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RADIOLOGICAL SAFETY BRIEFING FOR [illegible]

410455

I. INTRODUCTION

1. Following the first shot of CASTLE unexpected radioactive fallout [illegible] over a wide area of the central Pacific. Significant fallout occurred on the inhabited atolls of RONGERIK, RONGELAP and UTIRIK. Prior to evacuation the military personnel on RONGERIK and native personnel on RONGELAP received a radiation dose of between 100 and 175 roentgens. The UTIRIK natives who were not evacuated received 37 roentgens. The chart shows the locations and radiation dosage received by the personnel of these atolls. Also shown on the chart is the estimated location of the Japanese fishing vessel, Fukuryu Maru. This estimated location is approximately 80 miles to the Northeast of BIKINI. Some 50 miles to the South of BIKINI is the approximate position of the Task Force fleet at the time very light fallout was encountered. This fallout was not significant as a health hazard.

The RONGELAP natives were evacuated to KWAJALEIN and the military [illegible] for medical care. (ENLARGED PHOTOGRAPHS OF NATIVES)

The two photographs of natives show the external symptoms of radiation sickness. Note the loss of hair and the depigmentation of the skin as evidenced by the photographs. The RONGELAP natives also suffered nausea and vomiting, the characteristic radiation exposure symptoms. The natives were treated at KWAJALEIN and are now living at MAJURO Atoll. All the natives have fully recovered; their hair has returned, same color, same count, and the skin has regained its pigmentation. All military personnel were returned to duty within 60 days after exposure. The island of RONGELAP is completely safe and the natives may be returned at any time.

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The incidents associated with the first shot of CASTLE resulted primarily from a penalty of information on fallout from high yield detonations. The BRAVO Shot of Operation III (on the order of 10 megatons) gave no apparent indication of the magnitude of fallout attending high yield nuclear detonations; the BRAVO Shot fission products apparently fell to the Northwest of ENIWETOK and were never detected. Reasonably good information on the extent of fallout from large devices was obtained from the several shots of the CASTLE series. We feel that this information will enable us to make fallout forecasts with a high degree of confidence.

II FALLOUT FORECASTING

During the next few minutes I will outline, briefly, the safety measures which will be taken during the forthcoming operation. The Task Force will employ a fallout prediction unit which will make detailed fallout forecasts based on forecast wind field for all shots of the series. You may be familiar with this organization as it is essentially the same group that provided fallout predictions for Operation TEAPOT in Nevada. The Fallout Prediction Unit is manned by scientists from the U. S. Weather Bureau, the University of California Radiation Laboratory, Los Alamos Scientific Laboratory, Sandia Corporation and officers of the Air Weather Service. This group is the outstanding authority in this field. The forecasting techniques to be used by this unit were employed successfully for all shots subsequent to the first CASTLE detonation. Previously, fallout forecasting had required long and tedious calculations. For BRAVO, the Task Force, through the AEC, has obtained three types of analog computers to aid the unit with their calculations.

One of these, the National Bureau of Standards' fallout computer, presents the fallout pattern on a scope similar to a PPI screen. This presentation permits the overlaying of a transparent map of any area on the scope. At the present time there are only two of the NBS computers -- the Task Force is using both of them. Engineers from the NBS have installed and are operating these instruments. One of the NBS computers is installed aboard the command ship and the other in the RANGER OFFICE at ENIWETOK.

In addition to the fallout forecast, the fallout prediction unit will forecast cloud trajectories which will be used as a basis for diversion of air traffic from areas through which the radioactive cloud may pass. CJTF will be informed of the forecast cloud track and will be able to divert air traffic away from any radioactive cloud.

III DANGER AREA

After the first shot of CASTLE, it became apparent that the existing danger area did not provide enough space for dumping radioactive debris from [illegible] detonations. The danger area was enlarged after the first shot. The danger area indicated on the chart is essentially the same as the enlarged CASTLE area. The enlarged danger area should aid in preventing a recurrence of the Fifteyre Maru.

The Task Force will employ one squadron of Lockheed P2V Neptune patrol aircraft to sweep the danger area prior to each shot. We realize that the danger area, some one-half million square miles, is a very large area for thorough aerial reconnaissance. However, search aircraft will sweep the entire danger area until two days prior to a shot. On the second and on the day before a shot, the squadron will make an intensive search in this area

[redacted]

of forecast fallout. Should any shipping be encountered, the ships will be warned that they are in a danger area and requested to clear the area. Should any shipping be encountered on the day just prior to a shot, the shot will have to be postponed until the ship is out of danger.

IV RADIOLOGICAL SURVEYS

The Task Force will conduct an extensive program of locating and measuring fallout. The program will locate and measure the fallout by operating surface ships through the fallout area. On these specially modified Liberty ships, the control rooms have been removed to heavily shielded locations deep within the ships. These ships are essentially floating radiation laboratories.

P2V aircraft, equipped with radiation detection and measuring instruments, which telemeter the radiation intensities to a central plot, will be employed to delineate the fallout area from the air. The surface and aerial monitoring of contaminated areas will take place for a duration of six days following each large detonation.

The scientific cloud-sampling program will provide early cloud track information which will permit a continuous monitoring of the cloud position during the early dangerous period. All Task Force aircraft will be equipped with radiac instruments and are required to report all radiation encountered.

V DETECTION AND WARNING NETWORK

The Task Force has established a radsafe warning and monitoring network at MOTEN, ENEWETAK, UTIRIK, KWAJALEIN, ROI-NAMUR, TARAWA, KAPINGAMARANGI and NUMEA. These are shown on this chart. These stations are equipped with radiation detection and measuring instruments and manned by qualified radsafe

[redacted]

permanently manned, WJAM and WTMK are manned by U. S. Public Health Service personnel and the remaining stations by military personnel. The classified stations, WJAM, WJAM and WTMK will be linked with the RADIFF WTMK by a positive two-way radio net. The other locations will be linked through the weather reporting radio net. Auxiliary radiation detection and measuring stations have been set up at the weather stations located at GUAM, KWAJALEIN, NAS JOHN and WAKE. These stations are equipped with radios interconnected and will report any detected radiation through the Pacific weather radio net. All the principal radsafe stations will be able to advise the local population on precautionary measures should unexpected fallout occur.

Aircraft will monitor the populated areas of the Northern Marshalls after each detonation. The Marshall, Marianas and Hawaiian Islands have been divided into a number of flight plans and will be monitored by patrol and early warning aircraft based in these areas. The Southern Marshall, Marianas and Hawaiian Islands will only be monitored when the predicted trajectories indicate cloud passage over these areas. These areas will not receive any significant fallout. They will be monitored, however, for documentary purposes. Aerial monitoring techniques have been employed very successfully during past tests and we accept this as a fully proven type of radiological monitoring. WB-50's will fly a continuous aerial radiation reconnaissance during the first 24 hours after each shot along the line from ENIWETOK to WAKE Island. This reconnaissance will provide an early warning should the cloud drift toward the populated areas toward the South of this line. P2V aircraft will fly continuous radiological reconnaissance on shot day (1) along an East-West line approximately 50 miles South of KWAJALEIN and ENIWETOK, and (2) along a

[redacted] Island

North-South line 50 miles East of [redacted] for all [redacted] shots. This service will provide early warning for the Task Force and nearby populated areas. The area of reconnaissance is indicated on the air monitoring charts.

The radioactive cloud will not present any significant health hazard to air traffic outside the established danger area. However, CAA and CINCPAC will be advised of the forecast track of the cloud outside of the danger area.

The Task Force RADSAFE OFFICE will maintain a current radiological situation map at all times. Reports from the various fallout reporting and monitoring programs, and from all island stations will be plotted periodically by the plotting center.

VI [redacted] RADSAFE

The protection of personnel of the Task Force will not present any difficulty as the Task Force has faced this problem a number of times and has a great depth of experience in this area. Each task group must be self-sufficient in radiological safety. Generally speaking, the functions performed by Task Force radsafe units are routine in nature, and are typical of [redacted] radsafe functions. These units have been supported with personnel and equipment for [redacted]

VII [redacted] PLANS

In the event of a disaster, either natural or induced by [redacted] operations, the Task Force has the organization and equipment for rescue and care of Task Force and native populations. Within the task force fleet the capability of evacuation has been provided for any or all populated areas that may be affected by fallout. The Task Force emergency medical plan provides

[redacted]

for the immediate evacuation and care of radiation casualties. All known radiation medicine specialists in the Department of Defense have standby orders to proceed by air to the DOMINIC area in event of a radiation emergency. Special laboratory equipment for the treatment of radiation sickness has been marked at the various medical centers in the United States and readily can be rigged to be put aboard special flights to the Pacific area.

VIII. CONCLUSIONS

We are confident that the fallout forecasting techniques which I have outlined earlier will insure that all the significant fallout will occur within the danger area. We also believe that we will learn promptly of any significant fallout which might possibly occur outside the danger area.

Firally, we believe that we are making adequate arrangements for the protection of Task Force and native populations.

WEATHER BRIEFING FOR [redacted]

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Introduction

Weather has a profound influence upon test operations at the Pacific Proving Ground. The observing and forecasting of weather in relation to the testing of high yield weapons is interwined with the weapons development program in such a way that the two cannot be separated. On most occasions, we have been normally that weather, and its influence upon radioactive fallout in the primary factor in determining the proper time to detonate our various weapons and devices.

Of major importance to the task force commander is the forecasting of the wind field from which a fallout prediction is made. Probably the major safety consideration of the task force commander for his personnel, as well as for inhabitants of surrounding areas, is you well know, radiological fallout can be a serious health hazard. Consequently this fallout must be deposited in areas where it will be harmless. To determine these areas, one must forecast the wind field from the surface to altitudes in excess of 100,000 feet, since the bomb cloud is acted upon by all winds which affect any portion of the bomb cloud. Realizing that the forecast of the area of radioactive fallout can be no better than the forecast of the wind field, major emphasis has been placed upon providing a proper weather organization for Operation REDWING. Previous experience at the Pacific Proving Ground has taught us that the weather data normally available throughout the Pacific Ocean area is both major

and wholly inadequate for accurate weather forecasts of the type required by the task force; consequently, available weather data is not adequate for making reliable fallout forecasts, which are naturally a major concern of the task force commander.

Let us now refer to the various weather factors which affect a test organization such as is assembled here at Eniwetok. While the prediction of the wind field is the most important one, other weather factors cannot be neglected. The extensive air operations which are a necessary part of the test program require timely and accurate forecasts of clouds, temperature, relative humidity, visibility, condensation trails and jet streams, not to exclude those specialized forecasts of certain items for classified operations. Such a routinely sounding matter as a timely and accurate forecast on the "state of the sea" may assume overriding proportions if small craft cannot operate within the confines of the Pacific Proving Ground.

II ORGANIZATION

To effectively provide the weather service necessary for this test operation, the task force has organized a weather central which, as its name implies, is the central agency for collecting and correlating all weather information, therefrom producing accurate and timely weather forecasts as required by all units of the task force (Chart #1, showing weather organization for REDWING). The weather central serves the task force commander and his staff through his designated Staff Weather Officer. Personnel assigned to assist me in fulfilling the duties of the staff weather officer include two assistants, plus several enlisted men. We

take the information given us by the weather central and therefrom brief the commander, and other individuals and units who have placed upon us their special requirements for weather information. The weather central, in turn, is staffed by what we consider to be the finest and best trained group of weather specialists in there is within the uniformed services and the civilian meteorological organizations, a group which is outstanding in its qualifications and capabilities.

Our task force is truly "joint", having members from the Air Force and Naval weather services, as well as from the various civilian meteorological organizations. These men have been trained as a unit to specifically perform the task of properly forecasting tropical weather; the task which the Commander, Joint Task Force SEVEN has placed on them. The 14 forecasters and 25 observers comprising the weather central have been trained by Professor C. E. Palmer of the Institute of Geophysics, UCLA; a world renowned and recognized authority on tropical weather, who is considered by all who know him to be an outstanding scholar and forecaster in the field of forecasting tropical weather.

Professor Palmer conducted a course of instruction for these forecasters and observers which was predicated upon requirements of the task force. With this special training, these men are far and above the average weather forecaster in their ability to forecast weather, clouds, and winds in the Pacific Proving Ground area.

III WEATHER RECONNAISSANCE

To support the weather central, there is a weather reconnaissance unit composed of 10 WB-50 Weather Reconnaissance aircraft. This reconnaissance unit flies a minimum of two sorties daily of 14 hours duration

and 2500 miles in length, covering all of the area within a radius of 1200 miles of Eniwetok, and taking observations from the surface to above 30,000 feet. These aircraft continuously gather information on winds, clouds, temperature, relative humidity, and any weather phenomena which may be present, such as rain, thunderstorms, and the like. The unit is particularly effective in gathering needed weather information in that it can send aircraft into any area where one suspects unusual weather conditions; these aircraft can then track and report on this weather. In an allied mission, this unit reconnoiters storms and typhoons which originate in the environs of the Pacific Proving Ground so that the task force and the surrounding areas can be properly warned of impending high winds and attendant dangers inherent in tropical Pacific storms and typhoons.

The importance of this weather reconnaissance unit's support to the weather central, and in turn to the task force, cannot be over-emphasized, inasmuch as there are extremely large sectors of the Pacific Ocean area which are not observable, weather-wise, by any other means, which point large to the other supporting weather units.

IV. WEATHER STATIONS

If one will glance at a chart of the South Pacific area, and note the weather stations normally located in that area (Chart #2, a map of the Pacific with an outline of the U.S. superimposed), one will notice that in an area of the Pacific Ocean the size of the United States, there are only seven stations, while within the United States there are 63 such reporting stations. It is obvious that the task force had to take

attempts to improve the weather reporting network. To do this, we have organized a series of weather stations surrounding the immediate areas of Eniwetok and Kwajalein. To the east is a surface and upper air reporting station at [redacted]. To the southeast is a similar station at TARAWA. To the south lies at KUSAIE and to the southwest a station at [redacted]. These stations are in addition to the U. S. Weather Bureau stations located at HONOLULU, PEARL HARBOR, MIDWAY and WAKE; the normal Air Force weather station at CANTON; and the normal weather station at the Naval Air Station, KWAJALEIN. Such are our stations surrounding the PPG. In addition, the routine reports of all other weather stations throughout the Pacific Ocean area are collected through an elaborate and comprehensive communications network, by the task force weather central. Still more information is needed and is available; to assist in this regard, all naval ships of the task force collect and report to the weather central; all patrol and search aircraft send routine surface weather observations of the wind, weather, clouds and state of the sea as a normal adjunct of their daily duties. Weather information is received directly in the weather central from as far away as Darwin, Australia, and the Fiji Islands; from the Hawaiian Islands; the Aleutian Islands; Japan; Korea; the Ryukyu Islands; Formosa; the Philippines; Hong Kong; the Dutch East Indies; Singapore and New Guinea. The weather of the Pacific Proving Ground is by no means a self-contained thing, but is influenced by weather conditions many thousands of miles away. All of this information is analyzed by the team of forecasters, who in turn issue forecasts of the winds, both at the surface and aloft, along with other items normally included in weather forecasts, such as weather per se, the cloud cover and visibility. All of these forecasters have actually but one objective in mind, and

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that is for the safe conduct of these tests, that is to say the detection of the weapons and devices without harm to personnel of the task force or to any other persons within the areas surrounding the test area.

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V DESTROYERS

Two destroyers, the USS JAMES E KYES and the USS HILROY are attached to the task force for Operation REDWING. Their primary mission will be to intercept any shipping which may be discovered by the RETURN patrol planes. With their high speed they can reach any portion of the area and escort out of danger any strays which may have inadvertently entered the exclusion area. Their speed will also be utilized in any evacuation of the outlying atolls that may be required.

Secondary to their RadSafe duties, the destroyers occupy an important place in the weather observing network. Their fire-control radar is ideal for tracking balloon-borne reflectors and thus following the winds aloft. These ship soundings should average 80- to 100,000 feet.

In addition to the balloons, the destroyers are equipped with recently developed wind-sounding rockets. These rockets, manufactured by the Loring-Cooper Corporation, are launched from single aluminum launching tubes mounted on the after 5-inch gun mount.

These rockets explode at pre-set altitudes, ejecting a cloud of metal foil known as "chaff". As this "chaff" drifts down it is tracked in the same way that a balloon-borne reflector is tracked on the way up. This rocket wind-finding system should give wind soundings as high as 150,000 feet. These rockets are known as "Finlay Aerological Sounding Projectiles" or "FASP". (Chart #4, a schematic sketch of the use of the FASP)

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The advantage of using destroyers as weather stations is one of mobility. They are not tied down to an island but may be used to sample the atmosphere in the block spaces to the northeast and northwest of the Pacific Proving Ground. They will normally be dispatched to an operating area several days prior to each shot. The charts of the area will depend upon the weather situation prevailing at the time. The data they obtain will be forwarded to the task force weather central for use in their analyses.

VI VERTICAL MOTIONS

When we speak of wind, the wind we mean is normally the horizontal motion, or the wind parallel to surface of the earth. In the great majority of weather problems, this is the only wind we need consider. There is, however, a vertical motion, or component, of the wind towards or away from the earth's surface which is normally neglected in routine operations since its magnitude is usually only 1/10 to 1/100 of the horizontal wind.

The task force organized a Meteorological Research Group at [redacted] Air Force Base, Hawaii, to study these vertical motions in the Pacific Proving Ground. (Chart 6, illustrating vertical motions through use of a cross-section) This group was headed by one of the Assistant Staff Weather Officers, Commander D. F., [redacted], U. S. Navy.

Briefly, and avoiding technical details, it was determined that there are significant vertical motions in the atmosphere over the Pacific Proving Ground. These motions may reach a velocity of two to three miles an hour either up or down. Due to us who may be accustomed to thinking

of winds of 150 miles per hour in typhoons, these velocities seem to be absolutely insignificant. But remember that these vertical speeds are of the same order of magnitude as the fall velocities of the particles carrying the radioactivity. Then the effect of the vertical motions would be to damp the radioactivity much closer to the point of detonation in the case of descending air and allow it to be carried farther away in the case of ascending air. In other words, atmospheric vertical motions may substantially increase or decrease the rate of fall of the radioactive particles.

These vertical motions cannot be observed directly or instrumentally as are the horizontal winds. Rather, they must be calculated from the observed horizontal winds at various altitudes. This has never before been done except on a research basis.

Cdr Rex has devised a system whereby these vertical motions will be computed daily on an operational basis. These results, which will be computed by the weather central, will then be used by the Fallout Prediction Unit (FPU) in its forecasts of the fallout areas.

VII SOLAR HYPOTHESIS

Another task of the previously mentioned Meteorological Research Unit has been to study methods of long range weather prediction in the Pacific Proving Ground. Under the direction of Professor C. E. Palmer, another Assistant Staff Weather Officer, Cdr C. A. Palmer, USN, has been investigating the effect of solar outbreaks, or flares, on the upper level wind structure in the tropics.

The results have been very encouraging. Briefly, it appears that wind systems which are desirable for shooting have a statistically significant tendency to occur from 3 to 7 days after a solar explosion.

We have made arrangements to obtain data on the sun from various parts of the earth on a daily basis. From this we hope to have sufficient advance notice to take advantage of all periods of good shooting weather.

VIII SPECIAL BALLOONS

With the advent of the high yield devices and weapons, and the attendant increase in the height of rise of the bomb cloud, it has become necessary to have better and more accurate information on winds aloft in the levels above 100,000 feet. (Chart #) A vertical cross-section of the atmosphere showing winds aloft. Normal sounding devices do not penetrate these extreme altitudes. To alleviate this problem, the task force in conjunction with the military services and civilian manufacturers, developed several new types of weather balloons which are capable of rising to much greater heights than have been attained before in operational use, in fact, capable of rising to heights even beyond the expectations of those who designed and developed these balloons.

A seeming paradox is found in the tropics. The rising balloon encounters cold temperatures far lower than those found at any place else on the earth, averaging from -75°C to -90°C. At these temperatures, the extreme cold causes later balloons to become brittle and to disintegrate. A balloon has been developed, and is now in use, which survives this extreme cold and thus allows the balloon to continue its ascent into the lower stratosphere.

These balloons carry aloft a small transmitter, a radiosonde, which is followed by a radio direction finding system; the equipment is known as AN/GMD-1A. As the balloon carries its transmitter aloft, it is tracked by the RDF techniques and the wind direction and speed is automatically computed. The transmitter also sends back to a ground receiver a continuous record of the pressure, temperature, and relative humidity encountered as the instrument rises. Thus, an aerological sounding is made of the atmosphere in the vertical. This equipment is not new, nor unique, but is possibly used more extensively here in this area of the Pacific than anywhere else.

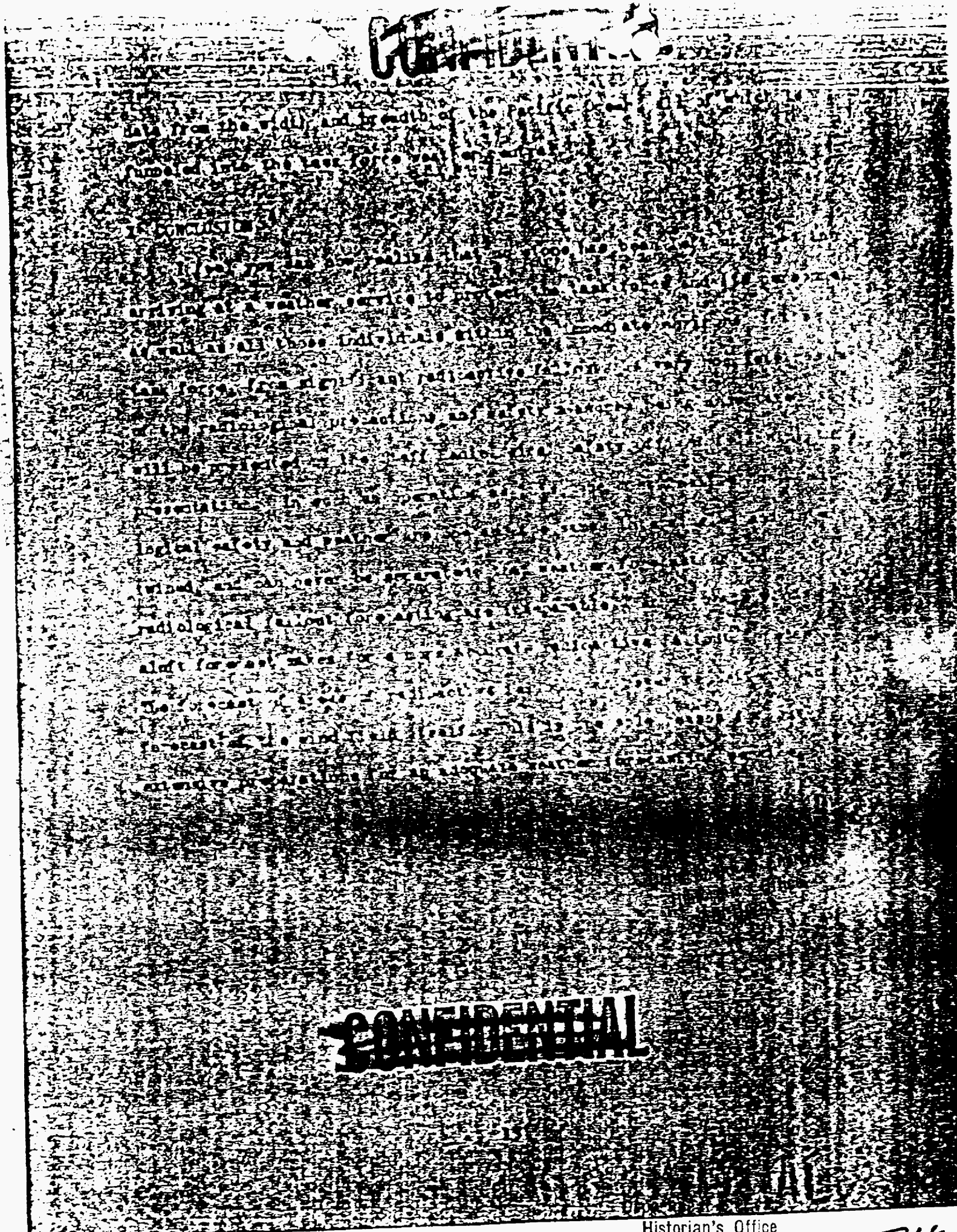
II. SPECIAL FACSIMILE NETWORK

To better utilize all weather information available throughout the Pacific and to transmit completed analyses and forecasts prepared by the task force weather central, special facsimile networks have been established. All of you gentlemen are well aware of the part that facsimile plays in your work. In the same helpful manner, the task force makes use of this very valuable media. The weather central regularly copies charts of the surface and upper air analyses which are broadcast by the major forecasting centers in Tokyo and Hawaii. These analyses are used to supplement and confirm the analyses made by our weather central. In turn, analyses and forecasts prepared by the task force weather central are transmitted to using agencies of the task force by facsimile. This is a rather new and unique method of providing weather information to subordinate units. These forecasts are then used routinely in the planning of test operations by these subordinate units. (Chart #5, showing the facsimile net)

Undoubtedly it is of interest to all of you to know just how a competent weather central proceeds in performing its duties and arriving at a weather forecast which can be of use to the commander and his staff in making the proper decision when to detonate a weapon or device without causing a safety hazard by allowing radioactive debris to fall on populated areas. These forecasts begin with the collection of weather information, amounting normally to a count of 75,000 groups per day. This is the same as saying that 75,000 words daily are funnelled into the analyzing unit, the weather central. All of this information is then completely inspected, placed into its proper perspective, and then analyzed. From this analysis a prognosis or forecast is made of future weather events, particularly the wind field aloft. By continually analyzing what has happened in the past, and what is happening at the present, trends may be established and forecasts made. This procedure is not different from that employed in any normal forecasting activity but never has so much emphasis been placed on forecasting tropical weather. Tropical weather is little understood and has been poorly documented in the past, in spite of numerous campaigns over extensive areas of the Pacific during World War II. Climatological records have not been maintained adequately to allow a tropical forecaster to understand what has taken place in his area of interest. Our increased number of stations during periods of weapons test activity allow us to gain this much needed knowledge. From such historical information, an experienced forecaster is then able to make daily analyses and therefrom make an accurate forecast of the various weather elements. Now, this term "accurate" needs to be defined. At best, weather, and the forecasting thereof, can never under any circumstances be called an exact science, such as physics, or chemistry, or mathematics. Meteorology is a field

science which encompasses an area extending horizontally over the entire earth's surface, and reaching in the vertical to the extreme reaches of space. Since so little is known of so much of the great expanse of atmosphere that surrounds the earth, it is not hard to understand why at this early time in mankind's exploration of the outer spaces, so little is known about weather, its production, and its possible control. So, never at any time believe that weather is an exact science and that weather can always be exactly forecast. We in the task force feel that we have the most capable group of individuals available gathered here to forecast the required weather information needed by the task force commander, but we are human and fallible. With the voluminous amount of data and breadth of experience of our group, we feel that a most competent and exemplary job can be accomplished, that of forecasting the weather for the Pacific Proving Ground.

The desired forecast is arrived at only when mature judgment has considered what can reasonably be expected to occur within the following 24 to 48 hours. No reliable means has been developed to forecast weather beyond this short period of time except the solar hypothesis, which I have discussed previously. The forecast of the weather and upper wind fields is then used by all interested in arriving at a proper conclusion when they can safely conduct their test operations. The task force commander then makes the final decision on firing, only after duly considering all safety aspects. It is of interest to realize that in excess of 500 men are required to support the task force in its weather activities. This is the number under the direct command and control of the task force commander, and does not include those men who gather and transmit weather



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national security.

The observers invited to participate in Operation Redwing were chosen on the basis of those who could most benefit from the lessons to be learned from the test series and those who could best transmit the knowledge gained to the people of America.

The briefings, the tours of inspection, and the witnessing of the various tests will, I am sure, lead to a better understanding of the effects of nuclear weapons and the enormous task for which civil defense must organize.

In our opinion, this, too, will be a major accomplishment - and one which will contribute greatly to the ultimate assurance of a lasting peace through the uniting of our people in the task of national defense.

Technically, the test series especially to obtain from this Pacific Series further pertinent data relative to radioactive fallout to assist in the development of radiological defenses.

Prompt determination of the intensity and extent of fallout is basic to most civil defense emergency operations. For this reason, we are particularly interested in the tests of fallout

measurement techniques, including early aerial survey, measurements using aircraft with a [illegible] detection system.

Of equal interest will be tests of methods to measure fallout dose rates, both after detonation and after fallout, due to the significance of these rates in determining when rescue operations, fire fighting and other civil defense actions may be conducted.

Additionally, the studies in this series of certain characteristics of fallout material are expected to provide useful data for fallout prediction models.

FCDA is deeply concerned with the effectiveness of different methods for decontamination of surfaces of building, clothing, and other materials which have been exposed to residual radiation [illegible] during decaying will be reviewed with much interest.

In the area of blast effects, much valuable data was obtained in Nevada tests concerning structural response to short-duration overpressure loading. The larger weapon detonations in the Pacific should furnish helpful additional information on the effects of long-duration overpressure on structures. Such data

is of great value to civil defense in the establishment of standards of protective construction.

Likewise, the amount of thermal energy measured at various distances from the point of detonation of large-yield weapons will be particularly helpful to civil defense in planning for human protection and in estimating the extent of potential fire hazard in target cities.

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