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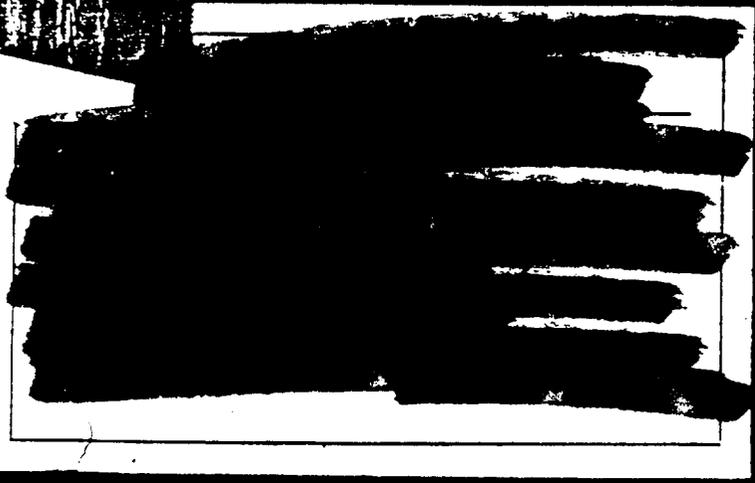
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PRELIMINARY REPORT



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OPERATION BASTLE

PRELIMINARY REPORT OF

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PROGRAM 2 - NUCLEAR RADIATION STUDIES

Program Director - LtCol E.A. Martell, USA

Project 2.1 - GAMMA RADIATION DOSIMETRY

Project Officer - Major R. Dempsey

The objective of this project was to measure gamma radiation exposure at various locations surrounding a nuclear detonation.

Gamma film and chemical dosimeters, placed in blast shields, were used to measure the gamma radiation at various land and water stations.

TABLE 2.1-1
RESULTS: LAND STATIONS

Station Number	Location	Dose Rate at Recovery Time (r/hr)	Total Dose (r)	Recovery Time (hrs)	Value X in $A = A_0 t^{-X}$
23	Airukiiji	.6	180	82	.85
27	Airukiraru	.37	130	82	.92
30	Bigiren	.30	100	82	.90
34	Enirikku	.14	56	100	.87
37	Chieerate	.12	50	100	.90
38	Arriikan	.10	50	100	.95
39	Ourukaen	.16	60	100	.85
40	Bokoetokutoku	.20	70	100	.84
41	Bokororyuru	.20	70	100	.84
42	Yurochi	10.	6000	78	1.10
43	Uorikku	9.	6250	78	1.12
44	Aomoen	3.8	3000	78	1.15
45	Romurikku	12.	6500	78	1.08
46	Aomoen	8.	5000	78	1.10

For all land stations, except those in the Yurochi-Aomoen Complex, the average decay law exponent is 0.88.

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For the Yurochi-Aomoen Complex the average exponent was 1.1. The variation in the Yurochi-Aomoen exponent may be due to the fractionation of the contamination. The results of the water stations rule out the possibility of cloud or initial radiation contribution.

TABLE 2.1-2
RESULTS: WATER STATIONS

Station Number	Location	Dose Rate at Recovery Time (r/hr)	Total Dose (r)	Recovery Time (hrs)
25	Airukiraru	.028	30	82
29	Bigiren	.020	30	82
31	Reere-Bigiren	.020	37	82
32	Enirikku	.040	17	100
13	Yurochi	10.	1300	78
14	Yurochi-Uorikku	5.	1400	78
17	Romurikku	6.	1500	78
19	Romurikku	6.	2400	78
20	Romurikku-Aomoen	2.	2400	78
8	Nanu Reef	.10	515	78
9	Nanu Reef	.10	412	78
10	Nanu Reef	.10	420	78
11	Nanu Reef	.10	562	78

The reef stations show that the initial gamma exposure was insignificant beyond 16,000 ft.

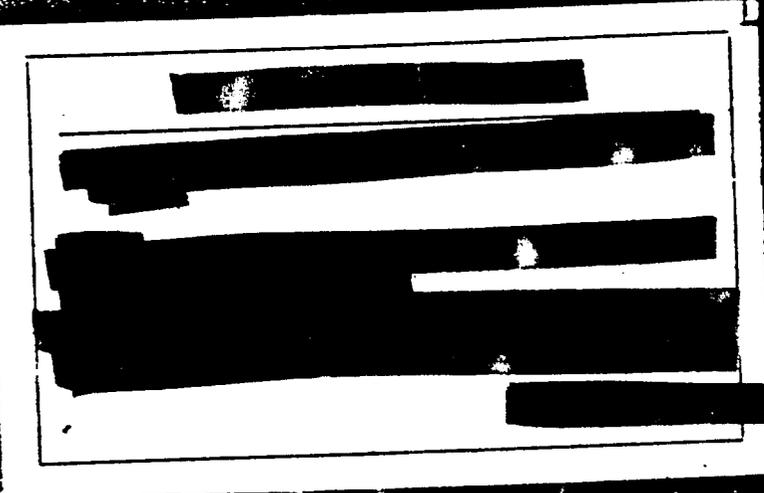
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OPERATION CASTLE

PRELIMINARY REPORT OF



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[REDACTED]

ASK UNIT 7 - J. D. SERVIS, MAJ, USA

(J. D. Servis, Maj, USA)

RADIOLOGICAL SAFETY

A damage and radiation survey was conducted at H+4 hours on [REDACTED] day. This survey covered the islands of the atoll and was conclusive enough to limit reentry to Enyu and Airukijji on the first day. This survey indicated that recontamination was extensive throughout the atoll and lagoon both to the east and west. No significant secondary fall-out was encountered at Bikini as a result of this detonation.

Lagoon water was heavily contaminated with radioactive sediment. Readings of 1 r/hr were obtained at 100 feet altitude in the vicinity of zero point on [REDACTED] +1 day. Floating objects revealed readings of 1 to 3 r/hr on shot day. Small boats and barges in Bikini - Enyu anchorage were contaminated to a moderate degree (1 - 6 r/hr). Lagoon flushing through the southwest passage materially increased radiation levels in Enirikku - Bokororyuru areas. Results are shown in Table 7-1.

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[REDACTED]

TABLE 7-1
[REDACTED] SUMMARY

Island	Extrapolated H + 4 hrs	[REDACTED] + 1 day	[REDACTED] + 5 days**	Background
Enyu	18.	2.0	.44	.02
Bikini	225.	25.	2.0	.32
Aomoen	50.	6.	.80	1.0
Romurikku	65.	7.5	1.2	1.0
Uorikku	95.	12.	2.0	.25
Yurochi	95.	12.	4.0	1.0
Namu	10.	- -	1.0	.80
Bokobyaadaa	- -	- -	.95	3.0
Ourukaen	3.5(?)	.50*	.12*	.01
Arriikan	1.3	.60*	.10*	.08
Enirikku	.18	.01	.01 - 1.0	.03
Airukiiji	.505	.01	.01	.01
Crater	- -	1.0***	- -	- -
Lagoon	- -	- -	80(West)	- -

* Radiation shine from water in southwest passage.

** Final aerial survey.

*** Reading at 100 feet.

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OPERATION CASTLE

PRELIMINARY REPORT OF [REDACTED]

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TABLE 2.1-1
GAMMA EXPOSURES - [REDACTED]

Station	Type	Location	Exposure (r)	Rate at Recovery (r/hr)	Recovery Time (hrs)	Act* Rate (r/hr)
	Land	Yurochi	215	.500	78	1.4
	Beach	Yurochi	16.9	.060	78	.120
	Beach	Yurochi-Uorikku	19	.075	78	.120
	Land	Uorikku	214	.600	78	1.40
	Bluff	Aomoen	83	.200	78	.500
	Beach	Romurikku	19.6	.100	78	.150
	Land	Romurikku	258	.600	78	2.10
	Beach	Romurikku	37.1	.120	78	.100
	Beach	Romurikku-Aomoen	37.1	.120	78	.200
	Land	Enirikku	4.1	.032	100	.014
	Land	Chieereete	4.0	.040	100	.010
	Land	Arrikan	4.6	.035	100	.010
	Land	Ourukaen	5.4	.042	100	.014
	Land	Bokoetoku	6.6	.041	100	.015
	Land	Bokororyuru	8.0	.050	100	.014

* Act rate is the rate existing at the time the detectors were used in the field (minus 209 hours.) The residual radiation is a result of the detonation of [REDACTED] at [REDACTED] minus [REDACTED] hours.

TABLE 2.1-2
GAMMA EXPOSURES - [REDACTED]

Station	Total Exposure (r)	[REDACTED] Exposure (r)*	[REDACTED] Exposure (r)**
	4.1	2.8	1.3
	4.0	2.0	2.0
	4.6	2.0	2.6
	5.4	2.8	2.6
	6.6	3.0	3.6
	8.0	2.8	5.2

Calculated from [REDACTED] minus 209 hours to [REDACTED] plus 100 hours
using $A = A_0 e^{-\lambda t}$.

** Total exposure minus [REDACTED] exposure.

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[REDACTED]

Project 2.2 - GAMMA DOSE VS TIME

Project Officer - P. Brown

(P. Brown)

Objective

To obtain gamma rates vs time for various distances from a nuclear detonation.

Instrumentation

Gamma exposure rates were obtained using scintillation detectors set one foot above ground. The detector outputs were recorded as a function of time on continuous recorders.

Instrument stations on Bokobyadaa and Namu had been destroyed by blast from [REDACTED] detonation, making it impossible to install instrumentation for close-in measurements.

Stations were installed on Airukijji, Airukiraru and Uechi Islands, Bikini Atoll, for the detonation of the [REDACTED] device.

Results

All stations operated, and showed negligible gamma exposure rates for the period of zero time to plus 36 hours.

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Project 2.3 - NEUTRON FLUX MEASUREMENTS

Project Officer - T. D. Hanscomb

Objectives

Participation in [redacted] was arranged on the basis of firm participation without duplication of Project 14.1 work. A physical installation for [redacted] was planned and effected on islands west of Aomoen. When the shot location was changed, participation was reduced to the amount indicated. The project objective is to provide data on neutron fluxes from boosted or non-nuclear devices for comparison with neutron fluxes from previously tested devices. The project is also concerned with introduction of plutonium and germanium as neutron detectors in order to test their usefulness.

Instrumentation

Detectors were installed on the 1403 line as shown in

Table 2.3-1.

TABLE 2.3-1
DETECTOR INSTALLATIONS

Station #	Range (ft)	Detectors	Remarks
1403-21	5100	Np, U, Pu, Ge	Recovered except Np
1403-22	5400	Np, U, Pu, Ge	Station Destroyed
1403-23	5700	U, Pu, Ge	Station Destroyed
1403-24	6000	U, Pu, Ge	Complete Recovery
1403-25	6300	Ge	Complete Recovery

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[REDACTED]

NIT 7 - J. D. Servis, Mai. USA

RADIOLOGICAL SAFETY

(J. D. Servis)

[REDACTED] Rad-Safe Survey Summary *

A partial Rad-Safe survey was conducted on [REDACTED] with incomplete atoll results. Results of this initial survey were conclusive enough to cancel all activities for B+1. First complete survey was conducted on B+2 days. As a result of wind conditions during B and B+1 day areas had become "spotty" in nature so the extrapolated values representing the H+4 hour readings can only be considered approximate. These extrapolated values are based on a $t^{-1.2}$ decay whereas laboratory analyses indicate a $t^{-1.8}$ decay during this period, thus indicating values in excess of those noted in Table TU-7-1.

Lagoon contamination, of consequence, was confined to lagoon areas containing suspended sediment. For the first few days this area was confined to the western quarter of the lagoon. This radioactive sediment washed over the western side, out through the southwest passage or settled to the bottom of the lagoon in a period of three days.

No alpha activity was detected in swipes about the [REDACTED] areas of the Task Group.

[REDACTED] included here because of inadvertantly omitting it from Report.

TABLE TU-7-1
SUMMARY (r/hr)

Island	Extrap. H+4 hours	B+2 days	B+7 days
Enyu	40 - 60	1 - 3	.38 - .40
Ikini	70 - 125	6 - 9	.8 - 2.1
Moan	25 - 180	1.2 - 9	.75
Murikku	400.	20.	.90
Nrochi	600.	30.	1.0
Enyu (Sta. 1200)	125.	6.	.45 - .6
Water		.1	.02
Okonejien	1500.	75.*	
Obyaadaa	280.	15.	2.0
Alta (Sta. 1341)	65.	3.0	
Okororyuru thru Irukijji	6 - 10	.1 - .22	.025 - .035
Airoko (30 mi. SE of Enyu)	.25		

All readings with radiac instrument AN/PDR-39

AN/PDR-18

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[REDACTED]

WK UNIT 7 - J. D. Servis, Maj. USA

RADIOLOGICAL SAFETY

(J. D. Servis)

[REDACTED] Rad-Safe Survey Summary

A partial Rad-Safe survey was conducted on [REDACTED] day with incomplete atoll results. Results of this survey (Table TU-7-2), indicated no extensive recontamination of the atoll except within the Bokobyadaa - Namu chain. An unforeseen fallout of radioactive material less than 5 microns in size did occur on the night of R+1. This fallout covered the atoll and raised radiation levels by approximately 100 mr/hr. Because of the late period of fallout this radiation level would have corresponded to 3.5 r/hr fallout at H+2 hours. This fallout, because of small particle size, was much more difficult to decontaminate than the macroscopic particles of [REDACTED]

Secondary fall out levelled off between 0700-0800, H+2. Residual top-side levels on ships were: Ainsworth - 12 mr/hr, Estes - 12 mr/hr, and Bairoko - 30 mr/hr. Maximum levels were 20 mr/hr to 45 mr/hr.

Lagoon contamination covered the western quarter of the lagoon with levels comparable to that of [REDACTED]. Lagoon flushing through the southwest passage materially increased background radiation levels in the vicinity of Ourukaen, Okoastokutoku, and Bokororyuru.

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[REDACTED]

TABLE TU-7-2
SUMMARY (r/hr)

Island	Extrap. H+4 hours	R+1 day	R+2 days	back ground at
Bnyu	.03	.03	.06	.03
<u>Bikini</u>	.20	.12	.14	.12
<u>lomoen</u>	.80	.80	.60	.22
<u>lomurikku</u>	1.6	1.7	.75	1.1
<u>lorikku</u>	.8 - 1.4	1.4	.85	1.2
<u>lurochi</u>	.8 - 1.0	1.3	1.0	1.3
<u>lamu</u>	2000.		100.	.6
<u>lokobyadaa</u>	1000.	50.0#	55.	1.2
<u>lrukaen</u>	.04	.10 *	.16 *	.04
<u>riikan</u>	.02	.40 *	.32 *	.02
<u>niirikku</u>	.005	.005	.05	.01
<u>lrukijji</u>	.02	.01	.08	.01
hinman	.012	.012	.06	
rater			.03	
hips			.02 - .04	

* Two hundred ft altitude.

* Radiation shine from water in southwest passage.

Underlined islands indicate islands contaminated by shot.

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OPERATIONAL PLAN
FOR THE YEAR 1961

[REDACTED]

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OPERATION CASTLE

A VERY PRELIMINARY REPORT

ON THE
RESULTS OF THE [REDACTED]

Submitted by
Task Group 7.1

[REDACTED]

W. E. Ogle
W. E. Ogle,
CTG 7.1

W. D. Higgins for
A. J. Hudgins,
CTU-12

H. K. Gilbert
H. K. Gilbert,
CTU-13

[REDACTED]

JF-8305

27 April 1954
(Date)

[REDACTED]

TASK UNIT 7 - J. D. Servis, Maj, USA

RADIOLOGICAL SAFETY

(J. D. Servis)

A partial Rad-Safe survey was conducted on [REDACTED] day with incomplete atoll results. Results of this survey did indicate that Bokobyadaa, Namu, Enirikku, Bikini, and the Yurochi - Aomoen chain were materially contaminated. Reentry and recovery were accomplished to a large degree on shot day. No secondary fall-out was detected as having resulted from this shot.

Lagoon contamination was restricted to a V shape pattern with apex at Eninman and tips covering the Bokobyadaa - Aomoen area. A reading of 100 mr/hr was obtained over the Eninman anchorage at H+4 hours. Enyu anchorage was clear of contamination while Bikini anchorage showed traces of contamination at H+4 hours.

[REDACTED] crater was materially different from that of [REDACTED] in that radiation levels within crater were dependent on "shine" from the lip of crater, and surrounding "sand dunes."

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TABLE TU-7-1

SUMMARY (r/hr)

Island	H+4 hrs Extrapolated	D+1 day	D+7 days	Pre-shot Background
Enyu	.03	.03	.03	.03
<u>Bikini</u>	5.0	.67	.07	.10
<u>Aomoen</u>	20.0	2.5	1.6	.35
<u>Romurikku</u>	10.0	1.6	.80	.50
<u>Jorikku</u>	5.0	1.0	.60	.47
<u>Yurochi</u>	5.2	1.0	.60	.45
<u>Iemu</u>	250.	30.0	16.0	1.5
<u>Waadaa</u>	600.		16.0	9.0
<u>Ukaen</u>	.60	.08	.02	.012
<u>Urrikan</u>	.50	.07	.01	.008
<u>Uririkku</u>	210.0	2.4 T	1.8	.008
<u>Urinman</u>			.02	.010
<u>Urukiiji</u>	.02	.02	.02	.018
Water	5000.	50.*	60.	

* Reading at 100 feet

* Reading at 200 feet

Underlined islands indicate islands contaminated by [redacted]

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A VERY PRELIMINARY REPORT OF THE RESULTS OF



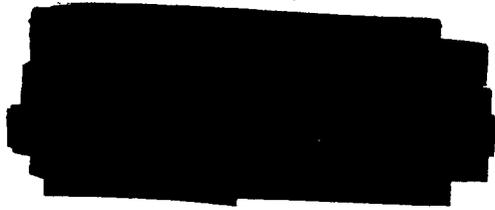
Submitted by

Task Group 7.1

W. E. Ogle
W. E. Ogle,
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R. L. Amott
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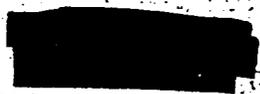
H. K. Gilbert
H. K. Gilbert,
CTO-13



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15 May 1951
(Date)

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Program 2 - NUCLEAR EFFECTS

Program Director - E. A. Martell, LtCol, USA

Project 2.1 - GAMMA RADIATION DOSIMETRY

Project Officer - R. H. Dempsey

Objective

To measure the gamma radiation exposure at various locations following a nuclear detonation.

Instrumentation

Film and chemical dosimeters were placed in $\frac{1}{8}$ -inch wall aluminum canisters mounted on 2-inch aluminum stakes. The detectors were placed at a height of 3 feet above ground for the land stations. The beach stations were set so that the detectors 1 foot above maximum high tide level. Both detecting systems were calibrated against an 11-Mev betatron.

Results

Results are as shown in Table 2.1-1.

Discussion

The results for stations 37, 38, and 39 give a meaningful decay expression exponent. The residual from the previous station is a large portion of the total exposure, with the variations in this residual due to slight assumed variations in the decay exponent being a significant part of the total exposures.

Land stations 72, 73, and 41 give an average decay exponent of .94. Station 18 had a decay exponent of .85. This is expected when it is noted that station 18 broke and fell

of ground during passage of the shock wave. This resulted in a smaller contribution from the previous residual than that calculated using a straight $A_0 T^{-1.3}$ expression. Decreasing the contribution would increase the X value at this station.

The beach stations, 19 and 20, had a higher decay exponent, averaging 1.23. This is natural since tidal washing removal of contamination is added to the normal decay in the decay factor obtained.

Station 16 is a bluff station which sees the beach on the side. Thus, it lies somewhat between the land and beach stations in decay exponent. Attention is called to the report in which station 16 was analysed with the land stations and produced the highest decay exponents of any of the stations.

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Station	Type	Location	Total Exp (r)	Rec rate (r/hr)	Act rate (r/hr)	exp (r)	exp (r)	X*****
210.72	Land	Bikini	405	.800	.120	19	386	.91
210.73	Land	Rochikarai	60	.100	.080	12	48	.97
210.15	Land	Uorikau	Chem	2.600	.600	93		
210.16	Bluff	Aomoen	1300	1.400	.440	68	1232	1.12
210.18	Land	Romurikku	1300	3.000	1.00	150	1150	.85
210.19	Beach	Romurikku	1000	.600	.160	25	975	1.29
210.20	Beach	Aomoen	730	.700	.220	33	697	1.16
210.21	Land	Aomoen	Chem	2.700	.900	140		
210.37	Land	Chieereete	3.8	.004	.022	3.3	.50	
210.38	Land	Arrlikan	3.3	.018	.010	1.5	1.8	
210.39	Land	Ourukaen	4.8	.016	.016	2.5	2.3	
210.41	Land	Bokororyuru	11.	.020	.010	1.5	9.5	.93

- * Rate at recovery time, [redacted] plus 104 hours
 - ** Rate at activation time, [redacted] minus 328 hours [redacted] plus 128 hours)
 - *** Total exposure calculated to be due to [redacted] contamination assuming a [redacted] decay expression of $A = A_0 T^{-1.5}$.
 - **** Total exposure minus [redacted] exposure equals [redacted] exposure.
 - ***** Decay exponent for portion of contamination attributed to [redacted]
- NOTE: Stations 15 and 21 had all film destroyed. Total exposures will be determined from final analysis of chemical detectors.
- Station 18 recovered but lying on ground.

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ASK UNIT 7 - J. D. Servis, Maj, USA

RADIOLOGICAL SAFETY

(J. D. Servis)

A damage and radiation survey was conducted on [REDACTED] day. This survey covered the eastern and northern islands of the atoll and was conclusive enough to limit reentry to Enyu, Bikini and Airukijji on the first day. The survey on D+1 day indicated that recontamination was limited to the Yurochi - Aomoen chain and the Bikini - Enyu sequence of islands. No material secondary fall-out was encountered at Bikini Atoll as a result of this detonation.

Lagoon water was materially contaminated with radioactive sediment. Readings of 4.2 r/hr were obtained at an altitude of 10 feet over zero point. This contamination moved to the west and southwest so that small boat operations could be conducted in the area. Lagoon flushing through the southwest passage materially increased radiation levels in the vicinity of Ourukaen, Bokoetokutoku and Bokororyuru.

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TABLE TU-7-1

SUMMARY (r/hr)

Island	H+4 hrs Extrapolated	D+1 day	D+4 days	Pre-shot Background
<u>Enyu</u>	.75	.10	.03	.01
<u>Bikini</u>	70.	8.5	.80	.03
<u>Amoan</u>	140.	15.0	2.0	.40
<u>Romurikku</u>	140.	15.0	2.4	.40
<u>Norikku</u>	85.	10.0	1.0	.36
<u>Jamu</u>			1.0	2.5
<u>Nurochi</u>	85.	10.0	1.0	.40
<u>Bokobyaadaa</u>		1.2	2.2	4.0
<u>Nurukaen</u>		.01	.50 T	.01
<u>Ikan</u>		.01	.60 T	.01
<u>Niirikku</u>		.06	.10 T	.90
<u>Ninman Crater</u>		6.5	4.0	100.
<u>Nrukijji</u>		.01	.01	.01
<u>Water</u>	42.0*			

*Reading at 500 feet

T:Shine from contaminated water.

Underlined islands indicate islands contaminated by pre-shot.

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PRELIMINARY REPORT

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[REDACTED]

Program 2 - NUCLEAR EFFECTS

Program Director - E. A. Martell, LtCol, USA

Project 2.1 - GAMMA RADIATION DOSIMETRY

Project Officer - R. H. Dempsey

Objective

To measure the gamma radiation exposure at various locations following a nuclear detonation.

Instrumentation

Film and chemical dosimeters were placed in $\frac{1}{4}$ " aluminum cannisters mounted on 2" aluminum stakes. The detectors were placed at a height of 3 feet above ground. Both detecting systems were calibrated against an 11 Mev betatron.

Results

Shown in Table 2.1-1.

Discussion

Analysis of the data was made assuming a fall-out time of $\frac{1}{4}$ hr. Stations 76, 77, 78, and 79, show evidence of having been exposed to considerable initial radiation in addition to the residual radiation that must have been present. Unfortunately, the films from stations 76, 77, and 78 were partially destroyed, the data from 78 being based on the single piece of film found. It is hoped to be able to plot an RD^2 vs D curve for the initial radiation when the chemical detectors are analyzed. The decay exponent was calculated for the remaining stations and was an average value of 1.13.

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TABLE 2.1-1
RESULTS - GAMMA EXPOSURES

Station	Type	Location	Total Exp. (r)	Rec. Rate* (r/hr)	X**
210.74	land	Bogallua	126	0.210	1.07
210.75	land	Bogombogo	123	0.150	1.18
210.76 ¹	land	Ruchi	chem.	0.210	
210.77 ¹	land	Cochiti	chem.	0.250	
210.78 ²	land	Sanildefonso	1450	4.20	
210.79	land	Bogon	640	0.055	
210.80	land	Engebi	20.5	0.030	1.12
210.81	land	Engebi	20.5	0.030	1.12
210.82	land	Engebi	19.5	0.022	1.20
210.83	land	Muzin	15	0.021	1.14
210.84	land	Kirinian	13	0.015	1.19
210.85	land	Yeiri	5.9	0.008	1.15
210.86	land	Yeiri	6.0	0.012	1.00

* Rate at recovery time, [redacted] plus 80 hours.

** Decay exponent in the expression $A = A_0 T^{-X}$

Stations 76 and 77 had film destroyed. Total exposures will be determined from final analysis of chemical detectors.

Station 78 film recovered lying on ground.

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TASK UNIT 7 - J. D. Servis, Maj, USA

RADIOLOGICAL SAFETY

(J. D. Servis)

A damage and radiation survey was conducted at approximately H+4 hours

This survey covered the islands of the atoll and was conclusive enough to limit reentry to the southern and eastern islands of the atoll. This survey indicated that radioactive contamination extended north of a line from Bogallua to Piraa. Secondary fall-out amounting to 2 mr/hr was experienced at Parry on the evening of [REDACTED]

Lagoon water was moderately contaminated in the vicinity of the chain Bogallua - Teitsiripucchi and cleared within two days.

TABLE TU-7-1
SUMMARY (r/hr)

Island	Extrapolated H+4 hrs	D + 1 day*	D + 2 days
Eniwetok	0	0	0
Parry	0	0	0
Japtan	0	0	0
Chinini	0	0	0
Aniyaani	0	0	0
Chinleero	0	0	0
Enit	0	0	0
Piraa	0.05	0.006	0.006
Araambiru	0.08	0.01	0.01
Lojoe	0.10	0.01	0.01
Kijiri	0.12	0.01	0.01

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TABLE TI-7-1 (Continued)
SUMMARY (r/hr)

Island	Extrapolated H + 4 hrs	D + 1 day*	D + 2 days
Aomon	0.17	0.02	0.02
Eberiru	0.17	0.02	0.02
Rujoru	0.10	0.012	0.02
Aitsu	0.14	0.016	0.02
Yairi	0.17	0.02	0.02
Bokonaarappu	0.17	0.02	0.02
Kirinian	0.35	0.04	0.04
Musin	0.42	0.05	0.06
Engebi	0.70	0.08	0.08
Bogon	0.98	0.12	0.14
Bogairikk	?	0.22	0.60
Teiteiripuechi	60.0	6.8	7.0
Cochiti	70.0	8.0	12.
San Ildefonso	75.0	8.4	1.0
Ruchi	8.0	0.80	0.36
Bogombogo	3.9	0.44	0.36
Bogallua	2.2	0.26	0.28
Rigili	0	0	--
Girinien	0	0	--
Ribafoni	0	0	--
Pokon	0	0	--
Mui	0	0	--
Igurin	0	0	--

* Period preceded by heavy rainfall.

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