on the coral head, and then a couple of these small bunker stations atop other installations. We're delinquent as usual on getting construction things in, but these are pretty well set now and I think everybody is reasonably happy.

The part of our work that I think will interest most people is the timing and firing system. While we do the work, we're not the people you come and beat on. In your status report, you should notify, through the distribution, Campbell if you want signals here and there and everywhere else, what they are, whether they be radio or wire. A new requirement, which I think we're got to get to avoid confusion, is where do you want a voice countdown and on what frequencies? Is the requirement in airplanes, or should we notify the rabbits. Things like this have got to be written down.

Now the timing system is going to be very much similar to the CASTLE system. Eniwetok is no great problem. There are wires all over the lot, but in Bikini the cable is limited and for people who want to get stations where there is no existing cable, we will supply radio signals.

Within the next two weeks, we will get out copies which are essentially a rewrite of the CASTLE timing manual. This specifies six common wire signals and radio signals. This has been found to be pretty much the kind of thing that is

needed. I noticed here that some people want two-second signals and this sort of thing. Rather than say they just don't exist, I say just ask Bob for what you want; if a whole group of people come up wanting a two-second signal, I'm sure we can get a two-second signal somehow. If one fellow wants one, we'll get together with him to discuss how to get his two-second signal or what to substitute for it.

There will have to be more radio signals, particularly on Cherokee shot on all this effects instrumentation up through that area. Radios, properly used, have been completely reliable; but it takes dry running and this I know is pretty rough for a fellow who's got a little station out on a reef somewhere with a sequence timer going every hour on the hour, as I understand Al's schedule is going to require.

There are going to be problems, but I think no one need have fears for radio time signals if they will just dry run and practice. This means getting out there early; for people who arrive the last week, the failure rate is pretty high.

We also will supply communications, which is essentially a function of the timing system; at least, it grew out of that. We will run Motorola nets for the technical people. If you have such a requirement, you should get this in so that Roberts can sort out how many nets, how many radios on a net, and this type of thing.

The confusion of the last couple operations during the last month over who wants a countdown gets everybody upset. I think that if you have such a requirement, you should put it in now. It's not always easy, in the last minute, to bust into an AF transmitter and give him a countdown on the right audio level so that the airplanes can get intelligent reception and will have a chance to work out antenna problems and that sort of thing. Rather than make private deals with EG&G, put your requirements on your status reports so that the distribution can see your problems.

We guarantee only one post-shot timing signal and that's a one-second signal when the other signals cut off. The reason for this is simply that in a station close by you can't guarantee that a relay is going to hold in through a shock wave. We have given over the radio five-second "beeps" for two hours and stuff like that. We will have radios going through zero time, for the benefit of those who are worried about this, and we can minimize this if we know beforehand and put in provisions to cut them off. It has to be done automatically, to do it satisfactorily. We would expect to be running on the order of a dozen frequencies and powers up to 250 watts mostly in the 150 mc band. However, if we get into this television monitoring of photographic links, there will also be some higher frequencies.

For the benefit of the J-Division people, we will probably have about 150 people involved but these will probably not exceed 90 or 95 in the FA at any one time.

Project 15.2 - J-15 Photography (High Speed Photography) - Gaelen Felt - LASL

We are concerned with the very early stage of photography. The work that I am going to describe a little bit is going to be done by the LASL photophysics group. Our main instruments are all very similar - they are rotating mirror cameras.

There are three main types; one is a framing camera, which, depending on the type of turbine we put in it, will take pictures at rates of 3,500,000 per second or approximately 7,000,000 per second. The recycling time is rather short and we don't end up with very many pictures, but the rate is very high. The other two types of cameras are streak cameras and sweeping image cameras. The Model 100 streak camera will write on the film with a speed of about 15-mm per microsecond. It can resolve approximately 10^{-8} seconds. The other camera, the LASL Model 103, a sweeping image camera is at present in the design stages; we haven't built any of them yet. Its theoretical limit in time resolution is 5×10^{-10}. We don't really think it is going to do quite that well, but if it will do 10^{-9} seconds it is perfectly satisfactory for the type of work we are trying to do.

We will operate three major instrument stations, one of them on the Island of Teiteirpucchi, which is up near Bogairikk - I guess that's Helen.

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The work that we are doing in these buildings falls into two main categories. The first category is diagnostic experiments where the intent is to obtain information on the behavior of the device being fired, for use in the analysis of the device itself - how it works. There are small variations in the type of information we are looking for. In all cases, we are dealing with very short time intervals.

In the Bikini group, these are all large devices; there the main piece of information we are after is the interval between reactions, the so-called time interval measurement which we have done before. I guess the first time we did this was on Mike. We are also interested in the very early growth of the fireball during the radiation phase. In particular, we are interested in the first three, four or five microseconds. The reason for this is that we think these measurements can help in separating out the yields. If there is more than one yield, as in the two-stage devices, we can tell something about the yield of the primary stage.

At Eniwetok, some of the work is diagnostic but the main effort is not. It is a continuation of the work that we have been doing for several years. Those of you who were in Nevada this time may recall the experiment we did there, in which we had the 500' vacuum pipes on the Apple 2 tower. The information here is research information - it is not connected with the device at all. It is using the device as a source of energy for the experiment.

Operationally, things are probably simple at Eniwetok. We will merely occupy the building and, in both places, we will have camps, at least for a while, that will take care of us pretty well. At Bikini, chances are quite good that before very long we will have to do as we did on CASTLE, and base our operations on a "T" Boat, going into the building when we have to go. We expect that the Island of Acmoen will sometime during the Bikini operation become contaminated, and make it impossible to live and work there very easily, so that we will then move down on the water.

Project 16.1 - Temperature Measurements - Marvin Hoffman - LASL
16.2 - Time Interval Measurements

DELETED DELETED DELETED Project 16.1 is a neutron measurement and this will be done with a detector installation near the zero point; it requires considerable construction near the zero point to take this electronic equipment and provide radiation shielding. This is strictly electronic measurement; the signals are detected at the zero point on Helen and transmitted back to the coding station on Bogon, a recording station which is in existence now, and recorded on scopes. The transmission lines are of the best practical quality and quite expensive so we go to some effort to make detectors which will cover an ample dynamic range which is three to four decades. This is done with either photocells or multipliers by making a non-linear device which will respond somewhat in a logarithmic manner to the signal.

The 16.2 experiment is a gamma-ray detection problem - here we have detectors both near the zero point and near the recording island. The zero point detectors, of course, again require transmission lines, so we use no more of those than are necessary. The detectors near the recording station use a somewhat collimated beam from the gadget. Again we require construction for the collimation of the gamma-ray beam and shielding to the recording station. Here the dynamic range is not of such importance - at least it is reasonable to cover with linear detectors; we will not use non-linear detectors here.

Project 16.3 - Electromagnetic Measurements - Ralph Partridge - LASL

Project 16.3 makes measurements on the electromagnetic pulse which was mentioned earlier. We're the people who were the pests running around asking everybody to get their transmitters off the air. We'd be delighted if we could get the aircraft to turn their engines off at zero time too. We have a two-fold purpose - we want to try and obtain diagnostic information, if at all possible, and we would also like to check out the theories on the electromagnetic stuff.

We want to have stations for measuring the early part of the signal in the alpha vicinity and on a longer time scale for, we hope, the probability of getting time interval for Bill. We'd like to try this a couple of ways. We want to have stations on both atolls, probably on Japtan which was done in CASTLE, and we want to have a station in the vicinity of Enyu which I hope will not require construction; I'd like to use trailers or something like that if we can do it, I don't know just how feasible this is. We've just got started on this stuff, so I haven't had a chance to talk to J-3 or J-6 about any of this yet.

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We are going to try to get increased sensitivity this time and it's making it tougher from the point of view of stray signals being around in the air. Then there is a remote possibility - depending upon whether we can get personnel to do it - we'd like to try making an airborne measurement of this stuff. Sometime in the future one might build this up into gear which drop aircraft might use, but for the time being, I'd just like to see if maybe this could be done as a measurement from an airborne station. We're going to have to check as to what is available along this line. And as an even more remote possibility, the project is trying to make a measurement on shipboard, so that we can get a quick measurement of time interval. That's the remotest of possibilities in this experiment.

I'd be awfully happy if people would let us know what they're going to have around the various bombs in the way of shielding and stuff that will keep gammas from coming out in various directions. This enters into our theories of the thing - we don't know whether it will check out to be the actual cause or not.

As usual, we try and ask everybody to get off the air, radio-silence-wise, and we'd like to confer with everybody who is going to be on the air. Of course, we'll argue this through J-3.

We haven't put in any requests yet because we've just had a chance to get going on this. We'll probably have something on the order of four personnel in the area however - maybe run six to twelve scopes; and it's possible, in the way of construction, we may want to put up some big fences around us to keep other radio signals out. In case this would interfere with anyone else, I would like to check. We are thinking in terms of fences, oh, 100' high or so of something like chicken wire, or something like this, maybe a couple hundred feet wide behind us. We have some ideas in mind that would make this rather cheap and easy to do, I think; but if it is going to interfere with other people, we will have to have lots of discussion on that subject.

PROGRAM 18

Project 18.1 - Little Inch - CDR John A. Dudley - NRL
18.2 - Big Inch
18.3 - University of Rochester
18.4 - Chord

Projects 18.1 through 18.4 are conducted by Dr. Stewart of NRL. Projects 18.1 and 18.2 are concerned with Pueblo and involve measurements which have to do with the behavior of the weapon itself. We will be using photoelectric techniques, spectrographic techniques, and high-speed streak cameras for this work. The cameras we will use will be the same as Gaelen Felt referred to as the Model 100's. The spectrographs will be a combination of the Model 102 camera with a grading spectrograph. The photoelectric technique will be similar to what we used on Apple shot on TEAPOT.

The operational side will consist of a station on Gene, on which Bob Campbell does not have the requirements yet. We will also have some 18,000' of vacuum pipe consisting of six vacuum pipes running from the station to GZ. Five of these pipes will presumably be 16" pipes; with the help of Bob Campbell and a steel mill, the sixth pipe will be 36" in diameter. We hope to have a vacuum in the order of less than a tenth of a micron, possibly down to two one-hundredths of a micron - I am a little optimistic on that.

The number of people involved in this station will be about 22 people, and the job as a whole will be similar to what we did on Apple at TEAPOT only on an enlarged scale.

[DELETED DELETED DELETED] It's entitled the "Chord" experiment, and in that we will observe with photoelectric and spectrographic instrumentation. An argon flash is so situated with respect to the weapon that we observe the flash, and the radiation path will cross the line of sight, so we will get information regarding the disturbance which the radiation causes. There is some possibility we may put a vacuum system there so that we can restrict the actual air path that we look at to some 10' or 12'.

The work of 18.3 and 18.4 will be done by University of Rochester personnel - Dr. Gordon Milne using the half-speed, whirling-drum spectrograph. The 18.3 part of that will be done by the J-10 personnel from LASL - if Don Westervelt is in the audience, he may have a few words on that.

Some of these things are still in the mill; in fact, the only reason Dr. Stewart isn't here now, is that he's back in Washington now trying to iron out some of the difficulties we have so that we can tell J-6 what we want. Construction-wise, Campbell has practically nothing from us yet.

PROGRAM 21

Project 21.1 - Radiochemical Analysis - R. H. Goeckerman - UCRL
21.2 - Sampling
21.3 - Short Half-Life Activities

Program 21 is essentially the same as Program 11. There are a few minor differences in operational procedure. Project 21.1 is basically our radiochemical analyses in the ZI at UCRL. Program 21.2, headed by Roger Batzel of UCRL consists of six men who carry out the same general functions as Dr. Plank at LASL. This is our sampling project, and is essentially cloud sampling. We are interested in gas as well as particulate samples.

Our requirements are similar to theirs, in that we want six aircraft flown through the cloud at different times and different places, and with an altitude capability commensurate with the cloud height expected of that particular shot. Not all aircraft, but a minimum of two should have a capability of going to the expected cloud height. One of the six men will be over there to check weather requirements for firing a shot as far as radiochemical analysis is concerned; he will act as advisor from the control plane on the sampling operation.

Project 21.2 is also responsible for returning the cloud samples stateside, with an additional responsibility that three of the six gas samples be returned to Parry immediately with the first filter sample on UCRL shots. The gas samples, in general, on practically all shots will be processed by the project which I will describe next, Project 21.3. We have some slight interest in getting hold of some of the fallout samples, but that is a matter which we will deal with just on the basis of hoping to cooperate with NRDL. We are interested in some of the species present in the fallout as they affect the validity of the radiochemical data on the debris present in the cloud at sampling time.

Project 21.3 "Short Lived Activities". This project has two phases. The gas sampling program is coordinated with requirements of AFOAT-1 who are interested in analyses of gas samples; but our gas samples will be transported immediately to Parry Island, where, in the compound, we will have a set-up to operate on short lived things. We will separate gas samples there into their components, which will be counted there, and also into water and CO_2 which will be bottled and returned to the states some time in the order of a week later for analysis for tritium and carbon-14. The first filter to be landed in UCRL shots, in general, will be transported to this laboratory also, where it will be subjected to radiochemical analysis for short lived species which would either be lost completely, or else the accuracy of the data would be greatly hindered, if the decay on transporting to the ZI were allowed to occur.

Project 21.3 will operate from about the middle of April to the bitter end of the program, on the basis of about seven men continuously there, but with frequent changes of the guard. The project officer for Project 21.3 is Floyd Momyer, who will be there at least half of the time. In addition, we will have couriers or monitors who will be sent out there to return with information and with the samples which have been done.

PROGRAM 22

Project 22.1 - Time Intensity Measurements - Louis Wouters - UCRL
22.2 - Remote Alpha Measurements

On the Ursula complex of islands, which are shown as Ruby and Sally on this map, we are going to make measurements on Yuma and Kickapoo, in a manner quite similar to those described by Bob Patten, his alpha measurements. The Mohawk experiment is a somewhat more complicated experiment in which we will attempt not just to measure the reaction rate, but also an interval of time between two portions of that experiment. In all the Ursula complex experiments, we will have detectors both in the cab and back in the vicinity of the blockhouse, with coaxial cables bringing signals into the recording station. The magnitude of that program can probably best be estimated by saying that there will be of the order of 30 oscilloscopes (that is 30 of these recording type oscilloscopes) in the blockhouse.

The Tare experiment at Bikini, the one called Zuni, is somewhat more along the lines of what UCRL has done in the past on CASTLE, except for the fact that we are not bringing 12 miles of pipe with us. And that has its complications, because the pipe does insure that there won't be any jet aircraft, ships, a piece of angle iron - all these things that people have mentioned - in the path of our gamma rays for the ten or several microseconds that we have to have a clear path. And, I do want to make that point. I think that is one value of a meeting like this, that we do need, along our two channels that we will be looking at, an absolutely clear path. Since we are going to have the air attenuation there already, we can't afford to have any additional equipment in the way.

To explain that a little more, those of you that were on CASTLE will remember that we had vacuum pipes leading from the zero site to the vicinity of the recording station. In this case, we will have two observation channels which will not be parallel, there will be a slight angle to them, so that they will diverge from the zero site on Tare to a position several yards apart at the far end, the blockhouse end, of Tare site. Now, that experiment will involve again about 30 oscilloscopes in the blockhouse, and a total of about six detectors scattered at various points on the island, at the end of these transmission paths and at the zero site.

As far as I know, our operational plan is to attempt to set up the permanent stations as early in the program as possible. I am hoping, personally, that all of our own installation work - the progress of our work will be such that we will be able to start dry running around April 15th.

The manpower requirement, I think, is in, and also most of the construction requirements have been in for some time. I don't believe there will be any more construction, except for the possibility of reactivating some station somewhere on one of two sets of islands, in an unoccupied blockhouse if we can find one that could be used, and this has to do with the extra tests that have been brought up once or twice here before.

I might make a comment - I don't think Herb was planning to say anything about 22.2, were you? That program was initiated again in connection with the Apache shot, and that was a program in which we would use remote methods, similiar to those used in TEAPOT, in order to measure, roughly, what was happening on the Apache shot. There is a problem as to where we would go, and I was very happy to hear that there would be at least remnants of a blockhouse on Namu, and that LASL was activating a blockhouse in the vicinity. I believe that it is a rather large blockhouse, maybe we will be able to sneak a couple of scopes in there.

Likewise, in the case of Lacrosse II, if it is necessary, do the same kind of thing - these are the only things that might come up. Actually, in terms of manpower, we would attempt to do any additional work with the crew that we already have put in requirements for.

Q: On Zuni, are you using photomultiplier detectors?

A: On Zuni, no, we are going to try to do all that with photodiodes. Our estimates of the flux - the primary of course is easy, we do that with cables running back to the blockhouse from the zero point - the other portions of that reaction - the gamma attenuation calculation - seems to show plenty of signal strength. Because they are direct view, we are not trying any conversion experiments or anything of that kind. It is strictly for timing. If we get any data on any of these three other reactions, it will be very interesting, but there isn't any requirement for them.

For additional information on Project 22.2 see Project 15.1, Program 15, page 67.

PROGRAM 23

Project 23.1 - Ball of Fire & Bhangmeter - Herb Grier - EG&G
23.2 - Cloud Photography

See Project 15.1, Program 15, page 67.

Project 23.3 - Time Interval Measurements - Harry B. Keller - UCRL
23.4 - Time and Pressure Measurements
23.5 - Remote Time Measurements

We are planning to obtain information which is strictly of a diagnostic type for three devices in which UCRL has interest, namely the large weapon devices, Zuni and Apache at Bikini Atoll, and the smaller device Mohawk at the Ursula complex, in the Eniwetok Atoll.

We plan on taking only one type of camera into the field, namely that which Gaelen Felt just referred to as the Model 100 streaking-type camera with a writing speed of something like 15.2-mm per microsecond. DELETED DELETED DELETED

In the case of the time interval type of experiment we require no installation of equipment at the zero site; however, in the case of time and pressure measurements, certain types of evacuated pipe equipment are necessary at the zero site.

The operational plan, as we foresee it presently, is to use the photo bunker which exists, but which needs a certain amount of reinforcing. In the bunker on Tare, we plan to install seven of these Model 100 cameras, and in a similar photo station at Ursula, seven cameras to cover the two events, Zuni and Mohawk.

It will probably be necessary for us to move some of our equipment from the Tare site to a site up around the Fox group of islands, in order to be able to cover the Apache event.

We are beginning to do some experiments in the laboratory on coefficients of transmission and resolution. For anyone doing photographic type experiments, it is apparent that it is important that you can see and resolve that which you are looking at; and, for this purpose, we hope to place at the GZ installations a relatively small amount of equipment; namely, multiple light sources, which we can scan and from this obtain some information about our ability to resolve two objects, and something about the light loss between the zero station and the photo bunker; but as yet this equipment is merely in the experimental stages.

PROGRAM 30

Project 30.1 - Microbarography - W. A. Gustafson - SC

This is the Microbarograph Program. The object of the project is to study propogation of pressure signals in air by large-scale detonations and to measure microbarographic signals received through ozonosphere and ionosphere. From this data, wind direction, speed and temperatures in the ionosphere and ozonosphere can be determined. This information will be valuable for missile flights, that is, ICBM etc.

The microbarograph measurements have been made on all operations starting with BUSTER-JANGLE and it has been found both large and small detonations give us upper air information. Further information is needed in the tropical regions.

The standard microbarographic equipment will be used. This equipment was manufactured by Wiancko. The total weight per station will probably be around 500# - it's quite compact and small. In order to make these measurements most meaningful, we would like to use islands in the following atolls: Eniwetok and Bikini, Rongerik, Wotho or Ujae, and Ujelang. We do not feel this project justifies sole off-atoll support and intend to establish microbarograph stations only on atolls which already require support - Bikini, Rongerik, Wotho; and we would like to operate on Eniwetok and Ujelang if possible.

We will not have any signal problems - we intend to use an electromagnetic pulse for our zero time indications. The number of people estimated at the present time is 12 - possibly two persons per atoll will be required. Construction at the present appears to be three four-man tents.

PROGRAM 31

Project 31.1 - Vulnerability of Stockpile Weapons - H. E. Hansen - SC

This experiment is designed to study the vulnerability of stockpile we thermonuclear and standard A bombs; and I want to emphasize this experiment designed to test these weapons under any particular conditions of storage o carry. It is designed so that the instrumentation will be general and that may be extrapolated to include any condition which might be of interest.

We wish to use Lacrosse for this experiment, and will have six stockpi on the Island of Runit, located at 500 psi, 200 psi, 75 and 40 psi regions. ticular at 500 psi we will have a TX-15x1 case assembly; at 200 psi a comple at 75 psi a complete TX-15x1 and two Mark 5's; and at 40 psi a Mark 5. We w instrumentation shelter for hard wire instrumentation located approximately between shot Lacrosse and the Blackfoot device, midway as far as the pressur is concerned, and we will instrument approximately 120 hard-wire channels at cation. In addition, we want to telemeter backup information from these uni utilize 12 telemetering frequencies on a band from 215 to 235 mcs, at about and we would like very much to transmit through zero. We will have two rece ers for this telemetered information - one on Parry Island, in which case we use the photo tower for our receiver antennas - the other located on Engebi, would like to use the multi-building.

Construction-wise, Mr. Campbell has received prints of most of the cons and I hope that he will be happy to hear that we have changed some of the mo will not have any rigidly mounted weapons in this test at all, but they will suspended, and this should simplify construction considerably.

As far as the operational plan is concerned, we will have approximately from about April 1 until a week or so after Lacrosse, and we are requesting a on Parry for assembly and testing. This building will need to be in the secu During the period prior to the Blackfoot shot on Runit, we will install our s equipment here; and immediately after Blackfoot, or as soon as possible, we w our weapons from Parry to Runit and complete check-out and calibration.

Q: What do you plan to measure?

A: We will be measuring environmental conditions at each weapon location, wh be overpressure and "Q". On the weapons themselves, we will be measuring the functions, or accelerations and thermal measurements - particularly on the cl units, we will be measuring strain and case deflections. We'll monitor all t and firing functions and fusing and firing equipment.

Project 31.2a - Temperature vs Time Inside Fireball by Electronics - F. E. Thompson - SC
Project 31.2b - Temperature vs Time Inside Fireball by Guns

The primary objective of these is to measure the removal of materials from metal surfaces inside the fireball. We have two schemes set up for making these measurements. The first one considered is the erection of a steel column inside the tower of the Kickapoo shot. We will mount metal samples at 20' intervals on this column, the first samples being 10' below the device. We'll have three types of metals - aluminum, copper and steel, as presently planned. On each of these samples we will have two types of gauges or switches, as it turns out, located at two different depths; in other words, four probes in each of the three metals, or a total of 12 channels at each station, with a total of eight stations. This gives us a total of 96 channels from which we will record on a magnetic tape which is housed in the shelter at the base of the tower. The recording system will not include any electronics - we will employ a method of erasing a pre-recorded signal by an electronic current which is initiated or terminated by the switches in the metal samples.

We anticipate some difficulties with possible ionization of cables and ionization of gaps in the normal open probes. We are running some tests now at the Materials Testing Reactor in Idaho Falls to determine the effects of radiation on the electrical cables that we intend to use in the steel column. We expect to minimize the electrical transient somewhat by having the entire recording system isolated from ground and having the entire system grounded only at one point - at the point of the shield at the probe on the tower.

We are also running some tests as to the effects of nuclear radiation on magnetic tape. So far we have subjected tapes and cable to gamma fields of 6×10^6 r/hr and have noticed no ill effects.

The second type of measurement which we propose is the firing of projectiles from recoilless rifles mounted on the same tower. We plan to mount three 75-mm recoilless rifles as near as possible to the top of the tower, firing vertically downward. Two more will be mounted approximately 100' below the cab, also firing downward. For one of the three mounted at the top we will attempt to catch the projectile in a barrel located some 15' below the rifle, another one of the projectiles fired from the top we'll attempt to catch about 125' below the rifle, and the third one we'll catch on the ground. For the two rifles mounted at the 100' station, we will attempt to catch one of the projectiles at about 25' below the rifle and the other one on the ground.

The nose section of the projectiles will consist of segments of copper, aluminum and steel and we hope that in this way we can measure the degree of metal removal by the thermal effects of the fireball for different integral portions of the fireball. In other words, the projectile is fired from the top. If we can catch it and shield it 15' below the rifle from any further thermal effects, we'll be able to find out how much of the metal is removed during the early portions of the fireball - and the other arrangement will give us different integral portions.

We expect to have a photographic coverage - two cameras on each of these rifles to tell us something about what their actual velocity is - it's supposed to be in the vicinity of 1000' per second. And from the photographic coverage we expect to find out what happens after the fireball overtakes them. We hope that we can catch these projectiles that we're trying to catch to terminate their exposure to the fireball at the times we're trying to terminate them; and we hope that by inspection afterward, when we recover these projectiles, that we can determine whether or not we actually did catch them.

We had some discussion last evening with representatives of J-6 and L-6 as to what difficulties we would run into in mounting these things on the tower, and I think by vertical firing we will eliminate any of their fears as to what the back-blast of these rifles may do to their device; and they were a little bit concerned about the drag of this totem pole on the tower, if we guy it to the tower. However, I think it can by guyed separately and eliminate anything of this sort.

We expect to have about six men in the field from the first of March until probably eight or 10 days after Kickapoo, depending upon how long it takes us to get in to recover the metals and the magnetic tape records. I think we can have completed our construction requirements by the latter part of next week.

Project 31.3 - Atlas - T. C. Looney - SC

(Note: This project has since been cancelled.)

When our ballistic missile re-enters the atmosphere there are two serious problems which are expected. One of them will be an erosion of the missile nose due to contact with particles in the atmosphere. The second one will be a general aerodynamic heating of the missile. In order to choose a suitable material for the missile skin, the designers would like to separate the two effects and study them independently.

Ramo-Wooldridge, who have the primary design responsibility for the Atlas system, have approached the SC with the idea of our exposing some samples to the thermal from a large yield weapon on this test. To get the desired flux, there are two ways you can do it: you can get far away from the blast and use mirrors to focus the heat on the material that you want to test, or the other way is to go in close. Project 5.9 already plans to use the mirrors. If we decide to do the project, we will go in close. There are advantages to mirrors and there are advantages to going close in, so everything here is based on whether or not we do the project.

If we do the project, we will place the samples on Dog Island. This will put us some 7,000' away from GZ, with a 92 psi overpressure region. The theoretical predictions of the flux in this area should be something like 500 calories per sq cm per second. The thermal peak should arrive something like 2-3/4 seconds after zero time and the thermal will be down to 35% of its maximum value six seconds after zero time. Unfortunately, the shock wave arrives before the thermal does and this brings two unwanted items; namely, salt spray and sand. We will eliminate the sand from the

experiment by putting the shelter of the gauge station close to the water's edge and we will try to eliminate the water vapor by building a blast shield which will be triggered by the shock wave and will remove itself shortly thereafter.

There will be something like 35 samples loaded in a concrete block, 4' wide x 5' tall. Some of these samples will require photocouple instrumentation which will have 18 channels of thermo couples, three channels of thermal flux measurement and one channel of overpressure. The recording shelter will be some 20' in back of the gauge location. The project will require four peeple in the FA from April 23 to D/10. Mr. Campbell has our preliminary construction requirements already and we will try to submit the final drawings next week.

There were no questions.

W. E. Ogle made the following closing remarks:

I think this meeting has accomplished its purpose. It certainly has as far as I'm concerned. I've received a few rude shocks and I suppose someone else has, such as rockets being fired at bombs and fences a hundred feet high. I hope that this has helped all of you appreciate the size and magnitude of the job we are undertaking.

I think you can all understand, not only from Campbell's statement, but from everyone else's, the extremely tight schedule we are on and that we have very little time to get this done. I think you can see that it is appreciably to your advantage and ours to get every requirement that you can think of in as soon as you can, especially those requiring construction or those that may cause interference with some other project, so that such interference can be cleared up early in the game. I suspect H&N are sitting back there grinning to themselves at this idle dream of ours. I have a feeling that in about six months they will not be grinning so much.

I would like to thank all of you very much for coming to this meeting. It is probably the only one of this type that we will have - at least until we get into the FA. I suppose I can make the announcement as usual that J-1 through J-6 will be open this afternoon. I'm not aware that it's a holiday, and if you have any further information you can give them I'm sure they would appreciate it. Thank you all very much for coming.

The meeting adjourned at 12:30 PM, July 27, 1955.

FOR THE COMMANDER:

Duncan Curry, Jr.
Deputy for Administration

1 Incl:
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M&R, LASL		1	32
DBM, USAEC	C. L. Dunham	1	33

LIST OF ABBREVIATIONS

AEC	Atomic Energy Commission
AF	Air Force
AFCRC	Air Force Cambridge Research Center
AFSAM	Air Force School of Aviation Medicine
AFSWP	Armed Forces Special Weapons Project
AFSWC	Air Force Special Weapons Center
AGC	Command Ship
APD	Destroyer Transport
ARDC	Air Research & Development Center
AV	Seaplane Tender
BRL	Ballistic Research Laboratories
BuAer	Bureau of Aeronautics
BuShips	Bureau of Ships
C-D	Contaminability & Decontaminability
cm	centimeter
CRL	Chemical & Radiological Laboratories
CVE	Escort Carrier
DD	Destroyer
D-Day	Shot Day
DOD	Department of Defense
DUKW	Amphibious Vehicle
EG&G	Edgerton, Germeshausen, & Grier, Inc.
ERDL	Engineer Research & Development Laboratories
ESL	Evans Signal Laboratory

FA	Forward Area
GZ	Ground Zero
H-Hour	Shot Time
H&N	Holmes & Narver
JTF	Joint Task Force
kt	kiloton
LASL	Los Alamos Scientific Laboratory
LCM	Landing Craft Medium
LSD	Landing Ship Dock
LST	Landing Ship Tank
mcs	megacycles
mm	millimeter
mr	milliroentgen
mr/hr	milliroentgens per hour
Mt	Megaton
NASWF	Naval Air Special Weapons Facility
NOL	Naval Ordnance Laboratory
NRDL	Naval Radiological Defense Laboratory
NRL	Naval Research Laboratory
NYOO	New York Operations Office, USAEC
PPG	Pacific Proving Ground
psi	pounds per square inch
Pt	Pitot
r/hr	roentgens per hour
R	roentgen

[redacted] SECRET

[redacted]

SAC	Strategic Air Command
SC	Sandia Corporation
SIO	Scripps Institution of Oceanography
SFOO	Santa Fe Operations Office
TAC	Tactical Air Command
TAP	Transport
TG	Task Group
TU	Task Unit
UCRL	University of California Radiation Laboratory
UHF	Ultra High Frequency
VHF	Very High Frequency
WADC	Wright Air Development Center
WEDT	Weapons Effects Test Division (AFSWP Field Command)
YAG	Liberty Ship
ZI	Zone of Interior

[redacted] SECRET

[redacted]