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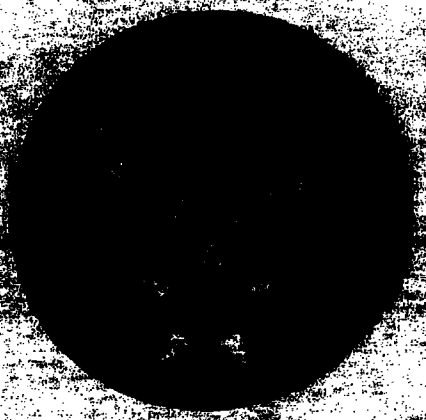
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SECURITY INFORMATION

Report of
OPERATION
FITZWILLIAM



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Hall
6 Oct 1952

Report
of
Operation FITZWILLIAM

Vol. I Introduction Copy No. 35

DESIGN OF OPERATION
AND
SUMMARY OF RESULTS

UNITED STATES AIR FORCE

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~~SECURITY INFORMATION~~

Report of Operation FITZWILLIAM

Introduction to Volume I

DESIGN OF OPERATION AND SUMMARY OF RESULTS

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I. INTRODUCTION

A. Object.

The object of Operation FITZWILLIAM was to obtain from the atomic weapons tests at Eniwetok in the Spring of 1948 the maximum amount of scientific data and the maximum testing of all available equipment and methods bearing on the detection of an atomic explosion at long ranges.

B. Authority.

By memorandum dated 16 September 1947 from the Chief of Staff, U. S. Army, the Commanding General, Army Air Forces, was charged with the overall responsibility for detecting atomic explosions anywhere in the world, which included the collection, analysis and evaluation of the required scientific data [redacted] The Commanding General, Army Air Forces, was directed, in carrying out this responsibility, to utilize to the maximum existing personnel and facilities, both within and without the War Department; to establish appropriate arrangements with other interested agencies for necessary assistance; and to effect and maintain liaison with all participating organizations.

In a memorandum dated 9 December 1947 to the Secretary of the Air Force, the Secretary of National Defense emphasized that "it is essential that methods be pursued with full vigor on the detection of atomic explosions, and tried out at the time of the next test in the Pacific".

C. Background.

[redacted] addressed a letter to the Departments of the Army and Navy, the Atomic Energy Commission, and the Joint Research and Development Board, in which he stated that "there exists an urgent and high priority, [redacted] for the development and coordinated employment of equipment capable of locating and measuring foreign experiments of large scale nuclear explosions [redacted] As a result of this letter, a Committee on Long Range Detection of Atomic Explosions was formed, composed of representatives of the Army, Navy, Army Air Forces, Atomic Energy Commission, Research and Development Board, Armed Forces Special Weapons Project [redacted] to survey the entire problem, and to make recommendations for its solution.

The Committee on Long Range Detection of Atomic Explosions concluded that:

a. The instruments and methods needed .... are available, actually or potentially, and possess adequate sensitivity.

b. The problem could be solved by:

(1) Locating large explosions by a combination of sonic, sub-sonic and seismographic methods.

(2) Obtaining samples of the explosion products by an aerial sampling technique as near the scene of the explosion as practical.

(3) Determining the atomic nature of the products of the explosion by radioassays and radiochemical analyses.

c. The Army Air Forces should be assigned the overall titular responsibility for long range detection provided that, in the analysis and evaluation, the Armed Forces Special Weapons Project, Atomic Energy Commission, and other appropriate agencies were included.

[redacted] in a memorandum to the Secretary of War, the Secretary of the Navy, the Chairman of the Atomic Energy Commission, and the Chairman of the Research and Development Board, submitted the conclusions and recommendations of the Long Range Detection Committee, and recommended that:

"The conclusions of the Committee be accepted, and implemented forthwith by appropriate directive to the Army Air Forces for overall responsibility, supported by request to other interested agencies for necessary cooperation and assistance to carry out the program."

[redacted]

D. Codewords.

Atomic Weapons Test. The codeword CROSSROADS (Unclassified) referred to the atomic weapons tests conducted at Bikini Atoll in 1947. The codeword SANDSTONE (Unclassified) referred to the tests conducted at Eniwetok Atoll in the spring of 1948.

Long Range Detection of Atomic Explosions. [redacted]

FITZWILLIAM [redacted] Projects. To facilitate administration, transportation and supply for FITZWILLIAM ([redacted]t) the restricted codewords were assigned as indicated below to designate the efforts of the respective participating agencies:

Agency	Codeword	Scientific Field
Air Materiel Command	BLACKHEART	Balloon acoustic
Air Weather Service	FIRSTRATE	Nuclear
Signal Corps, U. S. Army	BIRTHROOT	Acoustic net
Signal Corps, U. S. Army	CRIMPED	Nuclear Instruments
Signal Corps, U. S. Army	CHEESECLOTH	[redacted]
Naval Ordnance Laboratory	TENSOR	Acoustic and seismic
Naval Electronics Laboratory	VECTOR	Acoustic
Naval Research Laboratory	SCALAR	Nuclear

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II. SCOPE OF REPORT

This Report consists of six volumes, as follows:

Vol. I - Design of Operation and Summary of Results.
Vol. II - Nuclear Detection by Airborne Filters.
Vol. III - Nuclear Detection by Ground Observations.
Vol. IV - Nuclear Detection by Radiochemical Analysis.
Vol. V - Nuclear Detection by Airborne and Balloonborne Counters, and Atmospheric Conductivity Apparatus.
Vol. VI - Acoustic and Seismic Detection.

Each volume consists of covering text (introduction) and accompanying Tabs.

The purpose of Volume I is to provide in a single volume an overall picture of the operation, including:

a. All operational and administrative aspects of FITZWILLIAM ([redacted]).

b. A short general summary of the scientific results and conclusions detailed in full in Volumes II and VI, inclusive.

Volumes II to VI, inclusive, are technical summaries of the work done during FITZWILLIAM (S[redacted]) in the various scientific fields. The accompanying Tabs are the detailed reports of the participating agencies. The primary purpose of Volumes II to VI is to make available to officers and scientists of each agency participating in Operation FITZWILLIAM (S[redacted]) and to other agencies of the National Military Establishment and of the Atomic Energy Commission, as pertinent, the results of the work of all agencies participating in each scientific field. The contents are arranged to permit compartmentalized handling, while at the same time providing maximum flexibility in use, consistent with security requirements.

a-7100

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III. DISTRIBUTION OF REPORT

Volume I is distributed to all interested agencies and headquarters. In general those agencies and headquarters which do not have a specific scientific interest are issued Volume I only. Those agencies participating in the nuclear aspects of the problem are issued Volume I and Volumes II to V, inclusive. Agencies having an interest only in the acoustic and/or seismic aspects of the problem are issued Volume I and Volume VI. Participating agencies involved in all three scientific methods are issued the entire report (Volumes I to VI, inclusive).

IV. DEVELOPMENT OF TEST PROGRAM

In accordance with the directive of 16 September 1947, to utilize to the maximum existing personnel and facilities, inquiry was made of all departments of the National Military Establishment, and of various other agencies of the government, as to the extent to which each agency was prepared to participate in FITZWILLIAM (Secret). Through a series of conferences held under the sponsorship of the Special Weapons Group, DCS/Materiel, Headquarters, USAF, it was determined that contributions could be made as follows:

Scientific Field		Department	Agency	Type of Contribution
Nuclear	1.	Air Force	Air Materiel Command	Furnish aircraft filter units, ground dust sampling units, ionization chambers and wrap-around Geiger counters.
	2.	Air Force	Air Weather Service	(a) Operate ground radioactivity measurement instruments; (b) Operate aircraft filter detection system.
	3.	Army	Signal Corps	Furnish ground dust sampling units and wrap-around counters.
	4.	Navy	Naval Research Lab.	(a) Furnish ground dust sampling units and radiological counters, and operate certain ground radiological stations. (b) Test balloonborne radiological counter methods.
Acoustic	5.	Air Force	Air Materiel Command	Test balloonborne acoustic detection instrument.
	6.	Army	Signal Corps	Test ground acoustic detection instruments in a six-station network covering northern hemisphere.

Scientific Field		Department	Agency	Type of Contribution
Acoustic	7.	Navy	Naval Electronics Laboratory	Test Rieber Research Laboratory acoustic detection instruments.
	8.	Navy	Naval Ordnance Lab.	Test ground seismic and acoustic detection instruments.

Work on all these projects was underway by November 1947.

In addition to the above, the following projects were developed early in 1948, in time to be tested to a limited degree in Operation FITZ-WILLIAM ([redacted]):

Scientific Field		Department	Agency	Type of Contribution
Nuclear	9.	Air Force	Air Materiel Command	To determine the increase in ion concentration in air due to the presence of fission products through air conductivity measurements.
	10.	Air Force	Air Weather Service	(a) Collect and analyze gas fission products collected in the upper atmosphere. (b) Collect and analyze fission products.
	11.	Navy	Naval Research Lab.	(a) Collect and analyze fission products [redacted] (b) Test aircraftborne radiological counters.
Seismic	12.	USC&GS		Measure seismic impulses at Eniwetok Atoll.
Miscellaneous	13.	Air Force	Air Weather Service	Measure magnetic perturbations caused by atomic blast (magnetometer).

Scientific Field		Department	Agency	Type of Contribution
Miscellaneous	14.	Navy	Naval Ordnance Lab.	Measure magnetic perturbations caused by atomic blast (magnetometer).
	15.	Air Force	Air Materiel Command	Measure perturbations in the ionosphere (ionospherograph).

The results accomplished under these various projects form the principal content of this Final Report FITZWILLIAM (S[redacted]) and its accompanying Tabs. An abstract of the summary results reported in Volumes II to VI, inclusive, is included in this volume.

The principal role of AFMSW-1 was the coordination of the efforts of all participating agencies to eliminate duplication and arrange for the optimum coverage to produce a maximum of usable scientific results. There was little opportunity to control the scientific objectives of the various projects since each participating agency developed its equipment with particular objectives in view. The effort was, therefore, primarily one of testing the capabilities and limitations of the equipment already being procured or manufactured, in order to establish to the greatest extent possible within the time limitations:

a. Which of such equipment, if any, could be employed usefully in a surveillance system to be established immediately after SANDSTONE (Unclassified).

b. What additional development would be necessary to render existing equipment suitable for such surveillance use.

c. What basic research would be necessary to develop more suitable instrumentation and methods.

In the rush of preparations for FITZWILLIAM ([redacted]) little attention could be paid to the analysis of the ultimate surveillance problem. Each of the pertinent scientific fields (i.e., nuclear, acoustic, seismographic, magnetographic, ionospheric, etc.) was regarded at that time as a distinct method of detection, complete in itself, rather than as one of many possible components of a complete surveillance system designed to provide the best possible determination of whether an atomic explosion has occurred.

The various tests and experiments which had been planned by the individual participating agencies, and the numbers and types of equipment which would be available, were determined only gradually through numerous conferences and staff visits to the agencies, laboratories, and manufacturing establishments. As each element was covered it was fitted into an overall design of the experiment, which emerged on 20 March 1948 as

"Operation Plan FITZWILLIAM" [redacted] (Tab A, Volume I). The plan was, therefore, a synthesis of the informal partial plans of participating agencies, filled out with empirical solutions of various administrative, operational, communications and logistic problems which appeared as the plan was being developed.

V. PREPARATIONS FOR THE TESTS

On 14 December 1947, Major General Albert F. Hegenberger, USAF, was assigned to the Special Weapons Group, DCS/M, Headquarters, USAF, to organize the long range detection program. Assisting him in the organization of the scientific effort were Colonel Benjamin G. Holzman, USAF, one of the principal scientific members of the original Long Range Detection Committee, and Dr. Ellis Johnson, formerly associated with the Carnegie Institute of Technology and the Naval Ordnance Laboratory. Shortly after 1 January 1948, Brigadier General Morris R. Nelson and Colonel Herbert W. Ehrgott were assigned to the Special Weapons Group to assist in the organizational, operational and general administrative aspects of the program. During this same period the technical staff was augmented by the addition of Mr. D. L. Northrup, Deputy Technical Director, Dr. William D. Urry, Chief Nuclear Research, and Mr. J. Allen Crocker, Chief Geophysics. This small group, together with a few airmen and clerical and administrative civilian employees, formed the nucleus of AFMSW-1, the subdivision of the Special Weapons Group which directed the long range detection program during SANDSTONE (Unclassified).

January and February of 1948 were spent in analyzing the mission and its background; obtaining personnel, working space and funds; establishing security standards and procedures; becoming familiar with the status of the preparation of the various participating agencies; settling upon locations of test stations; establishing close liaison with Joint Task Force Seven, the agency responsible for the conduct of the SANDSTONE (Unclassified) tests; and making detailed arrangements for the deployment of personnel and equipment.

By February 1, it became apparent that the majority of the radiological equipment would not be completed in time to permit adequate calibration and familiarization by operating personnel. The problem was intensified by the fact that equipment procured by the various participating agencies by contract or by manufacture within their own laboratories would, in many cases, have to be operated by personnel of other participating agencies to fit the overall plan. To provide a partial solution to the problem a contract was effected with Tracerlab, Inc., Boston, Massachusetts for the establishment at Fairfield-Suisun Air Force Base of a two weeks training course in operation of the various instruments. Officers and enlisted personnel of Air Weather Service detachments throughout the Pacific, Army and Air Force officer graduates of radiological defense schools at the Army Chemical Center, Edgewood, Maryland, and U. S. Navy Installation, Treasure Island, California, and officer and civilian scientific personnel furnished by the Office of Naval Research, U. S. Navy, attended the course. Although the time available was insufficient for completely satisfactory training, all equipment was placed in operation by graduates of the course in time for the first explosion on 15 April 1948. For details of this training course, see Tab C, Volume III.

Adequate testing of some of the equipment required its establishment and operation in the Marshall Islands area, at or close to Eniwetok Atoll. Since, for security reasons, complete authority over all activities in that area was vested in the Commander, Joint Task Force Seven (Lt. Gen. John G. Hull), it was necessary to request the Task Force to provide certain operational and logistic support. Joint Task Force Seven undertook to render all possible assistance which would not interfere with the accomplishment of its principal mission, which was to support the scientific tests of the atomic weapons by the Atomic Energy Commission. Specific assistance was requested of, and granted by, Joint Task Force Seven as follows:

a. Permission to establish long range detection testing stations at Eniwetok, Kwajalein, Majuro, Rongerik, and a number of smaller atolls.

b. Provision of logistic support to such stations.

c. Construction of foundations and shelters for five seismographic stations on Eniwetok Atoll.

d. Notification to outlying stations of the anticipated times of the explosions.

e. Meteorological information furnished through the Staff Weather Officer, Joint Task Force Seven by the 514th L. R. Reconnaissance Squadron, operating as Task Unit 7.4.4.

Preliminary arrangements with Headquarters, Joint Task Force Seven offered no difficulty since that headquarters was adjacent to AFMSW-1 in the Pentagon. Close liaison with Joint Task Force Seven was maintained through Colonel Nelson P. Jackson, FITZWILLIAM ([redacted]) Project Officer, Joint Task Force Seven. On 12 February 1948, Headquarters, Joint Task Force Seven moved to Schofield Barracks, T.H., in preparation for the further move to the Marshall Islands. On 24 February 1948, Colonel Ehrgott, accompanied by Major Stephen Pournaras of the Air Weather Service, proceeded to Hawaii to brief General Kepner and his staff on the status of preparation for Operation FITZWILLIAM ([redacted]). In a series of conferences the following unsettled points were resolved:

a. Details of time notification procedure.

b. Detailed arrangements for transportation of Naval Ordnance Laboratory personnel and equipment from the West Coast to Eniwetok, and for logistic support to Naval Ordnance Laboratory stations in the Joint Task Force Seven area.

c. Additional radio sets and batteries for Naval Ordnance Laboratory stations.

d. Arrangements between Staff Weather Officer, Joint Task Force Seven (Colonel Holzman), and Navy and Air Weather Service units for the supply of meteorological information needed for the proper conduct of the

FITZWILLIAM ([redacted]) tests.

The results of these conferences were incorporated in "Operation Plan FITZWILLIAM Forward" (Tab B, Volume I).

On 17 March 1948 a special headquarters designated "FITZWILLIAM Forward" was established at Eniwetok with responsibility for coordinating all long range detection efforts in the Joint Task Force Seven area. This headquarters served throughout the three tests as a general clearing house for all communications between AFMSW-1, Joint Task Force Seven, the island commands, and the field parties of the various participating agencies. Its establishment proved to be a large factor in the success of the operation.

VI. SUMMARY OF RESULTS

The prime purpose of Operation FITZWILLIAM ([redacted]) was to explore all possible means by which an atomic explosion could be detected at long range. Toward this end, in the six weeks permitted for preparation, a rapid evaluation of possible methods, techniques and instrumentation was made, and those which were considered to be at all feasible were implemented to an extent consistent with available equipment, personnel, and the time schedule. The means of detecting and locating an atomic explosion which were investigated in Operation FITZWILLIAM ([redacted]) can be classified into two groups, namely (1) those which depend upon the tremendous energy released by such an explosion, and (2) those which depend upon the radioactive atomic debris released by such an explosion.

Into the first group falls acoustic and seismic instrumentation as a means of detection and location. The acoustic experimentation indicated that the maximum range of detection for test XRAY, YOKE and ZEBRA of Operation SANDSTONE (Unclassified) ranged between 1000 and 1700 miles, with signal periods greater than 10 seconds and a signal duration of several minutes. Before an accurate estimate of the reliability of acoustic measurements as a means of detecting large scale energy releases in the atmosphere can be made, much research must be done with respect to the phenomena of sound transmission in the upper atmosphere. Following this research, it might well be possible to give an accurate evaluation of the effectiveness of long range acoustic detection and location of atomic explosions.

The seismic data indicated that existing seismographs are incapable of detecting an air burst at long range. Signals were observed on seismographs within 500 miles of the atomic explosion. These signals had a velocity which corresponds with transmission through water. Seismic data should be quite useful for the long range detection and location of an atomic bomb provided that it is exploded under water or under ground. Unfortunately, as to date, there would be no way of making certain identification of the event as an explosion rather than as a small earthquake. It is possible that a research program involving detailed study of the characteristics of seismic waves from large scale explosions and earthquakes will lead to the development of instrumentation and techniques which will permit this distinction. Further, it is conceivable that research on seismic instrumentation might well lead to apparatus that will render it possible to record air bursts through seismic means at long range.

Detection dependent upon the release of radioactive debris following atomic explosions can be sub-divided into two classes, namely (a) those methods which involve the direct measurement of the BETA and GAMMA radiation in the neighborhood of an atomic cloud, and (b) those which involve the concentration of atomic debris from large volumes of air by methods such as filtration [redacted] Procedures (b) are inherently more sensitive since they are capable of detecting about 1000 fold lower

concentrations of dispersed radioactive material. Moreover, it is only this procedure which results in samples of fission products which can be subjected to detailed radiochemical and physical studies, and it is only through these studies that unquestioned proof of an atomic explosion can result.

During Operation FITZWILLIAM (Secret) the direct measurement of the increase in the radioactive level (Procedure (a)) at any location due to the presence of an atomic cloud in the vicinity was investigated at numerous land and ship based installations strategically placed throughout the northern hemisphere. [redacted] These measurements were carried out on the ground by automatic recording instrumentation which either involved the usage of gamma ray sensitive Geiger tubes plus the requisite auxiliary electronic equipment, or high pressure ionization chambers and their associated electronic equipment. These studies indicated that ground detectors of this type are unsuitable at long range. The maximum limit of detection was approximately 600 miles. Unlike the acoustic and seismic experimentation, the limits of detection were not due to the instrumentation per se, but to the small concentration of atomic debris which reaches ground level at distances greater than 600 miles from an explosion.

Long range detection of an atomic cloud was also carried out in the air by means of aerial counters and atmospheric conductivity apparatus. In general, these studies showed that aerial monitoring at altitudes [redacted] were capable of detecting atomic clouds which resulted from the SANDSTONE (Unclassified) Operation at [redacted] from the site of the explosion. It is to be concluded that the prime importance of properly engineered apparatus of this type is to delineate an atomic cloud, since during the aerial flights aerial filtration to collect fission product activity can be carried out with the utmost ease. Balloonborne counters were released from certain strategic locations following each of the three SANDSTONE (Unclassified) explosions and the pertinent data were telemetered back to the ground monitoring station. These studies showed that a balloonborne counter [redacted] from the site of the explosion and which passed through the atomic cloud trajectory is probably capable of detecting the presence of said cloud up [redacted] feet.

All of these monitoring means of detection, both ground and airborne, irrespective of their sensitivity have the obvious limitation that they only measure the increase in the radioactive background over that due to cosmic radiation and natural activity. They do not result in the unquestioned proof of the presence of fission products. This can only be done through the collection and concentration of fission products in the vicinity of an atomic cloud trajectory through aerial filtration at high altitudes, by air filtration at a ground monitoring station, and/or [redacted]

Aerial filtration at high altitudes by means of filter boxes, which contained Chemical Warfare type V-5 filter paper, attached to B-29's was

investigated in Operation FITZWILLIAM (S[redacted]). This procedure proved to be extremely satisfactory. [redacted] paper exposures on flights at approximately [redacted] in the vicinity of each of the atomic cloud trajectories at great distances from all three of the atomic explosions of Operation SANDSTONE (Unclassified) resulted in collection of sufficient fission product activity to demonstrate the presence of the atomic cloud. The activity on the filter paper was measured by means of a lead-housed, thin-walled all glass Geiger tube in conjunction with a standard scaler. Activity determination begun four hours following flight collection usually sufficed to differentiate fission products from the possible presence of natural activity on the exposed filter paper. [redacted]

The measurement of activity on filter paper exposed at ground level was not nearly so satisfactory. Operation FITZWILLIAM (S[redacted]) [redacted]

[redacted] over a strategic location during the passage of the atomic cloud trajectory is a powerful method of obtaining reasonably large quantities of fission products. For example, during Operation FITZWILLIAM (S[redacted]) fission products were collected by this means at [redacted] However, this method has the obvious limitation that it is dependent upon two simultaneous phenomena, namely, that the trajectory will pass over the rainwater collection station and that precipitation will occur during this period.

It can be seen from the above that the most flexible means of obtaining samples which can result in the unambiguous proof of an atomic explosion is by means of aerial filtration. In addition the following and demarcation of the atomic cloud trajectories by means of aerial filter flights, together with estimates of the time of blast from either radioactivity decay or radiochemical data, coupled with the meteorological data, offer the only practical method at the present time of locating the atomic explosion. For the three Operation SANDSTONE (Unclassified) explosions this estimation of location was done with surprising accuracy.

Radiochemical analysis of aerial filters [redacted] at long range were carried out in Operation FITZWILLIAM (S[redacted]). Due to the crash nature of the program, these analyses for fission products and fissionable material were only semi-quantitative in nature. However, they proved that further research and development should be carried out to devise a more efficient means of aerial collection, to devise a more efficient means of separating the atomic bomb debris from

[redacted] to develop instrumentation which is specifically designed to assay extremely low levels of activity, to investigate a more judicious selection of fission products to be isolated, to quantitate the radiochemical procedures used, and to investigate in detail the chemical and physical properties of the particulate nature of atomic bomb debris collected on aerial filter papers. Following these researches, the aerial collection of fission products at great distances from the site of an atomic explosion together with the possibility of obtaining appreciable samples [redacted] methods might well allow.

VII. LIST OF SENIOR PERSONNEL

AFMSW-1

Maj. Gen. Albert F. Hegenberger, USAF
Brig. Gen. Morris R. Nelson, USAF
Col. Herbert W. Ehrgott, USAF
Col. Benjamin G. Holzman, USAF
Col. Nelson P. Jackson, USAF
Dr. Ellis Johnson
Mr. Doyle L. Northrup
Dr. Wm. D. Urry
Dr. Donald H. Rock
Mr. J. Allen Crocker

Geophysics Research Directorate of Watson Laboratory - Air Materiel Command

Dr. P. W. Wyckoff
Dr. James A. Peoples
Mr. Albert P. Crary

Air Reduction Research Laboratory (under contract to AMC)

Dr. Fred C. Balcor (Technical Director)
Dr. Hoke S. Miller (Group Leader)
Dr. Frank McKenna
Dr. Clayton S. Wynn

Columbia University (under contract to AMC)

Mr. Joseph M. Johnson

Tracerlab, Inc. (under contract to AMC)

Dr. F. C. Henriques, Jr.
Mr. D. W. Atchley, Jr.
Dr. L. R. Zumwalt
Dr. W. C. Peacock

New York University (under contract to AMC)

Mr. Charles B. Moore
Mr. Charles S. Schneider

Air Weather Service

Maj. S. W. Pounaras

Evans Signal Laboratory, Signal Corps, U. S. Army

Mr. George Lukes
Dr. Craig Crenshaw
Dr. S. H. Anderson
Dr. Fred B. Daniels

Office of Naval Research, U. S. Navy

Capt. B. Hutchinson
Comdr. E. W. Humphrey

Naval Ordnance Laboratory, U. S. Navy

Dr. J. V. Atanasoff

Naval Electronics Laboratory, U. S. Navy

Dr. Alfred Focke

Naval Research Laboratory, U. S. Navy

Dr. Herbert Friedman
Dr. M. H. Johnson
Mr. P. A. Caldwell

U. S. Coast and Geodetic Survey

Mr. Frank Neuman

VIII. LIST OF TABS

Tab

A — U. S. Air Force, Operations Plan FITZWILLIAM (Secret), dated 20 March 1948.

B — U. S. Air Force, Operations Order FITZWILLIAM (Secret) Forward, Headquarters FITZWILLIAM (Secret) Forward, dated 11 April 1948.

C — U. S. Air Force, Report of FITZWILLIAM (Secret) Forward, dated 17 May 1948.

D — U. S. Air Force, Project FIRSTRATE (Secret)(Narrative & Annex), AWS Participation in FITZWILLIAM (Secret), HQ, AWS.

GPO—880—1

DTRA/SCC-WMD Scientific & Technical Review Information

REMARKS CONT:
DOE has no objection to release, Air Force deletions are incorporated.

This report has been identified as pertaining to radioactive fallout from nuclear weapons testing. IAW Public Law 109-163 National Defense Authorization Act for Fiscal Year 2006 these records are to be preserved and made available to the public. Within DoD, DTRA has that responsibility.

This report has been reviewed by the Air Force and DOE. The results of their reviews are attached. The classification markings have been deleted IAW DoD procedures.

Their is no Privacy Act information contained in the report.

Atomic veterans have requested copies of this report in the past. Volumes IV and V were sanitized and cleared for public release in Jan 2014.* Volumes II and III are still awaiting Army & Navy responses. AF? ✓

– Paul Blake, PhD, GS-15
NTPR Program Manager

* Digital copies were released to NTPR, DTRIAC, DTIC, and DOE's Nuclear Test Archive on 28 Jan 2014.
– Paul Blake –

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Report
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Vol. I Tab A Copy No. 35

Operations Plan–FITZWILLIAM

UNITED STATES AIR FORCE

SECRET

Department of the Air Force
HEADQUARTERS UNITED STATES AIR FORCE
Washington, D.C.

20 March 1948

OPERATIONS PLAN - FITZWILLIAM

1. Authority.

a. By memorandum from the Chief of Staff, U. S. Army, to the Commanding General, U. S. Air Force, dated 16 September 1947, the U. S. Air Force was given the responsibility for detecting atomic explosions anywhere in the world, and was directed to utilize to the maximum existing personnel and facilities, both within and without the War Department.

b. In memorandum from the Secretary of National Defense to the Secretary of the U. S. Air Force, dated 9 December 1947, the importance of trying out all possible methods for the detection of atomic explosions at the time of the next tests in the Pacific was emphasized.

c. In accordance with the foregoing directive and expression of policy, the U. S. Air Force has organized in the Special Weapons Group, DCS/Materiel, U. S. Air Force, an office (AFMSW-1), to carry out the U.S. Air Force responsibility for long range detection of atomic explosions.

d. After reviewing all instruments and techniques which appear to be feasible for detecting physical phenomena ensuing from an atomic explosion, AFMSW-1 supervised and coordinated the design of a test program prepared in detail by various agencies concerned; supervised the development, procurement, and allocation of equipment; and coordinated the assignment of responsibility for field observations among the operating agencies.

2. General Plan.

a. The U. S. Air Force will investigate possible techniques and equipments for the detection of atomic explosions, by observing geophysical phenomena resulting from Project SANDSTONE, utilizing to the maximum existing facilities both within and without the armed services. This phase of the long range detection program is called FITZWILLIAM and is the subject of this plan. The purpose of FITZWILLIAM is to obtain the maximum of observational data consistent with the time schedule established for SANDSTONE.

b. The end objective of the U. S. Air Force program is to establish, as soon as possible, a system of surveillance which will permit detection of atomic explosions anywhere in the world.

3. Specific Instructions.

a. Each of the following agencies:

Department of the Army (Signal Corps)
Department of the Navy (Office of Naval Research)
Department of the Air Force (Air Weather Service)
Department of the Air Force (Air Materiel Command)
U. S. Coast & Geodetic Survey

will design, develop, procure, and/or manufacture special instruments; establish and operate observation stations; report observational data; and render reports; all as detailed in Annexes "A", "B", "C", "D", and "G".

b. AFMSW-1 will:

(1) Coordinate and supervise the conduct of the tests to be carried out by the participating agencies;

(2) Establish a filter center for the collection, analysis, and evaluation of all radiological, geophysical, and meteorological data;

(3) Correlate such data with military intelligence material;

(4) Submit final report through channels to Secretary of National Defense. The final report will include:

(a) a summary of the results of Operation FITZWILLIAM;

(b) recommendations for action deemed essential to the establishment at the earliest possible date of a system of continuous surveillance, which will incorporate the most feasible instruments and techniques;

(c) recommendations for additional research or development required:

(1) for further test of existing instruments or techniques;

(2) for further development of existing instruments;

(3) for the development of new or improved instruments or techniques.

c. FITZWILLIAM Forward will:

(1) Arrange with Commanding Officer, Air Weather Detachment, at Eniwetok for assistance to the two scientists conducting ionospheric observations and arrange authority for these scientists to be furnished warning of the explosions.

(2) Arrange with Commanding Officer, Air Weather Detachment, at Eniwetok to furnish two observers for operation of magnetometers. Obtain magnetometers from NOL detachment at Eniwetok and aircraft batteries from Air Weather Detachment (furnished by Air Materiel Command). Arrange for instruction of AWS observers in operation of magnetometers by NOL technician. Arrange authority for observers to be furnished warning of timing of explosions.

(3) Notify CTU 7.4.4 at twelve hour intervals of position of radio active cloud for information of Air Materiel Command scientists conducting atmospheric conductivity observations from special B-29 based at Kwajalein.

(4) Direct Commanding Officer of Air Weather Detachment at Kwajalein when to release "Rawin" 658 equipment at Kwajalein Air Weather station for use of scientists of the Air Materiel Command balloon sonic project during a five hour period at the proper time after the first explosion. Issue similar instructions to the Commanding Officers of Air Weather Detachments at Kwajalein, Guam and/or Hickam Field, as required, for subsequent explosions.

(5) Vector weather reconnaissance and cloud chasing aircraft of TU 7.4.4 at Kwajalein to the radiological cloud as required, and direct as necessary the collection of aircraft filters and gaseous samples from aircraft based at Kwajalein.

(6) Vector Destroyer-Mine-Sweepers Quick and Davison, under operational control of CTG 7.3, to positions to insure maximum probability of intercepting the radiological cloud with balloon-borne radiological counters. Inform NRL FITZWILLIAM Stations on the two DMS's and at Ronjerik, Majuro and Pearl Harbor when to launch balloons.

(7) Direct Commanding Officers of appropriate Air Weather Service reconnaissance units to move aircraft with radiological filters, from home bases to FITZWILLIAM stations in accordance with AWS Plan Doubleday, to be furnished FITZWILLIAM Advanced by Air Weather Service before April 4th, 1948.

Vector such aircraft toward the radiological cloud in accordance with the predictions of the Meteorological Officer, JTF-7. Release aircraft to home bases in accordance with the requirements as determined by the progress of Operation SANDSTONE.

(8) Inform AFMSW-1 of timing of explosions, by special prearranged code approved by CJTF-7, to insure the readiness of FITZWILLIAM stations at White Oaks, Maryland; Alamogordo, New Mexico; and San Diego, California.

x. General.

(1) Training

(a) Participating agencies will be responsible for training of personnel required for the operation and maintenance of special FITZWILLIAM equipment.

(b) Air Materiel Command is providing through contract with Tracerlab Inc., Boston, Massachusetts, specialized instruction and supervision for all personnel manning radiological stations equipped with automatic recording counters, ground air-filter units and aircraft filters. (See SOP for ROS, Annex K). Graduates of the Tracerlab Training School at Fairfield-Suisun Air Force Base, will train personnel at stations of the participating agencies.

(2) Security. General instructions concerning security requirements of FITZWILLIAM are covered in the Security Plan, Annex "E". Special security requirements for the handling of radioactive filter papers and gas-samples are covered in inclosure 7 to SOP for ROS, Annex "K".

(3) Time Notification. Information required by certain FITZWILLIAM stations to insure timely notification of the timing of explosions is contained in the Time Notification Plan, Annex "F".

4. a. Logistics. See Logistic Plan, Annex "L".

b. Roll-up

(1) Pending determination, based upon evaluation of results of the FITZWILLIAM test program, of the test techniques and equipments to be incorporated in a routine surveillance

system, [redacted] an interim network of equipments will continue in operation subsequent to the rollup of FITZWILLIAM.

(2) Instructions concerning allocation of equipment for the interim network, responsibility for operation of the interim stations, and responsibilities for the rollup of FITZWILLIAM are contained in Rollup Plan, Annex "H". Rollup will be accomplished as soon as practicable after completion of tests.

(3) Personnel and equipment not employed in the interim surveillance system will be returned progressively to destinations as soon as the particular mission of the personnel or equipment in FITZWILLIAM has been completed.

(4) Final instructions for the operation of interim stations subsequent to FITZWILLIAM will be issued prior to 1 June 1948.

c. Administration

(1) Participating agencies will be responsible for all administration of FITZWILLIAM personnel assigned to stations under their operational control.

(2) AWS is responsible for administration of all Tracerlab Inc. employees outside the continental United States.

5. a. Distribution

(1) The Distribution List (Annex M) gives the distribution breakdown of both the complete plan and the separate sections and annexes thereof. Higher headquarters receiving complete plans are authorized, within the security requirements, to make additional distribution of either the complete operations plan with annexes, or of separate annexes or parts thereof as necessary for the accomplishment of the respective missions.

(2) Additional copies of the plan or of separate annexes or inclosures for such additional distribution will not be reproduced by participating agencies, but will be requisitioned by letter to Chief, AFMSW-1. Such requisitions will be accompanied by detailed proposed distribution, and an explanation of the necessity therefore.

b. Communications. See Communications Order, Annex I.

c. Location of Headquarters

(1) Chief, AFMSW-1: Hq., U. S. Air Force
Special Weapons Group, DCS/M
Washington 25, D. C.
ATTENTION: Chief, AFMSW-1
Room 5B 318, Pentagon Bldg.

(2) FITZWILLIAM Forward: c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California

FOR THE CHIEF OF STAFF:

(s) A. F. HEGENBERGER
A. F. HEGENBERGER
Major General, USAF
Chief, AFMSW-1
Special Weapons Group, DCS/M

12 Incls
1. Annex A - Design of Experiment
2. Annex B - Equipment & Personnel Chart
3. Annex C - Station List
4. Annex D - Four (4) Maps
5. Annex E - Security Plan
6. Annex F - Time Notification Plan
7. Annex G - Reporting Plan
8. Annex H - Rollup Plan w/6 charts
9. Annex I - Communications Order
10. Annex K - Standard Operating Procedure for Radiological Observation Stations w/7 Incls.
11. Annex L - Logistics Plan
12. Annex M - Distribution List

OPERATION FITZWILLIAM

ANNEX "A"

DESIGN OF EXPERIMENT FOR FITZWILLIAM

20 March 1948

1. Introduction.

2. Description of Instrumentation.
   a. Radiological Instruments
      (1) Automatic radiological counters
      (2) Ground filter units
      (3) Wrap around Geiger counters
      (4) Airborne filters
      (5) Airborne radiological counters
      (6) [redacted]
      (7) Atmospheric conduction
      (8) Gas sampling equipment
   b. Acoustic Instruments
      (1) Micro-barophones
      (2) Arrays
      (3) Balloon-borne equipment
   c. Exploratory Instruments
      (1) Seismographs
      (2) Magnetometers
      (3) Optical detectors
      (4) Ionospherograph

3. Description of Projects
   a. Radiological
      (1) AWS ground level network
      (2) NRL ground level network
      (3) NRL ship-borne stations
      (4) [redacted]
      (5) AWS airborne filters
      (6) NRL airborne counters (balloon)
      (7) NRL airborne counters (aircraft)
      (8) AWS atmospheric conductivity
      (9) AWS gas sampling
   b. Tracerlab coordination of radiological data
   c. Acoustic
      (1) NOL acoustic network
      (2) NEL acoustic arrays
      (3) SC acoustic arrays
      (4) AMC acoustic balloons
   d. Exploratory
      (1) AWS/NOL magnetic
      (2) SC Optical
      (3) AWS ionospherograph

4. Operational
   a. U. S. Signal Corps
   b. Naval Electronics Laboratory
   c. Naval Ordnance Laboratory
   d. Naval Research Laboratory
   e. Tracerlab
   f. Air Weather Service
   g. AEC/Watson Labs

DESIGN OF EXPERIMENT FOR FITZWILLIAM

PURPOSE: The FITZWILLIAM experimental program has been designed to obtain the maximum amount of data on long range detection of atomic explosions, consistent with the time schedule established for SANDSTONE.

1. Introduction.

   a. Included among the methods of detection are:

      Radiological
      Sonic
      Seismic
      Atmospheric conductivity
      Electromagnetic
      [redacted]
      Ionospheric

   b. Exigencies of time, personnel and experimental equipment limit the present investigation of the above list, although other less obvious influences may eventually be proved useful. Further limitation in the scope of each item has been necessary with the result that radiological and sonic programs are reasonably complete, seismic programs are considerably less so, and investigations of the remaining four methods of detection are definitely not exhaustive but rather of an exploratory nature.

   c. A network of about fourteen (14) automatic radiological counters, located at various universities gives good coverage of continental U. S. This system may be augmented by about twelve (12) more counters located at continental Naval establishments if time permits. [redacted] units with wrap-around Geiger counters, high sensitivity ionization chambers [redacted] In addition to these land stations, there will be twelve (12) shipborne installations with ground air-filter units and automatic recording radiological counters.

d. From nine (9) bases well distributed throughout the Pacific, Air Weather Service aircraft will patrol various atmospheric levels with air stream filter installations. Air stream filtering by Air Weather Service aircraft will also be performed in a follow-the-cloud manner over the required latitude band eastward from Eniwetok, encircling the globe if necessary. Anticipated operating locations will be: Hawaiian Islands; West Coast, U.S.A.; East Coast, U.S.A.; Bermuda; Azores; North Africa; Guam. Movement of aircraft and all aircraft operation under this plan will be classified SECRET. Radioactivity in the air traversed will be checked, by measuring activity on the filters with wrap-around Geiger counters located at the bases. One (1) plane equipped with automatic recording Geiger counters, and a second with equipment for measuring the electrical current of the atmosphere will augment the upper atmospheric investigations. Balloons bearing radiological counters and telemetering equipment will be launched from stations located at Pearl Harbor, two (2) atolls and two (2) ships, so located as to supplement the data collected by aircraft. In addition, planes carrying gas sampling equipment will be vectored to the cloud.

e. One sonic network consists of six (6) stations distributed from Kyoto, Japan to Frankfurt, Germany. A second network consists of three (3) "arrays" located at approximately 1,000, 2,000, and 4,000 miles respectively, from the explosions. A third network of sixteen (16) to twenty (20) arrays will be distributed at distances between fifty (50) to 2,000 miles, with a special station in Washington, D.C. Two (2) airborne balloon stations located at ranges of 400 and 4,000 miles respectively are equipped to measure air pressure fluctuations both on the ground and at an altitude of 50,000 feet.

f. Eight (8) Seismographs are located between 250 and 1,000 miles from the explosions, and four (4) are located on the atoll. These seismic records will be augmented by records from all USC & GS permanent seismograph stations, which have suitable instruments. Three (3) magnetometers, two (2) optical detection stations and one (1) ionospherograph complete the present complement of instruments.

2. Description of Instrumentation. The instrumentation development required for FITZWILLIAM has been achieved through the cooperation of the Air Materiel Command, the Office of Naval Research, and the U. S. Signal Corps, with their associated laboratories and contracting agencies. Both radiological and sonic instrumentation have been developed by all three of these agencies. In general it may be stated that the responsibility for the development of radiological instrumentation has been divided about equally between the Air Materiel Command and the Office of Naval Research. The Office of Naval Research and the Signal Corps have divided the basic responsibility for the development of sonic equipment, with one exception, i.e., Watson Laboratories (AMC) balloon and ground sonic equipment. Seismic instrumentation has been developed primarily by the Office of Naval Research supplemented by existing U.S.C. & G.S. installations.

a. Radiological instruments developed or procured by the Naval Research Laboratory, the Air Materiel Command, and the U. S. Signal Corps.

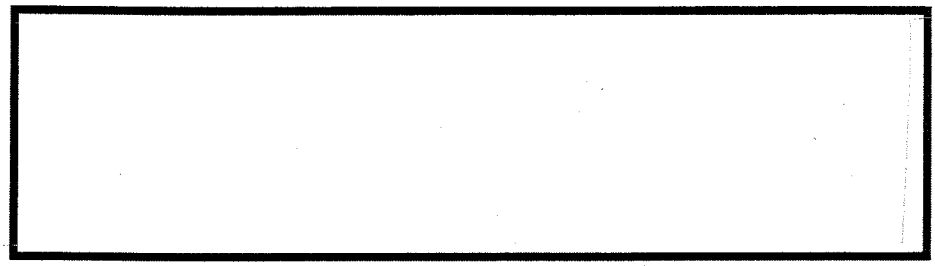
(1) (a) Automatic radiological recording counters. Two (2) general types of radiological counters will be used. One of these employs a conventional scaling circuit in combination with an automatic printing message register with interpolation lights. The other uses a modified Neher-Pickering circuit with pre-amplifier, pulse shaping circuits and rate metering circuits in conjunction with a 5 milliampere Esterline-Angus pen and ink recorder with 5 ranges from background to 20,000 counts per minute. The message register type scaler manufactured by the Atomic Instrument Company utilizes a scale of 64 circuit with amplitude discrimination, capable of the resolution of pulses separated by 5 micro-seconds. The high sensitivity gamma ray counter tube cluster used with this instrument has a threshold of about 0.5 Mev.

(b) The second type of automatic counter using the Esterline-Angus recorder is manufactured by the General Radio Co. The resolution of this counter is a maximum of 20,000 counts per minute. In this case, the record will appear on a conventional Esterline-Angus recording milliammeter as a deflection proportional in amplitude to the counting rate, modified by the scale factor.

(c) The first type of automatic counter provides a printed record of the total number of counts at known time intervals. It is necessary for an operator or analyst to calculate the actual counting rate.

(d) The various components of each of the automatic radiological counting systems, namely, the scaler, pulse amplifier, power supplies and recorders have been combined into an integral unit and housed in tropicalized steel instrument case.

(2) Ground filter units. There are two types of ground filter units, one supplied by Air Materiel Command and one supplied by the Signal Corps. The AMC filter or dust sampling unit incorporates a 20 horsepower driving motor and blower combination. This unit when utilizing the V-5 chemical warfare filter paper has an estimated capacity of 1,300 cu ft per minute. The Signal Corps radioactive dust sampling unit or "ground filter unit" utilizes a 1/12 h.p. motor and a 2 ft



(3) Wrap-around Geiger counters. These instruments are supplied in two (2) types with each of the ground filter units described above. The Signal Corps ground filter unit is supplied with a wrap-around counter composed of one electronics scaler unit with a thin wall Geiger counter capable of measuring Beta particles of about 0.1 Mev. energy. The AMC ground filter unit is supplied with a scale of 64 counter with message register and interpolation lights operating on a Beta counter with an aqua-dag-coated anode and a thin window rather than a thin wall. These types of counters are used at stations as indicated in the equipment and personnel chart (Annex "B") to check the activity of both airborne and ground filter units.

(4) Airborne filters. The airborne filter units are inherently simple, since no pumps are required to move the air through the filters. They consist essentially of a mounting for a filter paper, 6" x 18" in dimensions, and provision for inserting a scoop in the air stream to divert an adequate volume of air through the filter. Approximately 50 aircraft of the AWS are so equipped. Chemical Warfare Service type V-5 is used for this purpose.

(5) (a) Airborne radiological counters. Two (2) types of airborne radiological counters are being used. The first typed, designed by the NRL, is a fully automatic recorder designed for mounting in aircraft. The instrument consists of a bundle of 19 Geiger counter tubes with amplitude discrimination and Esterline-Angus type recording. The sensitivity of these instruments is of the order of hundreds of atoms per cc. Three (3) such installations, one in a B-29 for high altitude work, are outfitted with a total of twelve (12) automatic counters.

(b) In addition to this, there are five (5) sets of balloon borne counters in which the counter tube and radiosonde equipment is airborne to a maximum height of approximately 50,000 ft. The scaling and recording units are on the ground. A transmitter in the balloon is capable of a range of 150 miles. The sensitivity of these Gamma counters is of the order of 0.1 Mev.

(6) [redacted]

(7) Atmospheric Conductivity. Ionization equipment has been installed in one B-29. This equipment is designed to measure simultaneously the conductivity and the voltage gradient of the atmosphere and combine these two parameters to obtain a value for earth to air current. The sensitivity of this equipment as compared with that of a Gamma ray counter is presently unknown, although competent physicists in charge of this installation believe it to be considerably superior to a counter.

(8) Gas sampling equipment. Seven (7) aircraft will be equipped with pumps and storage tanks (400 lbs/sq in) to permit the collection of samples of gas in the vicinity of the radioactive cloud. Radioactive analysis of the gas will be made at Tracerlab in Boston initially, and possibly in Hawaii after April 15-30.

b. Acoustic Instrumentation developed by ONR and U. S. Signal Corps for "ranging".

(1) (a) Micro-barophones. The microphone stations of the Signal Corps sonic network consist of condenser microphones having a time-constant of about 30 seconds, mounted in a special cabinet at ground level to prevent the formation of turbulence in the air. A single termination to the atmosphere is used on all Signal Corps microphones.

(b) The Reiber Research Laboratory microphones used at three NEL ten unit array stations are of the "vibratron" type. The vibratron is an instrument developed by the RRL to permit recording of pressure changes by measuring the effect of sonic changes on the frequency of vibration of a tungsten wire placed in a magnetic field. Since the tension on this wire is varied in proportion to the pressure change, these units are extremely sensitive and will have to be operated at a fraction of their maximum sensitivity because of the magnitude of daily ambient background. The RRL microphone also uses a single termination to the atmosphere with the use of streamlined faring to prevent turbulence.

(c) The microphone stations designed by the NOL comprise a single induction type transducer connected to a pipe network or array having 4 or 12 separate terminations to the atmosphere. The microphone itself consists of an inductor which includes in its magnetic circuit a diaphragm-mounted permalloy core. Variations in pressure applied to the microphone produce a marked variation in balance of the bridge circuit which in turn actuates the Esterline-Angus recorder. The individual terminations of the NOL array are spaced a small fraction of a wave length apart and are arranged so as to produce a substantial reduction of the ambient "noise" background. It is expected that the gain in signal to noise level will be in proportion to the square root of the number of terminations. Thus a 12 unit array should produce an improvement in signal to noise level ratio of better than a factor of 3 and a 100 unit array should effect an improvement of the order of 10.

(2) Arrays. The RRL equipment and the SC equipment will be arranged in so-called arrays. The Reiber array will be 10 units uniformly distributed around a one mile radius circle and connected to a single recording station. The form of the final record will be a 12 trace variable density sound on film recording. Special equipment for analysis of these film records are being designed by the RRL. The SC array consists of 4 microphones located at the corners of a 10 mile square. The purpose of these arrays is to obtain by virtue of the phase difference in the pressure waves arriving at each station, some indication of the direction of propagation of the incoming pressure wave.

(3) The Watson Laboratory of AMC have designed a very light microphone, capable of being borne aloft by "Sky Hook" balloon. The balloon borne equipment includes a radiosonde transmitted providing contect with the ground control station. The time-constant of this hydrophone has been adjusted to cover the range down to a period of 30 seconds.

c. Exploratory Instruments

(1) Seismographs. The NOL has designed seismographs of the variable permeability type using the same inductor units as used for the microbarograph described above. The seismograph is a spring stabilized inverted pendulum, the displacement of which is measured by a permalloy button mounted on the pendulum and included in the magnetic circuit of an

inductor similar to that described above. This device is sensitive to horizontal translation only and will not respond to vertical accelerations.

(2) Magnetometers. Three (3) magnetic airborne detectors designed by the NOL for aerial magnetic survey work have been modified for high sensitivity magnetic measurements in the vicinity of the blast. The instrument is essentially a second harmonic detector arranged for recording on an Esterline-Angus recorder. The sensitivity is of the order of the 10^{-5} gausses.

(3) Optical detectors. The optical detector will consist of a telescope (approx 5 in) [redacted] and using an electron multiplier type of photo tube as the sensitive element. It is estimated that under ideal conditions light variations will be of sufficient magnitude to be detected with such an apparatus.

(4) Ionospherographs. The ionospherograph is an instrument of the type produced by the Communications Measurements Laboratory. This device scans from one to twenty-five megacycles and transmits 50 to 100 microsecond pulses with a peak power of 10 kilowatts. The pulse repetition rate is 60 to 120 cyclesper second. Records are made on 25 millimeter and 16 millimeter movie film.

3. Description of Projects. The series of experimental projects comprising FITZWILLIAM have been assigned to the following operating or participating agencies:

Air Weather Service
Naval Research Laboratory
Naval Ordnance Laboratory
Naval Electronics Laboratory
Tracerlab
Evans Signal Laboratory
Office of Naval Research
Watson Laboratories

These agencies will carry out their programs as outlined below, reporting to AFMSW-1 through appropriate channels.

a. Radiological Projects. In this section each radiological project will be described in order of the agency doing the housekeeping. (See Annex D (1) and Annex B).

(1) AWS ground level network. The AWS will operate a network of 21 stations distributed [redacted] each of which will be equipped with automatic radiological counters and with ground filter units. In addition to this equipment, five (5) of the stations will operate high sensitivity ionization chambers [redacted]

(2) NRL ground level network. The NRL will operate twelve (12) automatic radiological counter stations at Continental U. S. stations, and eight (8) ground radiological stations distributed [redacted] Annex D (1) and Annex B. These stations will be equipped with automatic radiological counters and ground filter units of both AMC and NRL design.

(3) NRL ship-borne stations. NRL will operate twelve (12) ship-borne detection stations maintaining automatic radiological counters and ground filter units. Because of the location of this equipment over water and the consequent reduction of Gamma ray background level greater signal to noise level should be realized at these installations. (Annex D(1) and Annex B).

(4) [redacted]

(5) AWS airborne filters. AWS stations will operate planes equipped with airborne filters based at the nine (9) stations shown on Annex D (2), and equipped with airborne filters as indicated in Annex B. These planes will operate in the areas roughly outlined by the dotted circles in Annex D (2) and should greatly augment the coverage provided by previously described radiological stations. Each base is equipped with wrap-around counters, for measuring the radioactivity of the filters brought back by the planes. Filters showing marked radioactivity will be forwarded to the nearest Tracerlab field laboratory for thorough analysis.

(6) NRL airborne counters (balloon). Five (5) balloon stations in positions indicated on Annex D (2) are equipped as indicated in Annex B with airborne radiological counters. These balloons will be released at the direction of FITZWILLIAM forward headquarters, in accordance with the predictions by the Weather Officer of JTF-7 of the location of the radioactive cloud. Each equipment is lifted by two balloons, one of which is designed to burst at thirty thousand feet. This devide provides rapid ascent to the strata to be monitored and slow traversal during the monitoring. Modulation of radiosonde carrier frequency by a barograph and by the counter permits simultaneous recording of the counting rates and altitude on a twenty pen Esterline-Angus recorder.

(7) NRL airborne counters (aircraft). The NRL will operate three (3) aircraft fitted with the automatic recording counters. One of these is an AWS B-29 based at Pearl Harbor for high level detection in the vicinity of the cloud. A second plane (A-26) will be based in the immediate vicinity of Pearl Harbor and a third plane (A-26) will be based at Guantenamo, Cuba. These counters are designed to provide extremely high signal to noise level for airborne radiological detection. Cosmic ray background as a function of altitude will be determined by calibration flights in the area of the tests.

(8) AWS atmospheric conductivity. A B-29 equipped with apparatus for simultaneously measuring the atmospheric conductivity and voltage gradient will be vectored into the path of the radioactive cloud in order to determine the capability of such equipment for detection, in comparison with more conventional Geiger counter equipment.

(9) AWS gas sampling. Seven (7) AWS planes equipped with tanks and high pressure pumps for taking samples of gas will be based on Kwajalein for the purpose of collecting samples of radioactive gas at various distances from the ground. These gas samples will be transported to Boston by air for radioactive analysis by Tracerlab. Gas samples will be taken on routine flights in advance of the tests to establish background.

b. Tracerlab - Radiological Data Analysis.

(1) Tracerlab has been engaged under contract to AMC to provide adequate scientific correlation between the various operating field agencies gathering radiological data. Operationally, this will require providing maintenance personnel at five

(5) [redacted] A second operational responsibility is the establishment of four (4) field laboratories, one each at Boston, Hawaii, Kwajalein, and Guam.

(2) The functions of the maintenance men are to effect any necessary field repairs to radiological detection equipment.

(3) The functions of the field laboratories shall be to make analyses of radioactive filters. Each laboratory is [redacted] analyzed for primary beta and gamma activity, and those samples exhibiting significant radioactivity will be further analyzed for identification of half-lives and for maximum beta and gamma energies by absorber foil technique. Tracerlab personnel decide whether or not the more difficult analysis for alpha particles is justified, and make such analyses as are required. If possible, rough chemical separation of basic radiochemical groups will be made in the field stations. This will be done only on the most active samples.

(4) At the conclusion of the tests, radiochemical analysis of samples of long half-life constituents will be made by Tracerlab of Boston. In this analysis, an attempt will be made to isolate and identify as many isotopes as possible by radiochemical means, obtaining results on a percentage basis where possible. The exact scope of this phase of the investigation remains to be determined by consultation with the AEC.

c. Acoustic Projects. Annex D-3 shows the networks set up by the Signal Corps, N.E.L., N.O.L., and the Watson Laboratory of A.M.C. Although these networks will operate independently their results will be coordinated on a world-wide basis through the system for reporting to AFSWP-1 outlined in Annex G.

(1) NOL acoustic network. The NOL will operate 10 microbarograph stations as indicated in Annex D-3. These stations will consist of the microphones described above, using 12-unit averaging termination arrays. Each station location shown on Annex D-3 is comprised of two (2) microbarophones separated by approximately 10 miles. This will permit determination of the angle of incidence of the primary pressure wave front at the successive traversals. Time signals broadcast from a radio transmitter on Kwajalein

will actuate the Esterline-Angus recorders of each microbarograph thus providing an accurate synchronization of data from all stations. A single station comprised of one 100-unit array will be installed at the NOL, White Oak. This array should have the lowest signal to noise level of any sonic station.

(2) NEL arrays. The NEL will operate three (3) sonic arrays composed of RRL microphone stations described above. The location of these stations is given on Annex D-3. Time notification for these stations and in fact for all remote sonic stations, will be achieved by special arrangement between JTF-7 and AFMSW-1.

(3) AMC Acoustic balloons. The Evans Signal Laboratory of the U. S. Signal Corps has established a network of six (6) stations located as indicated on Annex D-3. A 24-hour continuous surveillance schedule is currently operating on all six (6) of these stations. No time signals or other notifications of the events will be required. Personnel of the Signal Corps will strive to effect identification of acoustic anomalies received on their networks and notify AFMSW-1 of all such anomalous behaviour according to a schedule agreed to separately between U. S. Signal Laboratory and AFMSW-1.

(4) AMC acoustic balloons. The Watson Laboratory of AMC will launch balloon borne radiological equipment described above at the sites indicated on Annex D-3. Since there will be only one party from Watson Laboratory in the Pacific, the three (3) stations will be sequentially manned depending on favorable results from the preceding event. Ground level sonic measurements will be made by Watson Laboratory personnel at each of the stations indicated. Equipment for the ground level measurements consists of converted World War II gun ranging equipment. The conversion is essentially one of increasing the time-constant of the instrument to approximately 30 seconds.

d. Exploratory projects. Three (3) additional investigations of a preliminary type will be conducted as outlined below:

(1) AWS/NOL magnetic. AWS will operate two (2) NOL high sensitivity magnetometers at the location indicated on Annex D-4. The NOL will operate one (1) high sensitivity magnetometer at a position shown on Annex D-4. With these three (3) magnetometer stations it is hoped to determine the feasibility of a future study of electromagnetic effects of atomic explosions due to dynamo action in the ionosphere resulting from the sonic or hydrodynamic waves.

(2) SC optical. The AMC will operate two (2) optical detection stations, at positions indicated on Annex D-4 to determine feasibility of future developments of this system of detection The object of the experiment will be to determine the amount [redacted] following the explosion.

(3) AWS ionospherograph. One (1) ionospherograph described above will be set up on the target atoll and operated by AWS personnel, to determine the magnitude of the dimples produced in the ionosphere by an atomic explosion.

4. Operational Instructions (General).

a. U. S. Signal Corps.

(1) The acoustic network of the U. S. Signal Corps will be operated independently of Operation FITZWILLIAM. Reporting anomalous behaviour of the acoustic network will be in accordance with instructions to be issued at later date.

(2) The optical perturbation equipment operated on Guam and Eniwetok by Signal Corps personnel will be subject to JTF-7 operational procedures.

b. Naval Electronics Laboratory. The acoustic network for long range sonic detection operated by the NEL will obtain its time notification through JTF-7.

c. Naval Ordnance Laboratory. The NOL acoustic network will operate essentially independently of any except Navy assistance. This assistance in the form of transportation or communications will be provided by station ships and three (3) supporting auxiliary Mine Sweepers furnished by CINCPAC. This group will require time notifications as indicated in Annex F. The Naval Ordnance Laboratory may require some personnel from Air Weather Service depending on local conditions.

d. Naval Research Laboratory. Naval Research Laboratory balloon teams will operate essentially under Naval control from the standpoint of transportation or communications required. Advance notice from FITZWILLIAM advanced headquarters of appropriate times to launch balloons will be required. Ground filters and automatic radiological counting stations will require only routine Naval communications and transportation during the experiment.

e. Tracerlab. Tracerlab maintenance personnel and Tracerlab field laboratories will report to the nearest Air Weather Station officer and will execute their responsibilities by requesting necessary airlift or communications from the Air Weather officers involved. All requirements for Tracerlab personnel will be supplied by Air Weather Service.

f. AMC/Watson Laboratories. AMC/Watson Laboratories will operate substantially independently, providing their own aircraft, transporting their own equipment and personnel in those aircraft. Maintenance facilities for the aircraft will be their only requirement.

g. Air Weather Service. In addition to its normal meteorological responsibilities to JTF-7 during FITZWILLIAM and SANDSTONE, the Air Weather Service will provide facilities as described above, to various participating agencies. It will also operate radiological equipment as indicated in par 3 above, including the operation of one (1) special B-29 for atmospheric conductivity measurements; seven (7) special gas sampling aircraft; and one (1) special B-29 radiological counter aircraft manned by NRL technicians. Air Weather Service will also operate NOL magnetometers and one (1) ionospherograph.

h. U. S. Coast and Geodetic Survey. One (1) civilian scientist of the U. S. Coast and Geodetic Survey and two (2) enlisted men of the U. S. Air Force will install and operate on Eniwetok Island, three (3) U. S. Coast and Geodetic Survey short-range seismographs. The purpose of the experiment is to determine the nature and intensities of the components of the seismic wave resulting from the explosions which traverse the earth's surface between the point of the explosions and the instruments. The instruments will be unaccompanied. They will be activated by a radio signal transmitted from Eniwetok Island to the instruments. Radio equipment was furnished by the U. S. Signal Corps. Time notification will be made available to operating personnel by JTF-7. JTF-7 has provided concrete foundations and light-proof shelters for each of the five (5) installations. The three (3) locations closest to each blast will be used.

ANNEX B

EQUIPMENT AND PERSONNEL CHART

OPERATION FITZWILLIAM

ANNEX "C"

STATION LIST

20 March 1948

1. The following detailed list of equipment and personnel participating in field operations of Operation FITZWILLIAM is arranged alphabetically by station name. Where two or more participating agencies are operating stations at the same locality, such stations are listed separately.

2. All information is correct as of 20 March 1948.

3. The "Index Number" listed for each station is the international meteorological code designation of the Weather Station at that location. For FITZWILLIAM stations at locations where there is no weather station, an arbitrary designation has been adopted, in which the first digit is 9 followed by a dash, and the remaining digits correspond to the FITZWILLIAM station number as listed on the Equipment and Personnel Chart, Annex "B". These index numbers are the identifying numbers under which all records and reports pertaining to the particular station will be recorded, filed, and referred to.

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OPERATION FITZWILLIAM

ANNEX "C"

STATION LIST

20 March 1948

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Adak Island (5-992)	51 53 N 176 39 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC Filter Unit	Evans Signal Lab to Westover by truck. Westover to Wright by ATC. Wright to Adak by ATC. (ID No. AL-USR-1H-2551-AF3)
1	NRL Radiological Counter	Washington to Wright by domestic ATC. Wright to Fairfield-Suisun School by ATC. Fairfield-Suisun to Adak by AWS aircraft.
1	AMC Ionization Chamber	Wright to Adak by ATC. (ID No. AL-USR-1H-2568-AF3)

[redacted]

MAINTENANCE - The nearest Tracerlab maintenance station is Elmendorf Field, Alaska, (5-433).

OPERATING PERSONNEL - Capt. H. T. Bingham (7th W.S.)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Ailingalapalap (9-002)	07 26 N 163 33 E	Naval Ordnance Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
2	NOL Microbarographs	Washington to Kwajalein by MATS. Kwajalein to destination by AWS-32 "Pelican". 2 NOL technicians to accompany equipment.
2	NOL Seismographs	Same as above

MAINTENANCE - Tracerlab maintenance man stationed at Guam. (4-892)

OPERATING PERSONNEL - Robert F. King (NOL) (Moves to Ujae for last test)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Albrook Field, C. Z. (5-923)	08 59 N 79 34 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC Ground Filter Unit	All equipment flown from Wright Field to Albrook Field by ATC. (ID No. CR-USR-1H-2406-AF2)
1	AMC Wrap-Around Counter	(ID No. CR-USR-1H-2546-AF3)

[redacted]

MAINTENANCE - Tracerlab maintenance man stationed at Boston, Mass. (5-509) and Fairfield-Suisun (5-493)

OPERATING PERSONNEL - Lt. J. Smith (8th W. Gp.)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Alamagordo, New Mexico (9-004)	32 54 N 105 55 W	Air Materiel Command

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC Microbarograph	All equipment will be flown from Red Bank to Alamagordo by AMC plane
1	AMC Sonic Balloon	
1	AMC Modified Gun Ranging Sonic Equipment	

MAINTENANCE - Operating personnel will supply all maintenance needs.

OPERATING PERSONNEL - Dr. Peoples

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Annette Island (5-048)	55 10 N 131 25 W	Weather Bureau

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC Ground Filter Unit	Washington to Wright by ATC. Wright to Annette by AMC aircraft.
1	AMC Trap-around Counter	Wright to Annette by AMC aircraft.
1	NRL Automatic Radiological Counter	Wright to Annette by AMC aircraft.
[redacted]		Wright to Annette by AMC aircraft.

MAINTENANCE - Nearest Tracerlab maintenance station is Elmendorf Field, Alaska, (5-433).

OPERATING PERSONNEL - Capt. G. D. Servis (Weather Bureau)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Barter Island (5-656)	70 08 N 143 11 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL Radiological Counter	Washington to Fairfield-Suisun School by courier. Fairfield-Suisun to Barter by ATS aircraft.

MAINTENANCE - Nearest Tracerlab maintenance man at Elmendorf Field, Alaska (5-433).

OPERATING PERSONNEL - Lt. B. B. Small (7th W. Gp.)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Bikini (9-007)	11 37 N 165 33 E	Naval Ordnance Lab.

INSTRUMENTS

No.	Name	Transportation & Identification
2	NOL Microbarographs	Washington to Kwajalein by MATS. Kwajalein to Bikini by ATS - 36 (Swallow)
2	NOL Seismographs	Same as above.

MAINTENANCE - Nearest Tracerlab maintenance station is Guam (4-892)

OPERATING PERSONNEL - Richard Lee Knodle (NOL)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Bird Dog 4 (Weather Ship) (9-008)	Guam to Kwajalein (Center of great circle route)	NRL/USN

INSTRUMENTS

No.	Name	Transportation & Identification
2	SC Ground filter units	Evans Lab to Willow Grove by truck. Willow Grove to Guam by MATS.
2	NRL automatic radiological counters	Washington to Guam by MATS

MAINTENANCE - Nearest Tracerlab maintenance man located at Guam (4-892).

OPERATING PERSONNEL

Bernard I. Small NRL
Elman O. Weaver NRL

REMARKS

This station will consist of two ships operated by the United States Navy, each one carrying one ground filter unit and one automatic radiological counter but only one being on location at any given time. Location in this case is a point half way between Guam and Kwajalein on the great circle course.

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Bird Dog F (Weather Ship) (9-009)	Pearl Harbor to San Francisco, California. (Center great circle route)	NRL/USCG

INSTRUMENTS

No.	Name	Transportation & Identification
2	AMC ground filter units	Wright to Moffatt Field. Moffatt Field to Hunter Point.
2	AMC wrap-around counters	Wright to Moffatt Field. Moffatt Field to Hunter Point
2	NRL automatic radiological counters	Washington DC to Hunter Point. Hunter Point to Naval Ship Yards, San Francisco, Calif.

MAINTENANCE - Nearest Tracerlab maintenance man located at Pearl Harbor (4-998) or Fairfield-Suisun (5-493).

OPERATING PERSONNEL

A. I. Reynard NRL
Oscar J. Mead NRL

REMARKS

Bird Dog F consists of two ships based at San Francisco with a station located half way between Pearl Harbor and San Francisco.

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STATION NAME AND INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Bolling Field (5-405)	38 51 N 77 01 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL automatic radiological counter.	Washington to Fairfield-Suisun by courier. Fairfield-Suisun to Bolling Field by AWS
1	SC ground filter unit	Evans Laboratory to Bolling Field by truck.
1	AMC ground filter unit	Wright to Bolling Field by ATC.
1	AMC wrap-around counter	Wright to Bolling Field by ATC.

MAINTENANCE - Nearest Tracerlab maintenance man is stationed at Boston, Mass. (5-509)

OPERATING PERSONNEL - Maj. Samuel A. Mitchell (CHW)

STATION NAME AND INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Boston, Mass. (5-509)	42 22 N 71 2 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio frequency laboratory automatic counter	Washington to Boston by domestic means.

MAINTENANCE - Nearest Tracerlab maintenance man located at same station (5-509).

OPERATING PERSONNEL

J. R. Zackarias	(MIT)	
Raymond P. Ghelardi	(Tracerlab)	
Jack R. Carlin	"	
Kurt Schneider	"	Two for gas analysis
Gordon C. Bell	"	Two for gas analysis
Abel de Haan	"	
John V. Francis	"	
Edgar C. Barker	"	

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STATION NAME AND INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Chitose (3-364)	42 48 N 141 40 E	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC [redacted]	[redacted]
[redacted]		
[redacted]		

MAINTENANCE - Nearest Tracerlab maintenance man [redacted] (3-374).

OPERATING PERSONNEL - Lt. J. D. McGowan (20th W. S.)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Clark (7-212)	15 11 N 120 33 E	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC ground filter unit	Evans Laboratory to Westover by truck. Westover to Clark by ATC (ID No. SW-USR-1H-2552-AF3)
1	NRL automatic radiological counter	Washington DC to Wright by ATC. Wright to Chitose by ATC. (ID No. SW-US-1A-5520-AF3)

[redacted]

MAINTENANCE - Nearest Tracerlab maintenance men stationed at Guam (4-892) or Tokyo (3-374).

OPERATING PERSONNEL - WO Benj H. Houston (15th W.S.)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Denver (5-469)	39 45 N 105 0 W	Office of Naval Research - University of Colorado

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio frequency laboratory automatic counter	Washington to Denver by domestic means.

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - J. W. Broxon (University of Colorado - ONR)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
DMS 37 (USS DAVISON)(9-016)	600 mile arc NE target	Naval Research Laboratory, United States Navy

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL ground filter unit	Washington to San Diego by MATS
1	AMC wrap-around counter	Washington to San Diego by MATS (this instrument sent to NRL for familiarity) NRL responsibility
1	NRL radiological counter	Wright to San Diego by MATS
1	NRL balloon radiological counter	Washington to San Diego by MATS

MAINTENANCE - Nearest Tracerlab maintenance man located at Guam (4-892)

OPERATING PERSONNEL -

NRL Balloon Team #4

Ens Seymour Yalen - in charge		L. J. Riedel	S1/C
R. H. Ford	Act M1/C	L. J. Toller	S1/C
N. J. Moran	RM1/C	L. S. Zeller	Air M1/C
A. Eicknns,Jr.	S2/C	L. J. Pittman	Rd M3/C

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
DMS 32 (USS QUICK)(9-017)	600 mile arc NE target	Naval Research Laboratory, United States Navy

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL ground filter unit	Washington to San Diego by MATS
1	AMC wrap-around counter	Washington to San Diego by MATS (this instrument sent to NRL for familiarity) NRL responsibility
1	NRL radiological counter	Wright to San Diego by MATS
1	NRL balloon radiological counter	Washington to San Diego by MATS

MAINTENANCE - Nearest Tracerlab maintenance man located at Guam (4-892).

OPERATING PERSONNEL

NRL Balloon Team #5

Ens. W. F. Tiemann, Jr. - In charge
W. M. Bingman - Air M1/C
H. W. Brien - Rd M3/C
R. J. Cruse - S2/C
G. R. Frankhouser - S1/C
W. H. Russell - S2/C
J. Siegfried, Jr. ET2/C
R. K. Thornton - RM1/C

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Elmendorf AF Base (5-433)	61 15 N 149 48 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
2	AMC wrap-around counters	Wright to Elmendorf by ATC (ID No. AL-USR-1H-2548-AF3)

[redacted]

MAINTENANCE - Nearest Tracerlab maintenance man located at same station (5-433).

OPERATING PERSONNEL

Lt. R. E. Frazier (7th W. Gp) Roger A. Coulombe (7th W. Gp) Tracerlab

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Eniwetok (9-019)	11 30 N 162 10 E	Air Weather Service U. S. Signal Corps

INSTRUMENTS

No.	Name	Transportation & Identification
2	NOL magnetometers	Washington to Eniwetok, responsibility NOL. NOL will deliver 2 magnetometers.
1	NOL microbarograph	Washington to Kwajalein by NATS. Kwajalein to Eniwetok by AMS/36 - Swallow
1	NOL seismograph	Washington to Kwajalein by NATS. Kwajalein to Eniwetok by AMS/36 - Swallow
3	Seismographs (USCNGS)	Washington to Kwajalein by ATC via Fairfield-Suisun. Kwajalein to Eniwetok by JTF 7 (priority arrangements from Col Celio). (ID No. CPX-US-1H-2697-AF3)
1	Optical perturbation	
1	ionospherograph	Mr. Elterman & Mr. Hammond and 3,175 lbs. Westover to Kwajalein to Eniwetok by ATC.

MAINTENANCE - Nearest Tracerlab maintenance man is stationed [redacted] (4-892).

OPERATING PERSONNEL

Capt. H. B. Hutchinson	(ONR Proj Off)
Wm. Thomas Whistler	(NOL)
Louis Elterman	(Watson Labs)
Lester A. Hammond	(Watson Labs)
Dr. Craig M. Crenshaw	(Signal)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Fairbanks, Alaska (5-603)	64 50 N 147 37 E	Air Weather Service Signal Corps

INSTRUMENTS

No.	Name	Transportation & Identification
2	AMC wrap-around counters	Wright to Ladd by ATC
1	[redacted]	
1	SC sonic equipment	Evans Laboratory to Westover. Westover to Fairbanks by ATC.
7	AMC aircraft filter units	Wright to Ladd by ATC

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Elmendorf, Alaska (5-433).

OPERATING PERSONNEL - Capt K. L. Leiby (7th W. Gp)
1st Lt. Arthur H. Burdick (Sig)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Fairfield-Suisun AF Base (5-493)	38 15 N 122 5 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC ground filter unit	Wright to Fairfield-Suisun by ATC
2	AMC wrap-around counters	Wright to Tracerlab. Tracerlab to Fairfield-Suisun.

INSTRUMENTS (Cont'd)

No.	Name	Transportation & Identification
1	AEC ionization chamber	Wright to Bolling. Bolling to Canbridge. Canbridge to Fairfield-Suisun
1	[redacted]	
25	Airborne filters	Fairfield-Suisun by ATC

MAINTENANCE - Nearest Tracerlab maintenance man located at Boston, Mass (5-509).

OPERATING PERSONNEL

Lt. A. Stout
Lt. Baird W. Falk
Jay T. Thomas (308th Rec Gp) Tracerlab

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Frankfurt, Germany (1-412)	50 08 N 08 34 E	Signal Corps

INSTRUMENTS

No.	Name	Transportation & Identification
1	microbarograph	Evans Laboratory to Westover. Westover to Frankfurt by ATC.

MAINTENANCE - Nearest Tracerlab maintenance man located at Boston, Mass (5-509)

OPERATING PERSONNEL - Capt Glenn T. Lutton, Sig C.

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Fort Lewis, Wash (5-206)	47 05 N 122 40 W	Signal Corps

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC microbarograph	Evans Laboratory to Westover by ATC. Westover to Fort Lewis by ATC.

MAINTENANCE - Nearest Tracerlab maintenance man located at Boston, Mass (5-509).

OPERATING PERSONNEL - 1st Lt Robert F. Comstock, Sig C.

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Fort Randall (5-308)	55 12 N 162 43 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC ground filter unit	Wright to Fort Randall by ATC (ID No. AL-USR-1H-2409-AF2)
1	AMC wrap-around counter	Wright to Fort Randall by ATC (ID No.AL-USR-1H-2540-AF3)
1	NRL automatic radiological counter	Washington to Fairfield-Suisun by AWS. Fairfield-Suisun to Fort Randall by AWS.

[redacted]

MAINTENANCE - Nearest Tracerlab maintenance man is located at Elmendorf AF Base, (5-433).

OPERATING PERSONNEL - WO R. I. Dunlap (7th W.S.)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Guadalcanal (4-715)	09 37 S 160 15 E	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL automatic radiological counter	Washington to Wright by ATC. Wright to Guam by ATC. Guam to Guadalcanal by ATC (priority from COMGENMARBO local ATC - Guam to Guadalcanal).

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Hawaii (4-996) or Guam (4-892).

OPERATING PERSONNEL - T/Sgt W. H. Craig

Operation FITZWILLIAM - Annex "C" 20 March 1948

STATION NAME & INDEX NO.		LATITUDE & LONGITUDE		OPERATING AGENCY
Guam	(4-892)	13 33 N	144 55 E	Air Weather Service Air Materiel Command Signal Corps Naval Electronics Lab

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC ground filter unit	Wright to Guam by ATC
3	AMC wrap-around counters	(2) Wright to Guam by ATC (1) Wright to Tracerlab by ATC. Tracerlab to Fairfield-Suisun by ATC. Fairfield-Suisun to Guam by ATC. (ID No. WP-USR-1H-2554-AF3) and (2553)
1	NRL automatic radiological counter	Washington to Wright by ATC. Wright to Guam by ATC. (ID No. WP-US-1A-8163-AF3)
1	AMC microbarograph	
1	NRL microbarograph	New York City to Guam by NATS
1	AMC sonic balloon	
1	optical perturbation equipment	
[redacted]		
1	AMC ionization chamber	Wright to Guam by ATC.

MAINTENANCE - Nearest Tracerlab maintenance man located at same station (4-892.

OPERATING PERSONNEL

Lt. C. V. Wilson	(30th W.S.)	Charles S. Schneider	(NYU)
George E. Howser	(30th W.S.) Tracerlab	Murray Hackman	"
Lt Com W.E. Greene	ONR Proj. Off	James R. Smith	"
Dr. Gilbert H. Curl	(In chge Vector 13)	Martin Koenig	"
F. E. Hale		Charles Moore, Jr.	"
J. A. Strong			
G. W. Somes		Daniel F. Comstock	(Tracerlab)
Mr. James A. Peoples	(Watson)	Elton H. Turk	"
Albert Crary	(")	Don C. Atkins	"
John W. Alden	(")	Emil L. Bernier	"
John A. Moulden	(")	George S. Houser	"
Joseph B. Olsen	(")	Daniel M. Elkstein	"
Peter H. Wyckoff	(")	William (MIT) Karp	"

Mr. Donald J. Southard (Signal)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Guantanamo (9-032)	20 11 N 75 15 W	Naval Research Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
1	Airborne filter and wrap-around counter	Washington to Guantanamo by NATS

MAINTENANCE - Nearest Tracerlab maintenance station at Boston, Mass (5-509).

OPERATING PERSONNEL - Aircraft crews

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
[redacted]		Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
2	AMC wrap-around counters	[redacted]

[redacted]

MAINTENANCE - Nearest Tracerlab maintenance man located at same station (3-374.)

OPERATING PERSONNEL

Capt Oscar Tibbets (20th W.S.)
Rowland L. Miller (43rd Wing Hq) Tracerlab

SITE & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Hawaii (Hickam) (4-998 & 4-999)	21 20 N 157 58 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
2	AMC wrap-around counters (ID No.CP-USR-1H-2547-AF2) (ID No.CPX-US-2H-2695-AF3)	(1) Washington to Hickam by ATC (1) Wright to Fairfield-Suisun by AWS/ATC Fairfield-Suisun to Hickam by AWS/ATC
1	AMC ionization chamber	Wright to Hickam by ATC. ***See below.
1	AMC microbarograph	Evans Laboratory to Westover by ATC. Westover to Hickam by ATC
1	AMC sonic balloon	
1	NRL ground filter unit	Washington to San Diego by NATS. San Diego to Pearl by DMS-32
1	NRL wrap-around counter	Washington to San Diego by NATS. San Diego to Pearl by DMS-32
1	NRL automatic radiological counter	Washington to Pearl by NATS
1	NRL radiological balloon	Washington to San Diego by NATS. San Diego to Pearl by DMS-32.
1	NRL airborne filter unit	Washington to Pearl by NATS
1	NEL microbarograph	Washington to Pearl by NATS
1	SC microbarograph	***(ID No. CP-USR-1H-2436-AF2)

MAINTENANCE - Tracerlab maintenance man on station.

OPERATING PERSONNEL

Capt. G. E. Davis
S/Sgt. E. Anderson
W. Harrison Faulkner, Jr. (31st W. Sq.) Tracerlab
1st Lt. Nelson A. Lecklikner, Signal Corps - Signal Corps Acoustics
Cmdr. H. L. Miller, USN - ONR Project Officer, Project FITZWILLIAM
Lt. (jg) J. C. DeFelice - ONR Asst. Project Officer, Project FITZWILLIAM

NRL Balloon Team #Three (SCALAR)	NEL
1. Lt. (jg) D. G. Wilson, in charge	T. McMillian (in charge of Project Vector One)
2. J. S. Black, Aer M1/c	
3. H. E. Ercue, AET M1/c	D. B. McRae
4. W. H. Humke, S1/c	J. L. Leonard
5. J. H. Montgomery, S1/c	B. V. Carlson
6. W. C. Shafer, S1/c	T. F. Thomas
7. C. E. Clark, RM3/C	
8. G. A. Kohrman, RM3/c	

Lt. Cmdr. R. G. Gleeson, USN - Fleet Weather Center Pearl - Temp. Add. Duty on CINCPAC staff as FITZWILLIAM Liaison Officer.

STATION NAME & INDEX NO. (Cont'd)
Hawaii (Hickam) (4-998 & 4-999)

OPERATING PERSONNEL (Cont'd)

Mr. James A. Peoples	Watson	Conditional
Mr. Albert Crary	"	
Mr. John W. Alden	"	
Mr. John A. Moulden	"	
Mr. Joseph B. Olsen	"	
Mr. Peter H. Wyckoff	"	Conditional
Mr. Chas. S. Schneider	NYU	
Mr. Murray Hackman	"	
Mr. James R. Smith	"	
Mr. Martin Koenig	"	
Mr. Chas. Moore Jr.	"	
Mr. Leslie E. Burris, Jr.	Tracerlab	
Mr. John W. Gryder	"	
Miss Joy G. Whitney	"	
Mrs. Mary Jane Barker	"	
Mr. John W. Jones	"	
Mr. Dana W. Atchley, Jr.	"	
Mr. William H. Faulkner, Jr.	"	
Miss Theresa Jane Colson	"	
Mr. Frederick C. Henriques, Jr.	"	
Mr. Wendell C. Peacock	"	
Mr. Donald C. Thompson	"	

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Helena, Montana (5-772)	46 35 N 121 01 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio frequency laboratory automatic counter	Washington to Helena by NATS

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Fairfield-Suisun (5-493).

OPERATING PERSONNEL - N. J. Holter (Holter Research Foundation) (ONR)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Houston (5-243)	29 49 N 25 20 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio frequency laboratory automatic counter	Washington to Houston by Commercial Means

MAINTENANCE - Nearest maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - T. W. Bonner Rice Institute ONR

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Iwo Jima (3-661)	24 47 N 141 19 E	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
[redacted]	[redacted]	[redacted]

MAINTENANCE - Nearest Tracerlab maintenance man stationed [redacted] (3-374) [redacted] 4-892).

OPERATING PERSONNEL - Capt. Francis P. Smith (30th W.S.)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Jaluit (9-041)	05 55 N 169 39 E	Naval Ordnance Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
2	NOL Microbarographs	Washington to Kwajalein by MATS, Kwajalein to Jaluit by AMS.

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Guam (4-892).

OPERATING PERSONNEL - George Robert Lund NOL

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Johnston Island (4-995)	16 55 N 169 30 W	Naval Research Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC ground filter unit	Evans Laboratory to Willow Grove by domestic Willow Grove to Johnston by MATS
1	NRL radiological counter	Washington to Johnston Island by MATS

MAINTENANCE - Nearest Tracerlab maintenance man staticned at Hawaii (4-998).

OPERATING PERSONNEL - Walter J. Keller, Jr. - NRL

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Key West (5-201)	24 40 N 81 48 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio frequency laboratory automatic radiological counter	Washington to Key West by domestic means

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - One officer from Naval Station.

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Kimpo, Korea (3-394)	37 33 N 126 47 E	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL automatic radiological counter	[redacted]

MAINTENANCE - Nearest Tracerlab maintenance man stationed at [redacted] (3-374).

OPERATING PERSONNEL - 1st Lt. Benjamin Walsh (20th W.S.)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Kindley Field (5-926)	32 22 N 64 40 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
2	AMC wrap-around counters	Wright to Kindley by ATC (ID No.BD-USR-1H-2545-AF2)
1	NRL automatic radiological counter	Washington to Wright to Kindley by ATC (ID No. BD-WS-1A-1592-AT3)
1	[redacted]	
14	Airborne filters	Wright to Kindley by ATC (ID No. BD-USR-1H-2412-AF2)

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - Capt. Richard A. Lambie (8th W. Gp.)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Kwajalein 4-968	08 43 N 163 44 E	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC ground filter unit	
4	AMC wrap-around counters	(1) Wright to Kwajalein by ATC (ID No. CP-USR-1H-2541-AF2)
1	NRL automatic radiological counter	Washington to Wright to Kwajalein by ATC (ID No. CPX-US-2H-2693-AF3)
1	AMC ionization chamber	Wright to Kwajalein by ATC (ID No. CP-USR-1H-2437-AF2)
1	AMC microbarograph	
1	AMC sonic balloon equipment	Watson Laboratory to Kwajalein by Watson Aircraft
1	Airborne ionization and potential equipment	
7	Airborne gas sampling equipment	
2	NOL microbarographs	Washington to Kwajalein by ATC
2	NOL seismographs	Washington to Kwajalein by ATC

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Guam (4-982), or Honolulu.

OPERATING PERSONNEL

Maj. H. C. Crim
Lt. R. W. Givens (ORN Project Officer)
Aaron Heller (NOL) in Charge
Zed Robinson (NOL)

James A. Peoples	- Watson		
Albert Crary	- Watson		
John W. Alden	- Watson		
John A. Moulden	- Watson		
Joseph B. Olsen	- Watson		
Peter H. Wyckoff	- Watson		
Charles S. Schneider	- NYU		
Murray Hackman	- NYU		
James R. Smith	- NYU	Lloyd R. Zumwalt	- Tracerlab
Martin Koenig	- NYU	Ronald A. Brightsen	- Tracerlab
Charles Moore Jr.	- NYU	Oscar F. Noss	- Tracerlab
Oliver H. Gish	- Carnegie	Alexander Thomas	- Tracerlab
George W. Waite	- Carnegie	Yoshikazu(NMI)Sakakura	-Tracerlab

STATION NAME & INDEX NO. [redacted] LATITUDE & LONGITUDE [redacted] OPERATING AGENCY Signal Corps

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC microbarograph	[redacted]

MAINTENANCE - Nearest Tracerlab maintenance man stationed [redacted] (3-374)

OPERATING PERSONNEL - 1st Lt. Robert W. Ryan, SC

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STATION NAME & INDEX NO. Los Angeles 5-295 LATITUDE & LONGITUDE 34 03 N 118 17 W OPERATING AGENCY Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio Frequency Laboratory automatic radiological counter.	Washington to Los Angeles by domestic means

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - Carl Anderson - ONR

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Los Alamos (5-270)	35 40 N 105 20 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio frequency laboratory automatic radiological counter	Washingto to Los Alamos by NATS

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - J. W. B. Kellogg, Los Alamos National Laboratory (ONR)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
March Field (5-297)	34 00 N 117 22 N	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC ground filter unit	Evans Laboratory to Tracerlab to Fairfield-Suisun by AWS. Fairfield-Suisun to March Field by AWS.

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - Major Montesue T. Morse

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
		Naval Research Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL ground filter unit	
2	NOL microbarographs and seismographs	" " " "
1	NRL wrap-around counter	" " " "
1	NRL automatic radiological counter	" " " "
1	NRL radiological balloon	" " " "

MAINTENANCE - Nearest Tracerlab maintenance station at Guam (4-892) (3-374).

OPERATING PERSONNEL - Jacob Pomerantz - NOL Technician (TENSOR)
W. R. Cook - NOL Technician (TENSOR)

NRL Balloon Team # Two (SCAIAR)
1. Ens. R. L. Vader, in charge
2. J. J. Adams, S2/c
3. T. E. Campbell, S2/c
4. J. F. Morgen, S2/c
5. R. F. Randalle, S1/c RM
6. H. R. Romig, RM2/c
7. G. A. Wright, Aer M1/c
8. R. L. Parkinson, CETM

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Midway (4-896)	28 15 N 177 25 W	Naval Research Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC ground filter unit	Wright to Moffatt by ATC. Moffatt to Midway by NATS
1	AMC wrap-around counter	" " " " "
1	NRL automatic radiological counter	Washington to Midway by MATS

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Guam (4-892).

OPERATING PERSONNEL - Walter J. Graham (NRL)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Mili (9-055)	05 53 N 172 09 E	Naval Ordnance Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
2	Microbarographs	Washington to Kwajalein by NATS. Kwajalein to Mili by AMS-32 "Pelican"

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Guam (4-892).

OPERATING PERSONNEL - George R. Lund (moves to Jaluit for last test).

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Minneapolis, Minn. (5-658)	44 59 N 93 17 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio Frequency Laboratory automatic radiological counter	Wright to Minneapolis by domestic means

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - Dr. J. T. Tate (University of Minnesota)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Nome, Alaska (5-987)	64 31 N 165 26 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL automatic radiological counter	Washington to Fairfield-Suisun by MATS. Fairfield-Suisun to Nome by AWS

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - 1st. Lt. Gordon L. Jacks (7th Weather Group)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
[redacted]		Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL automatic radiological counter	[redacted]

MAINTENANCE - Nearest Tracerlab maintenance man stationed at [redacted]

OPERATING PERSONNEL - Capt. W. R. Freeze (15th Weather Squadron)

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Palau (7-891)	07 26 N 134 28 E	Naval Ordnance Laboratory Naval Research Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
2	NOL microbarographs	[redacted]
1	NRL radiological counter	

MAINTENANCE - Nearest Tracerlab maintenance man stationed at [redacted]

OPERATING PERSONNEL - Kenneth Stanley Bonnit (NOL)
Derrill Joseph Bordelon (NOL)
Waldo E. Whybrew (NRL)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Princeton (5-409)	40 20 N 74 40 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio Frequency Laboratory automatic radiological counter	Washington to Princeton by domestic means

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - John A. Wheeler, University of Princeton

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Red Bank (5-502)	40 21 N 74 07 W	Signal Corps

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC ground filter unit	In place.
1	SC microbarograph	

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass.(5-509)

OPERATING PERSONNEL - Capt. John M. Brittain (Signal Corps)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Rongerik (4-934)	11 03 N 167 45 E	Naval Research Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL ground filter unit	Washington to San Diego by NATS. San Diego to Kwajalein by DMS-32. Kwajalein to Rongerik by AMS-16
1	NRL wrap-around counter	Washington to San Diego by NATS. San Diego to Kwajalein by DMS-32. Kwajalein to Rongerik by AMS-16
1	NRL automatic radiological counter	Washington to San Diego by NATS. San Diego to Kwajalein by DMS-32. Kwajalein to Rongerik by AMS-16
1	NRL radiological balloon	Washington to San Diego by NATS. San Diego to Kwajalein by DMS-32. Kwajalein to Rongerik by AMS-16

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Guam (4-892).

OPERATING PERSONNEL

NRL Balloon Team # One (SCAIAR)

1. Ens. G. D. Robertson, in charge
2. D. L. Hoffman, S1/c
3. W. J. Janik, S1/c
4. Joseph Ochmanski, S1/c
5. R. G. Reese, RM3/c
6. J. W. Thomas, Jr., Aer M1/c
7. M. G. Verschoore, RM3/c
8. G. J. Dodd, CETM

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
8 Roving Ships (9-064 thru 9-071)	8 ships scattered between San Francisco and Shanghai	Naval Research Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
5 to 8	AMC ground filter units	
5 to 8	AMC wrap-around counters	
8	AMC radiological counters	

MAINTENANCE - Nearest Tracerlab maintenance man stationed [redacted] (3-374).

OPERATING PERSONNEL -

Warren L. Christianson	NRL #1
John E. Malone	NRL #2
Phillip D. Simpe	NRL #3
Edward J. Pember	NRL #4
Gene O. Whetzel	NRL #5
Herbert G. Schafer	NRL #6
Richard D. Arnold	NRL #7
Joseph K. Burton	NRL #8

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
San Diego, Calif.(5-290)	32 41 N 117 08 W	Naval Electronics Lab.

INSTRUMENTS

No.	Name	Transportation & Identification
1	NRL microbarograph	Reiber Laboratory to San Diego by NATS

MAINTENANCE - Nearest maintenance station at San Diego

OPERATING PERSONNEL

Comdr. R. R. Bradley	ONR Project Officer
Dr. Alfred B. Focke	In charge
W. P. Mitchel	(Vector 13)
L. H. Walden	
L. R. Padberg	
R. L. Waddie	
F. L. Tignor	

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
San Francisco, California (5-494)	37 48 N 122 25 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio Frequency Laboratory automatic radiological counter	Wright to San Francisco by domestic means

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL

Capt. R. O. Myers	ONR Project Officer
Robert Brode	ONR Observer

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Seattle, Washington (5-793)	47 36 N 122 21 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio Frequency Laboratory automatic radiological counter	Washington to Seattle by domestic means

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL

J. E. Henderson (ONR)

Operation FITZWILLIAM - Annex "C" 20 March 1948

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Shemya (5-549)	52 43 N 174 07 E	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
2	AMC wrap-around counters	Wright to Shemya by ATC (ID No. AL-USR-1H-2543-AF3)
1	[redacted]	Wright to Shemya by ATC

MAINTENANCE - Nearest Tracerlab maintenance man stationed [redacted] (3-374).

OPERATING PERSONNEL - Lt. T. A. Hope (7th W. Gp.)

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	
Spokane, Washington (5-785)	47 39 N 117 26 W	Air Weather Service

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC ground filter unit	Wright to Spokane by domestic ATC
1	AMC wrap-around counter	Wright to Fairfield-Suisun by ATC. Fairfield-Suisun to Spokane by AWS.
1	[redacted]	

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - Lt. J. E. Kuchenbecker

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
St. Louis, Missouri (5-434)	38 39 N 90 13 W	Office of Naval Research

INSTRUMENTS

No.	Name	Transportation & Identification
1	Radio Frequency Laboratory automatic radiological counter	Washington to St. Louis by domestic means

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Boston, Mass. (5-509).

OPERATING PERSONNEL - Robert Sard, University of Washington

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STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Truk (4-971)	07 25 N 151 51 E	Naval Research Laboratory Naval Ordnance Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC ground filter unit	Wright to Moffatt by ATC. Moffatt to Truk by NATS
1	AMC wrap-around counter	Wright to Moffatt by ATC. Moffatt to Truk by NATS
1	NRL automatic radiological counter	Washington to Kwajalein by NATS. Kwajalein to Truk by NATS.
2	NOL microbarographs	Washington to Kwajalein by NATS. Kwajalein to Truk by NATS.

MAINTENANCE - Nearest Tracerlab maintenance man located at Guam (4-892) [redacted]

OPERATING PERSONNEL

Jay Pheeps Leary	NOL
Robert Kenneth Fox	NOL
Neil L. Davis	NRL

STATION NAME & INDEX NO.		LATITUDE & LONGITUDE		OPERATING AGENCY
Ujae	(9-073)	07 55 N	165 45 E	Naval Ordnance Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
2	NOL microbarographs	

MAINTENANCE - Nearest Tracerlab maintenance man stationed at Kwajalein (4-968).

OPERATING PERSONNEL

Robert F. King NOL

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STATION NAME & INDEX NO.		LATITUDE & LONGITUDE		OPERATING AGENCY
Ulithi	(7-045)	10 05 N	139 43 E	Naval Research Laboratory

INSTRUMENTS

No.	Name	Transportation & Identification
1	SC ground filter unit	
1	NRL automatic radiological counter	Washington to Ulithi by NATS

MAINTENANCE - Nearest Tracerlab maintenance man located at Guam (4-892).

OPERATING PERSONNEL

William J. Rosch NRL

Operation FITZWILLIAM - Annex "C" 20 March 1948

STATION NAME & INDEX NO.	LATITUDE & LONGITUDE	OPERATING AGENCY
Wake Island (4-495)	19 54 N 166 33 E	Weather Bureau

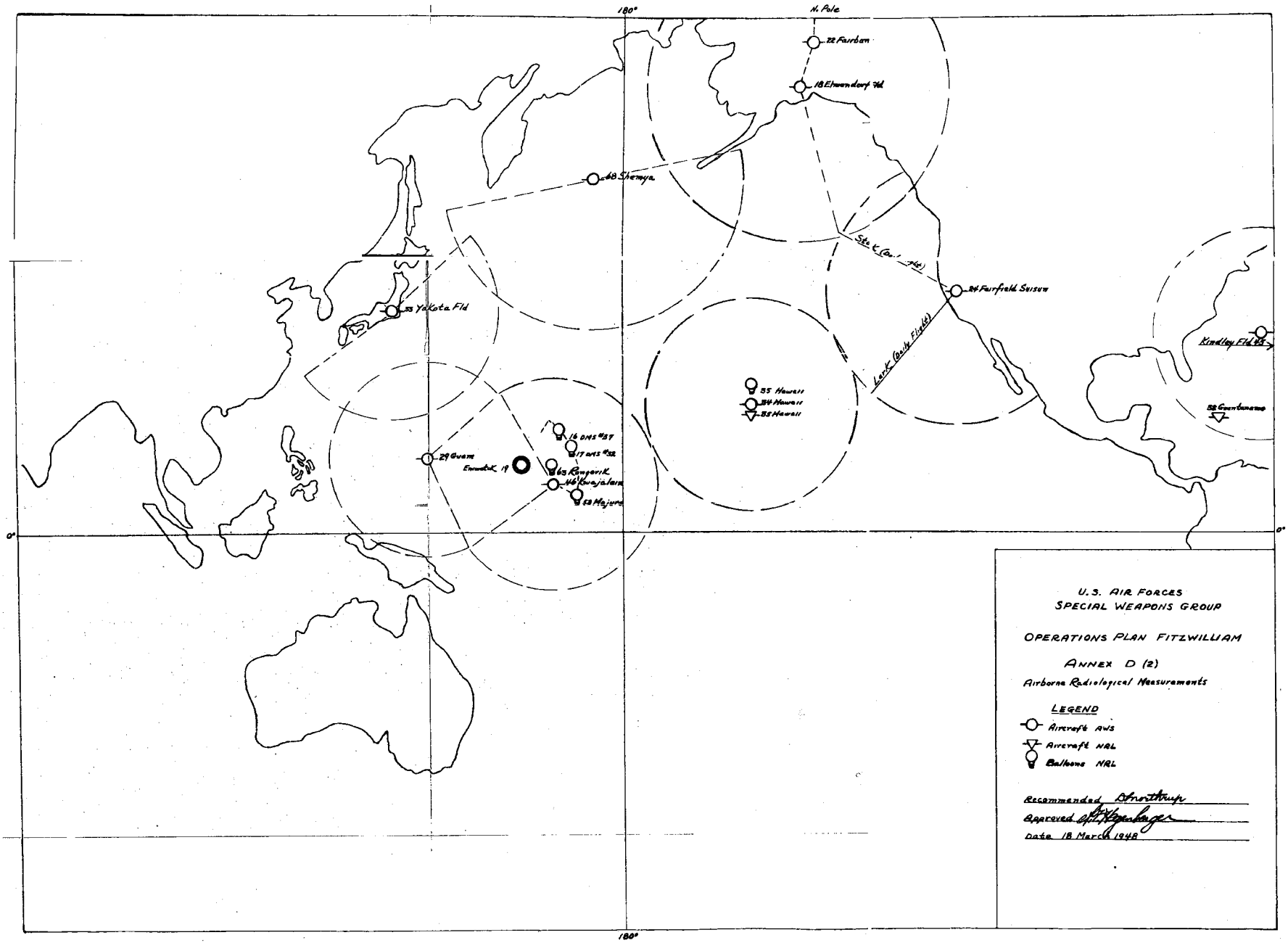
INSTRUMENTS

No.	Name	Transportation & Identification
1	AMC ground filter unit	Wright to Kwajalein by ATC. Kwajalein to Wake by JTF-7.
1	AMC wrap-around counter	Wright to Kwajalein by ATC. Kwajalein to Wake by JTF-7.
1	NRL automatic radiological counter	Washington to Wright by ATC. Wright to Kwajalein by ATC. Kwajalein to Wake by JTF-7.

MAINTENANCE - Nearest Tracerlab maintenance man located at Guam (4-692).

OPERATING PERSONNEL - Capt. H. C. Brill (W. Bur.)

ANNEX D: Pages D-1, D-3, and D-4 DELETED.


180°
N. Pole
22 Fairbanks
18 Elmendorf Fld
68 Shemya
Ste E (Ca. 1944)
24 Fairfield Suisun
33 Yokota Fld
Lark (Early Flights)
Kindley Fld
55 Hawaii
54 Hawaii
55 Hawaii
58 Guantanamo
16 DNS #37
17 DNS #32
29 Guam
Eniwetok 19
63 Roi-Namur
46 Kwajalein
53 Majuro
0°
0°
180°
U.S. AIR FORCES
SPECIAL WEAPONS GROUP
OPERATIONS PLAN FITZWILLIAM
ANNEX D (2)
Airborne Radiological Measurements
LEGEND
Aircraft AWS
Aircraft NRL
Balloons NRL
Recommended Ashworth
Approved Lt. Wyenberger
Date 18 March 1948

D-2

OPERATION FITZWILLIAM

ANNEX "E"

SECURITY PLAN

REFERENCES: AR 380-5; AAF letter 46-22, dated 27 June 1946; AAF letter 46-22A, dated 5 May 1947; AAF letter 46-24 dated 10 March 1947; Amendment, AF letter 46-24A, dated 24 October 1947; Atomic Energy Act of 1946.

20 March 1948

1. Personnel Security Clearances.

a. Security clearances required for personnel engaged in Operation FITZWILLIAM will be in general as prescribed in the cited references or in the comparable U. S. Navy regulations.

b. Participating agencies are responsible for obtaining personnel security clearances for their personnel and for coordinating the clearance status of their personnel with Security Officer, AFMSW-1.

c. Personnel will be cleared at the level necessary for the handling of classified material necessary to the performance of the allotted job assignment. The granting of a security clearance at a certain level authorizes the person so cleared to have access to only such material, classified at or below the level of his security clearance, as is necessary in the job assignment.

2. Classification of correspondence, data, and equipment.

a. Classification of correspondence and data as "Restricted Data" will be determined in accordance with the cited references, especially AAF Letters 46-22 and 46-22a.

b. Equipment used on FITZWILLIAM is, of itself, unclassified but as used will be classified Military "Restricted".

c. Data not connected by time, place, or purpose with Operation SANDSTONE or FITZWILLIAM, will, in general, be classified Military "Restricted". The establishment of any connection of data with the two above operations will immediately result in the necessity for higher classification and more secure handling.

d. The handling and classification of gas samples and significant filters for radio-chemical analysis is prescribed in a separate detailed plan sent only to those addressees directly concerned with such samples and filters.

e. Filters below the level of significant and held at stations will be classified "Restricted".

3. Code Words.

a. The code word FITZWILLIAM is classified "Secret" and will be so handled. If connected with the purpose of FITZWILLIAM the code word and accompanying data or correspondence will be classified military "Top Secret" and so handled. In general, the code word FITZWILLIAM will not be used in connection with its purpose.

b. Code words cited in inclosure 5, Communications Plan, Annex I, will be handled as military "Restricted" when used solely for the intended purpose, and in no way ostensibly connected with FITZWILLIAM or its purpose.

4. The security of time signals for AFMSW-1 participation in Operation SANDSTONE will be maintained through close adherence to Annex "F" and the directives cited therein pertaining to such signals and through the restriction of knowledge of such signals to personnel requiring them in the actual performance of their duties. Personnel receiving such signals will be "Q" cleared.

6. a. For security reasons, the Logistics Plan, Annex "B" to this operations plan, should be detached and forwarded to stations not requiring the entire plan.

b. A single station sheet in the Station List, Annex "C", may be detached and down-graded to military "Confidential" for forwarding to the individual station named on such single station sheet.

c. Many stations will not have personnel cleared for receipt of military "Top Secret" information. Therefore, the entire operations plan or the parts of it classified "Top Secret" is not to be sent to such stations.

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OPERATION FITZWILLIAM

ANNEX "F"

TIME NOTIFICATION PLAN

20 March 1948

1. General. It is of the utmost importance that the time at which explosions are to occur be known only to those individuals whose duties make it imperative that they have such knowledge. No persons directly engaged in Operation FITZWILLIAM at FITZWILLIAM stations will require knowledge of the exact time of any explosion, in advance of the explosion. However, because of the nature of the projects and the characteristics of the equipment, the stations listed in paragraph 2a. and 2d. below will require time notification signals. For this purpose a series of time warnings and a final notification of the approximate times of explosions will suffice.

2. Time Notifications - Pacific Area.

a. Joint Task Force Seven has prepared, and the Army Security Agency USARPAC has distributed, a cryptographic system for notifying appropriate overseas FITZWILLIAM stations of the approximate timing of the explosions. The Key List of this Timing Signal Encryption System (short title ARPACAS 3-1) will be furnished to one individual (with "Q" clearance or for whom a "Q" clearance has been initiated) at each of the following stations:

(1) Truk (two NOL stations)
(2) Bikini (two NOL stations)
(3) Ailinglapalap (two NOL stations)
(4) Mili (two NOL stations)
(5) Jaluit (two NOL stations)
(6) U.S.S. Quick (one NRL station)
(7) Palau (two NOL stations)
(8) Kwajalein (two NOL stations)
(9) Kwajalein (one AMC balloon station)
(10) Ujae (two NOL stations)
(11) Eniwetok (two NOL stations)
(12) U.S.S. Davison (one NRL station)
(13) Majuro (two NOL stations)
(14) Majuro (one NRL station)
(15) Pearl Harbor (one NEL station and one NRL station)
(16) Rongerik (one NRL station)
(17) Guam (one NEL station)

b. Joint Task Force Seven will broadcast ARPACAS 3-1 on the following frequencies:

(1) 6.490 megacycles
(2) 11.305 megacycles
(3) 17.865 megacycles

Agencies participating in FITZWILLIAM will provide suitable radio receivers and personnel capable of copying and translating Morse Code transmitted (repeatedly) at a very slow rate. No part of the broadcast concerned with ARPACAS 3-1 will be rebroadcast under any circumstances.

c. In addition to ARPACAS 3-1, Joint Task Force Seven will broadcast continuously a series of one second time signals. This broadcast will be transmitted on frequencies of 6.375 and 10.665 megacycles.

d. Project Officer, FITZWILLIAM, will coordinate arrangements for making time notifications available to the following special projects:

(1) U.S.C.& G.S. seismographic project - Eniwetok

(2) A.M.C. ionospheric measurements - Eniwetok

(3) [redacted] - Eniwetok

(4) Air Weather Service recording magnetometer - Eniwetok

(5) [redacted] - Guam

3. Time Notification - Continental United States.

a. Commander Air Forces, Joint Task Force Seven, has prepared a special system for notifying appropriate FITZWILLIAM stations in the Continental United States of the approximate timing of the explosions. The system consists of two parts as follows:

(1) System for keeping the Chief, AFMSW-1, informed of the timing.

(2) System by which the Chief, AFMSW-1, can notify appropriate stations when to start observations.

The stations involved are:

(1) Naval Ordnance Laboratory, White Oak, Maryland

(2) Detachment, Watson Lab, AMC, Alamogordo, N.M.

(3) Naval Electronics Laboratory, San Diego, Calif.

b. The Chief, AFMSW-1, will be kept informed of the timing of explosions by a series of TOP SECRET messages initiated by Project Officer, FITZWILLIAM, on the staff of Commander Air Forces, Joint Task Force Seven. Such messages will be addressed to Chief, Special Weapons Group, DCS/Materiel, Hq., U.S. Air Force, for Hegenberger, and will be given a precedence of Operational Priority. The prearranged code for this purpose will be known only to the following individuals:

(1) Commander Air Forces, Joint Task Force Seven

(2) Project Officer, FITZWILLIAM, and one assistant

(3) Chief, Deputy Chief, and Executive Officer, AFMSW-1

c. Promptly upon receipt by Chief, AFMSW-1, of the time at which an explosion has occurred, designated individuals (with "Q" clearance or for whom a "Q" clearance has been initiated) will be advised by telephone and TWX of the time at which observations should be begun. The prearranged code for this purpose will be known only to the following individuals:

(1) Chief, Deputy Chief, and Executive Officer, AFMSW-1

(2) One representative and one alternate, ONR.

(3) Two designated individuals at each of the three stations listed above.

* * * * * * * * * * *

OPERATION FITZWILLIAM

ANNEX "G"

REPORTING PLAN

20 March 1948

1. General. Reports will be submitted to Chief, Special Weapons Group, (AFMSW-1), Hq. USAF, by participating agencies in accordance with instructions contained herein.

2. Reporting Agencies:

a. Department of the Navy.

(1) Office of Naval Research
(2) Naval Research Laboratory
(3) Naval Ordnance Laboratory
(4) Naval Electronics Laboratory

b. Department of the Air Force

(1) Air Weather Service
(2) Tracerlab, Inc.
(3) Watson Laboratories

c. Department of the Army.

(1) Evans Signal Laboratory

3. Schedule

a. Dispatch reports.

(1) Radiological stations:

(a) Balloon stations will forward by airmail within four (4) days after each explosion a report of any significant results.

(b) Aircraft filter stations, ground filter stations, and automatic Recording Counter stations will report observed data every twelve (12) hours, beginning as soon as the station is established and in operation. See Communications Plan, Annex I, for standard messageforms and procedure and Standard Operating Procedure for Radiological Observation Stations, Annex "K".

(2) Sonic stations:

(a) Sonic stations will forward by airmail not later than four (4) days after each explosion, a report of the amplitude, signal-to-noise ratio, and signal interval of each significant signal.

(3) Seismic stations:

(a) Seismic stations will forward by airmail within four (4) days after the event a report of amplitude, signal-to-noise ratio, and signal interval of significant events.

(4) The Atmospheric Conductivity Group will forward by airmail within four (4) days after each atomic firing a report of the time, location and amplitude of the atmospheric electric perturbations, together with the estimated average background.

(5) "Fitzwilliam Forward" will forward by airmail a report of the results obtained on the recording magnetometers and ionospherograph within four (4) days of the event.

b. Interim reports: Each participating agency will submit an interim written report to include all available facts and an "on the spot" analysis not later than thirty (30) days following the last atomic explosion.

c. Final Reports: Participating agencies will submit final reports of FITZWILLIAM tests, to include original records, not later than four (4) months following the last atomic explosion.

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OPERATION FITZWILLIAM

ANNEX "H"

ROLL-UP - FITZWILLIAM

20 March 1948

1. Personnel:

a. Each participating agency will be responsible for proper disposition of personnel (assigned or attached) involved under its supervision in FITZWILLIAM.

2. Disposition of property:

a. Each participating agency will be responsible for disposition of supplies and equipment under its control in accordance with regulations and instructions of the military service to which the property belongs. AEC property being returned to Fairfield-Suisun Air Base will be addressed to Air Freight Terminal, Air Transport Command, Fairfield-Suisun Air Base, California, Attention: C.O. 308th Air Weather Reconnaissance Group.

b. All stations will carefully preserve packing boxes and crates for reshipment of the instruments to the designations indicated, upon completion of Project FITZWILLIAM.

c. All instruments and apparatus will be plainly marked with the list and index number which corresponds to the station at which they are operated. In the event that there are duplications of instruments at any one location, they will carry the suffix "a", "b", "c", etc. The list number is the first integer and the index number is the next three integers of the station identification as it appears under the column headed "Index", inclosure 1 to this Annex. Inclosure 1 lists the stations and instruments which will be retained to operate as an interim net. Inclosure 2 lists the present location of instruments which will be stored pending further instructions. These instruments will be stored at Fairfield-Suisun Air Base, California, or will be returned to the agencies from whence they originated, as indicated in the final column of inclosure 2.

d. In general, radiological instruments listed in inclosure 2 will be stored at Fairfield-Suisun Air Force Base. All other instruments and apparatus will be returned to the originating agencies. Exceptions will be:

(1) Any unused radiological balloons and their associated equipment will be returned to their originating agency.

(2) Equipment at station Index No. 4-999, (operating agency, NRL, located at Pearl Harbor), will be transferred from NRL to Air Weather Detachment, Hickam Field, for participation in the interim net.

3. Records:

a. Participating agencies are responsible for proper disposition of records pertaining to project FITZWILLIAM.

4. Detailed Plans of Participating Agencies:

a. Participating agencies will furnish to AFMSW-1 by 20 April 1948 a draft of detailed plans for roll-up, conforming to the general instructions given in this Annex, for incorporation in a revision of this Annex.

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HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

FITZWILLIAM AGENCIES IN MARSHALL ISLANDS AREA

Annex, "A" to Operations Order No. 1

1. Department of the Air Force.

   (a) Air Weather Service.
   (b) Air Materiel Command.

2. Department of the Army.

   Signal Corps.

3. Department of the Navy.

   a. Office of Naval Research.
      Naval Research Laboratory.

   b. Naval Ordnance Laboratory.

4. U. S. Coast and Geodetic Survey.

	ANNEX	ANNEX COPY NO.	ORDER COPY NO.
Air Weather Officer, ENIWETOK	E	1 & 2	26 & 27
AMC Sonic Rep., KWAJALEIN	F	1	28
ONR Representative, KWAJALEIN	G&H	1	29
NRL Representative, KWAJALEIN	G	1 to 5 incl.	30 - 34 incl.
NOL Representative, KWAJALEIN	H	1 to 10 incl.	35 - 44 incl.
NOL Representative, KWAJALEIN	E	3 & 4	
SC Representative, ENIWETOK	I	1	45
C&GS Representative, ENIWETOK	J	1	46
Air Weather Officer, KWAJALEIN	D	1 to 5 incl.	48 thru 52

Copy No. 48 to have Appendices I thru IV inclusive.
Copy No. 49 to have Appendix I.
Copy No. 50 to have Appendix II.
Copy No. 51 to have Appendix III.
Copy No. 52 to have Appendix IV.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

DUTIES OF HEADQUARTERS FITZWILLIAM FORWARD

Annex "C" to Operations Order No. 1

1. The following duties will be performed by HEADQUARTERS FITZWILLIAM FORWARD in addition to those listed in paragraph 3, basic Operations Order No. 1.

2. FITZWILLIAM FORWARD officer aboard the USS MOUNT McKINLEY will:

a. Direct Commanding Officers of appropriate Air Weather Service reconnaissance units to move aircraft with radiological filters, from home base to FITZWILLIAM stations in accordance with AWS Plan Doubleday.

	Unit	Home Base
(1)	374th VLR Recon. Sqdn. (W)	Fairfield-Suisun, California
(2)	375th VLR Recon. Sqdn. (W)	Fairfield-Suisun, California
(3)	514th VLR Recon. Sqdn. (W)	North Field, Guam

b. Issue instructions, based on the predictions of the Meteorological Officer, JTF-7, to appropriate units, listed below, to vector their aircraft toward the radiological cloud. Release aircraft to home bases in accordance with the requirements and progress of OPERATION FITZWILLIAM.

	Unit	Operation Base
(1)	374th VLR Recon. Sqdn. (W)	Barbers Point, T. H.
(2)	375th VLR Recon. Sqdn. (W)	Shemya, Alaska
(3)	514th VLR Recon. Sqdn. (W)	Kwajalein, Marshall Islands (and as required)

c. Vector Destroyer-Mine-Sweepers QUICK and DAVISON, under operational control of CTG 7.3, to positions to insure maximum probability of intercepting the radiological cloud with balloon-borne radiological counters.

d. Inform NRL FITZWILLIAM stations on the two DMS's and at RONGERIK, MAJURO, and PEARL HARBOR when to launch balloons.

3. FITZWILLIAM FORWARD officer on ENIWETOK ISLAND will be responsible for:

a. Issuing instructions that will cause the proper encoded time signals, for FITZWILLIAM stations, to be put on the automatic keying device at the JTF-7 Communications Center on ENIWETOK ISLAND.

(1) Send dummy three-letter code groups (with random periods of silence) on 6490, 11305 and 17865 kilocycles.

(2) Send significant three-letter code groups on same frequencies giving warnings of seven (7) days, twenty-four (24) hours, four (4) hours, two (2) hours and ten (10) minutes ("Start your Program") before SANDSTONE atomic explosions and, in case of cancellation of the shot, send "Stop your Program".

(3) The Key List of the Timing Signals Encryption System (short title ARPACAS 3-1) has been furnished to one (1) individual at each of the following stations:

(a) TRUK (two (2) NOL stations)
(b) BIKINI (two (2) NOL stations)
(c) AILINGLAPALAP (two (2) stations)
(d) MILI (two (2) NOL stations)
(e) JALUIT (two (2) NOL stations)
(f) USS QUICK (one (1) NRL station)
(g) PALAU (two (2) NOL stations)
(h) KWAJALEIN (two (2) NOL stations)
(i) KWAJALEIN (one (1) AMC balloon station)
(j) UJAE (two (2) NOL stations)
(k) ENIWETOK (two (2) NOL stations)
(l) USS DAVISON (one (1) NRL station)
(m) MAJURO (two (2) NOL stations)
(n) MAJURO (one (1) NRL station)
(o) PEARL HARBOR (one (1) NEL station and one (1) NRL station)
(p) RONJERIK (one (1) NRL station)
(q) GUAM (one (1) NEL station)
(r) GUAM (one (1) Signal Corps station)

b. Emergency Evacuation.

(1) Making arrangements with the proper authorities for the emergency evacuation of FITZWILLIAM FORWARD personnel from either or both ENIWETOK and/or PARRY ISLANDS in the event that it becomes necessary to evacuate stand-by personnel from either or both of the islands after an atomic explosion.

(2) Furnishing instructions to FITZWILLIAM FORWARD personnel on ENIWETOK and PARRY ISLANDS concerning their evacuation in case of an emergency.

(3) Controlling the activities and location, with respect to his emergency evacuation plans, of all FITZWILLIAM FORWARD personnel on ENIWETOK ISLAND during X, Y and Z-days.

(4) Insuring, in case emergency evacuation of ENIWETOK is ordered by Commander Task Group 7.2, that all FITZWILLIAM FORWARD personnel are reported to Air Base Commander, for air evacuation.

4. Officers of Headquarters FITZWILLIAM FORWARD will start collecting data from FITZWILLIAM stations and agencies immediately following atomic explosions, and will be present at processing of same and will render reports as follows:

a. ENIWETOK.

(1) Naval Ordnance Laboratory, (NOL) collect sonic and seismic tapes from NOL agent in charge of stations on ENIWETOK ISLAND and on USS BIAROKO, see that tapes are properly marked, receipt for same, deliver them to ONR representative at KWAJALEIN for transmittal to NOL, White Oaks, Maryland, and obtain receipt for same.

(2) Coast and Geodetic Survey (C&GS) arrange liaison aircraft transportation for Chief C&GS team to visit his stations on islands of atoll, obtain film tapes from seismographs, and deliver same to Headquarters FITZWILLIAM FORWARD. An officer of Headquarters FITZWILLIAM FORWARD will accompany the Chief C&GS team to KWAJALEIN where he will be present at Naval Photographic Laboratory when Chief C&GS team develops the data film. This officer will:

(a) Assure that no copies are made of the film.

(b) Assure that no unauthorized persons see the film.

(c) Assure that the Chief, Coast & Geodetic Survey Team sees film and takes necessary "Secret" notes thereon.

(d) Make out a certificate for file in Headquarters FITZWILLIAM showing:

(1) Who developed film.
(2) Who was present during developing.
(3) Who saw developed film.
(4) That no copy was made of the film.
(5) Date, time and place of developing.

(3) Air Weather Service (AWS). Collect magnetometer tapes from Air Weather Service Officer at ENIWETOK, see that tapes are properly marked, receipt for same, classify military "Top Secret", package and transmit to Chief AFMSW-1 by courier.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY AIR WEATHER OFFICER, KWAJALEIN

Annex "D" to Operations Order No. 1

1. Authority.

Per direction of the Chief, Air Weather Service, Headquarters, U. S. Air Force, the Air Weather Officer at KWAJALEIN is responsible for providing facilities to the following listed stations or teams on KWAJALEIN:

a. AWS ground level station (see Appendix I) equipped with:

(1) Ground filter unit.
(2) [redacted]
(3) Automatic radiological recording counter.
(4) Wrap-around Geiger counters.

b. Tracerlab team (see Appendix II) equipped with:

(1) Field laboratory to analyze up to five hundred (500) radioactive filter samples per day.
(2) Ionization chamber.

c. 514th Long Range Air Weather Reconnaissance Squadron (see Appendix III) equipped with:

(1) Airborne filter installed in B-29 type aircraft.
(2) Gas sampling tanks and high pressure pumps installed in B-29 type aircraft.

d. AWS atmospheric conductivity team equipped with a B-29 type aircraft having apparatus for simultaneously measuring the atmospheric conductivity and voltage gradient. See Appendix IV.

2. General.

The Commanding Officer of the 31-8 AWS Detachment, KWAJALEIN will be responsible for the operation of the station listed in paragraph 1, above, for the duration of the FITZWILLIAM program.

3. Specific.

a. Code-word.

The military restricted code-word shipping designator for AWS participation is FIRSTRATE, and for the purposes of this order is used to refer to the AWS project. The word FIRSTRATE will not be ostensibly connected in any way with FITZWILLIAM or its purpose.

b. Reporting.

The Commanding Officer of the 31-8 AWS Detachment at KWAJALEIN will render weekly report to Chief, Air Weather Service, with information copy to Commanding Officer, 43rd Weather Wing, as of 2400Z each Wednesday covering status of all equipment listed in paragraph 1 above. This report is in addition to those emanating from stations per attached appendices.

4. Roll-up. Upon completion of their participation in the FITZWILLIAM program following Z-day, the organization and teams listed under paragraphs 1.a, 1.b, 1.c and 1.d, above, will roll-up their operating locations in accordance with the instructions listed below and in the pertinent Appendices to this Annex.

a. AWS Ground Level Station -- see paragraph 4.c, Appendix I to Annex "D" (Change No. 2, dated 4 May 1948).

b. Tracerlab Team -- see paragraph 4.c, Appendix II to Annex "D" (Change Nos. 2, dated 4 May 1948).

c. 514th VLR Recon. Sqdn. (Weather) -- see Paragraph 4.a, Appendix III to Annex D (Change No. 2, dated 4 May 1948).

d. Atmospheric Conductivity Team -- see paragraph 4.c, Appendix IV to Annex "D" (Change No. 2, dated 4 May 1948).

e. The Air Weather Officer, KWAJALEIN, will make the necessary arrangements for the roll-up of the personnel and equipment listed under paragraphs 4.a and 4.b, above and for the roll-up of the Gas Sampling Equipment of the 514th VLR Recon. Sqdn. (Weather).

f. The A-4, Task Group 7.4, has agreed to provide assistance, upon the the request of the Air Weather Officer, KWAJALEIN, in arranging for space reservations and air priorities for the personnel and equipment included under paragraph 4.e, above, and in arranging for the recrating and shipment of this equipment.

Appendices:

I Participation by Ground Level Station.
II Participation by Tracerlab team.
III Participation by 514th Long Range Air Weather Reconnaissance Squadron.
IV Participation by Atmospheric Conductivity team.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY GROUND LEVEL STATION, KWAJALEIN

Appendix I to Annex "D", Operations Order No.1

1. Authority. The Chief, Air Weather Service, Headquarters U.S. Air Force, has established a ground level station equipped with a ground filter unit, [redacted] four (4) wrap-around Geiger counters and an automatic radiological counter.

2. General.

a. The AMC ground filter unit is a dust sampling device that catches micron particles on filter paper.

[redacted]

c. The wrap-around Geiger counters are used to check the action of ground exposed filters, precipitation filters and airborne filters.

d. The automatic radiological counter is a background counting device for recording radiation level at station.

3. Specific.

a. Equipment.

(1) The ground filter is a dust sampling unit incorporating a twenty (20) horsepower driving motor and blower combination. It has an air sampling capacity of 1,300 cubic feet per minute when using V-5 Chemical Warfare filter paper capable of stopping one (1) micron particles. The unit is supplied with a scale of sixty-four (64) counter with message register and interpolation lights operating on a Beta counter with an Aqua-dag-coated anode and a thin window.

(2) [redacted]

(3) The automatic radiological counter is pulsed by seven (7) Geiger tubes through an anti coincidence circuit (to minimize cosmic count) driving an Esterline-Angus recorder.

(4) The wrap-around Geiger counter is composed of one (1) electronics scale shielded with lead chamber unit with a thin wall Geiger counter capable of measuring Beta particles of about 0,1 Vex. energy.

b. Maintenance.

(1) Will be performed locally by FIRSTRATE project officer and such Tracerlab personnel as have technical ability to assist him.

(2) If the work is beyond the capabilities of FIRSTRATE personnel at KWAJALEIN, a maintenance repair man will be requested from Tracerlab at Hickam Field.

(3) A daily log will be kept on maintenance.

c. Calibration. All instruments will be calibrated every twelve (12) hours, and calibrations recorded.

d. Data Collection.

(1) The filter paper in the ground filter unit will be changed every hour, and a count will be run on the exposed paper.

(2) [redacted]

(3) Data will be compiled from the automatic radiological counter every twelve (12) hours, and coded for transmission.

(4) Airborne filter units will have counts run on them as soon as delivered to the ground level station by the 514th Long Range Air Weather Reconnaissance Squadron (Task Unit 7.4.4).

(5) All filter papers having a radiological count of twice or more background count will be analyzed in the field laboratory at KWAJALEIN.

e. Reporting.

(1) Calibration reports will be marked "Secret" and submitted once weekly to Tracerlab at Hickam Field, retaining a copy in the station file.

(2) Maintenance logs will be maintained at the station and turned in to Tracerlab at Boston, Mass. upon completion of Operation FITZ-WILLIAM.

(3) Data collected will be reported per AACS instructions to FIRSTRATE project officer as follows:

(a) From the ground filter unit and from automatic radiological counter code to WXIA, AACS, Washington, D. C. every twelve (12) hours.

(b) [redacted] letter to Tracerlab at Hickam Field once a week.

(c) From airborne filters by special code to WXIA, AACS, Washington, D. C. as soon as counts have been run and compiled following a flight.

(4) All records and reports pertaining to the Ground Level Station will be recorded, filed and referred to under index number 4-968 which is the international meteorological code designation of the Air Weather Station at KWAJALEIN.

Logistics. The AWS has provided airlift for equipment and instruments LEIN.

Administration. The ground level station is manned by one (1) officer attached for administration to the 31-8 AWS Detachment -KWAJALEIN.

Roll-up. Upon completion of the Ground Level Station's participation in the FITZWILLIAM program following 2-day, personnel and equipment will be returned to the Zone of the Interior.

1) Personnel. Personnel will be returned to their proper stations by air under arrangements that will be made by the Air Weather Officer, KWAJALEIN.

2) Equipment. Equipment will be recrated and shipped by air to the proper station by Ground Level Station personnel under arrangements that will be made by the Air Weather Officer, KWAJALEIN.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY TRACERLAB AT KWAJALEIN

Appendix II to Annex "D", Operations Order No. 1

1. Authority. Tracerlab under contract to AMC through Watson Laboratories has established a radiological analysis field laboratory and set up a high sensitivity ionization chamber at KWAJALEIN.

2. General.

a. Ionization chamber measures and records the background air ionization and cosmic showers.

b. Laboratory facilities are used to separate fission samples from contaminated filter paper and analyze their activity; also separate elements and determine what they are by means of their counting rates.

3. Specific.

a. Equipment.

(1) The ionization chamber consists of a 110volt high pressure vessel containing argon gas connected to a low-pressure vessel containing electronic battery-operated signal generating equipment. The signal generated is fed through cables to a signal analyzer which in turn operates a speedomax recorder.

(2) The field laboratory is equipped with shelves, benches, tables, chemical vapor hood, steam bath, distilled water and rock gas.

b. Maintenance. Will be performed daily by team personnel within limits of their capabilities, and an account kept thereof in the log. Tracerlab at Hickam Field will be notified of breakdowns that cannot be repaired at KWAJALEIN.

c. Calibration. Will be performed twice daily and a record kept thereof.

d. Data Collection. Ionization chamber runs continuously, and data is automatically recorded on a chart therein on a weekly basis.

e. Reporting.

(1) Ionization Chamber.

(a) Weekly reports marked "Secret" will be rendered to Tracerlab at Hickam Field on calibration and background.

(b) Weekly ionization chamber charts will be marked "Secret" and forwarded to Tracerlab at Hickam Field when taken off the machine at 0001Z each Monday.

(2) Laboratory. Will be made to Tracerlab at Hickam Field per instructions of Chief of Hickam laboratory.

(3) All records and reports pertaining to the Tracerlab Station will be recorded, filed and referred to under index number 4-968 which is the international meteorological code designation of the Air Weather Station at KWAJALEIN.

4. a. Logistics.

(1) AMC has provided air lift for equipment and instruments to KWAJALEIN.

(2) There are two (2) spares for ionization chamber.

b. Administration. The team is manned by seven (7) civilians who are attached for administration to the 31-8 AWS Detachment.

c. Roll-up. Upon completion of the Tracerlab Team's participation in FITZWILLIAM following Z-day, personnel and equipment will be returned to the Zone of the Interior.

(1) Personnel. Personnel will be returned to their proper stations by air under arrangements that will be made by the Air Weather Officer, KWAJALEIN.

(2) Equipment. Equipment will be recrated and shipped to the proper station by Tracerlab personnel under arrangements that will be made by the Air Weather Officer, KWAJALEIN.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY THE 514TH LONG RANGE AIR WEATHER RECONNAISSANCE SQUADRON (TU 7.4.4), KWAJALEIN

Appendix III to Annex "D", Operations Order No. 1

1. Authority. Commander, Joint Task Force SEVEN has ordered the 514th Long Range Air Weather Reconnaissance Squadron, (TU 7.4.4) to perform cloud tracking flights covering air filters and gas sampling bottles.

2. General.

a. Airborne Filters. Will collect solid radioactive particles courses flown by AWS B-29's.

b. Airborne Gas Sampling Bottles. Will collect samples of gas in the vicinity of the radioactive cloud.

3. Specific.

a. Equipment.

(1) Airborne Filters. Consist of a mounting for filter paper 6" X 18" in dimensions, and provision for inserting a screen in the air stream to divert an adequate volume of air through the filter.

(2) Airborne Gas Sampling Bottles. Consists of pumps and storage tanks (400 pounds/square inch) to permit the collection of samples of air.

b. Maintenance. Will be performed by 514th Long Range Air Weather Reconnaissance Squadron.

c. Background. Flights will be made prior to atomic explosions to determine background.

d. Data Collection.

(1) In accordance with Operations Order No. 2 paragraph 3 (10) Commander Air Force, Headquarters, Joint Task Force SEVEN one (1) B-29 aircraft will be in position at 5,000 feet, thirty (30) miles

south of the zero point. After H-hour this aircraft will follow the flanks of the atomic cloud as it moves in a westerly direction. This aircraft will be equipped with air filtering devices and with apparatus for obtaining air samples. Filter paper on this B-29 aircraft will not be changed during the flight. This aircraft will land at ENIWETOK after following the atomic cloud in accordance with instructions from Commander Air Forces, Joint Task Force SEVEN. The filters will be removed by AEC personnel (TG 7.1) who will retain custody of the filters and will be responsible for the disposition of the filters. A minimum of four (4) gas sample bottles will be collected and flown to KWAJALEIN as soon as possible after filter papers are removed at ENIWETOK. The back-up radiological safety aircraft which will be present in the orbit area will change filters in accordance with Air Weather Service instructions.

(2) At H plus twelve (12) hours, H plus twenty-four (24) hours and H plus thirty-six (36) hours, a total of six (6) B-29 cloud tracking missions will be flown. The tracks for these missions will be designated as Vulture Seven and Vulture Eight. Vulture Seven will track portion of the atomic cloud expected to travel to the west and Vulture Eight the portion expected to travel to the east. The Commander Air Forces, Joint Task Force SEVEN will notify Task Unit 7.4.4 of the probable path of the atomic cloud at altitudes of 5,000; 10,000; 20,000; 30,000; and 40,000 feet for two (2) or more days in advance. These paths will be corrected as justified by the meteorological wind analysis prepared by the Meteorologist, Joint Task Force SEVEN. In accordance with these predicted paths a total of six (6) B-29 cloud tracking missions will be flown thru H plus thrity-six (36) hours, two (2) missions being flown at H plus twelve (12) hours, two (2) at H plus twenty-four (24) hours and two (2) at H plus thirty-six (36) hours. Normal weather reconnaissance flight procedures may be employed changing filter papers in accordance with instructions from the Air Weather Service. In general Vulture Seven will be flown at 5,000 feet outbound and at 10,000 feet inbound. Vulture Eight will be flown on a slow climb to maximum altitude outbound, maintaining the highest altitude for at least one (1) hour and then a slow descent inbound.

(3) The filter paper will be changed in accordance with instructions from the Air Weather Service. An extract from these instructions is as follows:

Change of filter paper:	
Prior to explosions ------	Every three (3) hours and/or change of search leg.
H to H plus 36 hours -----	Every hour and/or change of search leg.

After H plus 72 hours ---- Every three (3) hours and/or change of search leg.

(4) At H minus twenty-four (24) or forty-eight (48) hours a minimum of four (4) gas samples will be collected for background analysis. All Vulture seven and Eight flight up to and including H plus thirty-six (36) hours will collect a minimum of four (4) gas samples bottles on each mission. It is desired that as many of the gas samples be collected in the search area as will be possible. The gas samples bottles will be delivered to the custody of the Base Weather Officer, KWAJALEIN who will forward these to Tracerlab, BOSTON, MASS. in accordance with instructions from Air Weather Service. After H plus thirty-six (36) hours no further gas samples will be required.

(5) On H plus 48 hours, H plus 3 days, H plus 4 days and H plus 5 days, Vulture Seven will be flown unless cancelled by Commander Air Forces, JTF-7. Since these flights may involve an extended search West as far as the Philippines, provision should be made by the Commanding Officer, Task Unit 7.4.4 (Air) for necessary communication and procedures for operation.

(6) Preparation for a Vulture Eight mission should be made on H plus 48 hours but if normal wind flow occurs at the time of H-hour, it is anticipated that this mission will be scrubbed. Vulture Eight missions will be flown after H plus forty-eight (48) hours only on specific instructions from Commander Air Forces, Joint Task Force SEVEN.

e. Reporting.

(1) Airborne Filters.

(a) Upon withdrawing the filter paper from the unit, notation will be made in pencil in the upper right-hand corner of the paper as to the date, operation location, plane number, portion of track flown (defined by geographic co-ordinates), altitude flown, time filter paper was inserted, and time paper was withdrawn.

(b) Will be turned over to the Ground Level Station immediately upon the completion of each flight.

(2) Airborne Gas Samples. The Commanding Officer of the 514th Long Range Air Weather Reconnaissance Squadron will be responsible for expeditious marking and shipping of filled cylinders which must arrive in Washington, D. C. within five (5) days of time of sampling.

(a) Cylinders will be identified by means of permanent inscription and will be numbered consecutively as follows: 514-1, 514-2, 514-3, etc.

(b) Cylinders after being classified "Secret" will be addressed to Air Weather Service and delivered to Air Transport Service for shipment.

(c) Individual record will be made for each sample by 514th Squadron aircraft crew:

(1) Such record to correlate cylinder number with:

(a) Altitude.
(b) Location.
(c) Time and date of sampling.
(d) Geiger counter recording at time of sampling.

(2) Three (3) copies of this record will be made:

(a) One (1) copy will be forwarded by air mail to Chief of Staff, USAF, ATTN: AFMSW-1.

(b) One (1) copy will be retained by 514th Squadron as a permanent record.

(c) One (1) copy will be placed in a sealed envelope, classified "Secret" and attached to cylinder containing sample.

(d) Advise of each shipment of air samples will be given by Commanding Officer of 514th Squadron to Air Weather Service, ATTN: Captain JOUBIN. (Information copy to Headquarters FITZWILLIAM FORWARD) so that shipment may be picked up immediately on arrival at Washington, D. C.

(3) All records and reports pertaining to the filter paper and gas bottle sampling of the 514th Long Range Air Weather Reconnaissance Squadron will be recorded, filed and referred to under index number 4-968 which is the international meteorological code designation of the Air Weather Station at KWAJALEIN.

4. Logistics.

a. Roll-up. Upon completion of the 514th VLR Recon. Squadron's participation in the FITZWILLIAM program following Z-day, personnel and equipment (except that specified in paragraph 4.b, below) will be returned to the organization's station by air. The organization is equipped with sufficient aircraft to provide for these transportation requirements.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY ATMOSPHERIC CONDUCTIVITY TEAM, KWAJALEIN

Appendix IV to Annex D, Operations Order No. 1

1. Authority. An atmospheric conductivity team under contract to AMC through Watson Laboratory is operating out of KWAJALEIN equipped with a B-29 type aircraft in which ionization equipment has been installed.

2. General. The airborne ionization equipment is designed to measure simultaneously the conductivity and the voltage gradient of the atmosphere and combine these two parameters to obtain a value for earth to air current.

3. Specific.

a. Equipment. The airborne ionization equipment consists of a device to measure the magnitude of current passing between a central electrode and an outer cylinder through which air passes. This current is a measure of conductivity.

b. Flight Orders. Flight orders for operations of B-29's will be received from Headquarters FITZWILLIAM FORWARD through CTG-7 and CTU 7.4.4 (514th Long Range Air Weather Reconnaissance Squadron).

c. Background. Flights will be made by B-29's prior to X-day in areas to be specified by Headquarters FITZWILLIAM FORWARD thru CTU 7.4.4 for the purpose of recording background data for ionization equipment.

d. Maintenance. The station is generally self-sufficient from a maintenance standpoint but will call upon Commander Task Unit 7.4.4 for such assistance as is beyond its own capabilities.

e. Data Collection.

(1) Headquarters FITZWILLIAM FORWARD thru 514th Long Range Air Weather Reconnaissance Squadron (TU 7.4.4) will order take-off at H plus 12 hours on X, Y, and Z days and to fly in areas to be designated by FITZWILLIAM FORWARD in order to collect atmospheric conductivity data.

(2) Data Film.

(a) Photographic film, brought into Joint Task Force SEVEN operating area by atmospheric conductivity team and turned over to Task Group 7.5 Film Auditing Agent at KWAJALEIN, will be drawn from said Task Group 7.5 agent on receipt as needed for background flights and for practice and test day flights.

(b) A log of all film to be kept by Chief Atmospheric Conductivity team.

(c) Exposed film will be returned to custody Task Group 7.5 agent upon completion of each flights, and receipt obtained therefor.

(d) An officer of HEADQUARTERS FITZWILLIAM FORWARD will draw the exposed film from Task Group 7.5 agent and receipt therefor, whereupon Joint Task Force SEVEN responsibility for the security of the film ends.

(e) The officer of HEADQUARTERS FITZWILLIAM FORWARD who draws exposed film will classify undeveloped film military "Secret", package and dispatch to Chief AFMSW-1 by officer courier.

(f) Reporting.

(1) The station will render a secret brief report to AFMSW-1 by officer courier three (3) days following each atomic explosion.

(2) The station will render a "Secret" brief report to Watson Laboratories by officer courier once a month through Chief, AFMSW-1.

(3) The final report will be rendered to Watson Laboratories in fifty (50) copies within thrity (30) days after return to ZI following last atomic explosion.

(4) Chief Atmospheric Conductivity Team will send a brief "Top Secret" radio report indicating positive or negative results to Chief AFMSW-1 as soon after each atomic explosion as possible.

(5) All records and reports pertaining to the Atmospheric Conductivity team will be recorded, filed and referred to under index number 4-968 which is the international meteorological code designation of the Air Weather Station at KWAJALEIN.

4. a. Logistics. Air Materiel Command through Watson Laboratories provided necessary airlift for equipment and instruments.

b. Administration. The station is manned by two (2) civilians supported by B-29 crew of five (5) enlisted men, all attached for administration to Task Unit 7.4.4.

c. Roll-up. Upon completion of the Atmospheric Conductivity Team's participation in the FITZWILLIAM program following Z-day, personnel and equipment will be returned to the Zone of the Interior by air in the team's assigned aircraft.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY AIR WEATHER OFFICER, ENIWETOK

ANNEX "E" to Operations Order No. 1

1. Authority. Commander, Joint Task Force SEVEN, has ordered the Air Weather Officer at ENIWETOK to assume the responsibility for the AWS/NOL magnetic station.

2. General. The magnetometers will be used to study the electromagnetic effects of atomic explosions due to the mass motion of ionized air.

3. Specific.

a. Code-word. The military Restricted code-word shipping designator for Air Weather Service participation is FIRSTRATE, and for the purposes of this annex is used to refer to the magnetic project. The word FIRSTRATE will not be ostensibly connected in any way with FITZWILLIAM or its purpose.

b. Equipment. Two (2) 24 volt battery operated magnetic airborne detectors AN/ASQ-3A (modified for high sensitivity magnetic measurements) comprise the station and are essentially second harmonic detectors arranged for pen and ink recording on Esterline-Angus tape recorders.

c. Maintenance. Will be performed locally by Air Weather Service personnel under supervision of Naval Ordnance Laboratory technician of Task Group 7.1. Batteries will be kept charged.

d. Calibration and Background.

(1) Calibration will be performed before atomic explosions.
(2) Background readings will be obtained for an hour before an atomic explosion.

e. Time Signals. Representative of Headquarters FITZWILLIAM FORWARD remaining on ENIWETOK will on X, Y and Z minus one (1) day, give personally to Commanding Officer Weather Detachment approximate H minus two (2) hours time based on predicted H-hour. FITZWILLIAM representative will by phone or other means convey to Commanding Officer Weather Detachment any change in this time by instructing him to add or subtract a given number of hours or minutes to the original H minus two (2) hours time.

f. Training. The AWS operators will be trained by an NOL technician of Task Group 7.1.

g. Data Collection. Turn on power at H minus two (2) hours, wind clock mechanism of recorder, put in fresh roll of recorder tape, start recorder, check recorder, balance instrument, mark tape, keep instrument in adjustment, and let run until H plus three (3) hours.

h. Reporting.

(1) Tapes will be marked as follows:

(a) Number roll.
(b) Number of the sheet (1 or 2).
(c) The date.
(d) The sensitivity step number to be used for the run.
(e) The knot setting.
(f) The latitude and dial settings.

(2) Tapes will be classified "Top Secret" and turned over to Headquarters FITZWILLIAM FORWARD for disposition.

(3) All records and reports pertaining to the magnetometer tests will be recorded, filed and referred to under index number 9-019 which is an arbitrary identifying number assigned by AFMSW-1 to the FITZWILLIAM activities at ENIWETOK.

i. Emergency Evacuation. In the event that it becomes necessary to evacuate ENIWETOK ISLAND after an atomic explosion because of high-altitude fall out of radio active particles Air Weather Service personnel will be evacuated from the island in accordance with instructions that will be furnished them by the Air Weather Officer, ENIWETOK.

4. a. Logistics. Magnetometers were delivered to ENIWETOK by NOL representative, and turned over to AWS officer on memorandum receipt.

b. Roll-up. Upon completion of the FITZWILLIAM program on Z-day all magnetometer equipment will be recrated and returned by the Air Weather Officer, ENIWETOK, to Mr. C. J. Aronson (representative of Naval Ordnance Laboratory on temporary duty with Task Group 7.1) on board the USS ALBEMARLE. Mr. C. J. Aronson will then assume responsibility for returning the equipment to the accountable officer in the Zone of the Interior.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY SONIC BALLOON TEAM, KWAJALEIN

Annex "F" to Operations Order No. 1

1. Authority. Watson Laboratories under contract to Air Materiel Command has established a sonic balloon team at KWAJALEIN.

2. General. The sonic balloon is a device to pick-up sound originating in the sound channel between 50,000 feet and 60,000 feet as well as sound originating on the ground and refracting through that layer.

3. Specific.

a. Code-word. The military Restricted code-word shipping designator for Air Materiel Command participation is BLACKHEART and for the purposes of this annex is used to refer to the sonic balloon project. The word BLACKHEART will not be ostensibly connected in any way with FITZWILLIAM or its purpose.

b. Equipment.

(1) The sonic balloons are helium filled, made of plastic, and are designed by gas and weights to rise at a rate of 500 to 600 feet a minute, and then to float at a constant altitude above sea level. A sonic microphone, pressure elements and a transmitter are attached to the balloon. Signals from the balloon are picked by Radiosonde SCR 658 on the ground at KWAJALEIN, and are recorded on tapes of two (2) recording elements.

(2) The team has on the ground for upper frequency ranges:

(a) A triangulation system of microphones to give direction and descending angles of sound using ten (10) cycles per second Signal Corps sound ranging equipment.

(b) A single microphone modified to one (1) cycle per second (Signal Corps sound ranging equipment).

(c) A recording altimeter that is a one-third cycle per second sensitive barograph.

(3) C-54, B-29 and B-17 for transporting equipment, instruments and supplies.

c. Maintenance. Will be performed locally by the sonic balloon team.

d. Calibration and Background. Will be accomplished and recorded before an atomic explosion.

e. Time Signals. (See paragraph 3b(3)(c) and (d), basic Operations Order No. 1.)

(1) ARPACUS 3-1 will be used for time warnings of an impending atomic explosion.

(2) Time ticks will be used for accurate timing.

f. Data Collection.

(1) Balloon will be inflated starting at H minus two (2) hours and will be released as soon inflated.

(2) This team with aircraft will remain at KWAJALEIN through X-day and possibly longer depending on results obtained on shot(s) X and/or Y.

g. Reporting. Preliminary report of data collected on shot days will be marked "Secret" and dispatched to Watson Laboratories. The data itself will be marked "Secret" and retained by the Chief of the sonic balloon team, and turned in by him to Watson Laboratories upon his return to the Zone of Interior.

4. a. Logistics. Air Materiel Command has arranged air lift for equipment, instruments and supplies in three (3) Air Materiel Command aircraft furnished to accompany the team.

b. Roll-up. The team will take its equipment, instruments and remaining supplies with it to the Zone of Interior following completion of Operation FITZWILLIAM.

c. Administration. The sonic balloon team (with aircraft) manned by nine (9) officers, eight (8) enlisted men and six (6) civilians will be attached to Task Group 7.4 for administration.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY NAVAL RESEARCH LABORATORY, KWAJALEIN

Annex "G" to Operations Order No. 1

1. Authority. The office of Naval Research has established a project office on KWAJALEIN manned by two (2) officers and one (1) enlisted man. Directly under it comes the activities of the Naval Research Laboratory in the operating area of Joint Task Force SEVEN, manning four (4) radiological balloon stations.

2. General. The radiological balloon stations will launch balloons equipped with radiological counters to detect the limits of the solid angle of diffusion of radioactivity in the vicinity of atomic cloud.

3. Specific.

a. Code-word. The military Restricted code-word shipping designator for Naval Research Laboratory radiological participation is SCALAR, and for the purposes of this order is used to refer to the radiological balloon project. The word SCALAR will not be ostensibly connected in any way with FITZWILLIAM or its purpose.

b. Equipment.

(1) Each of the airborne radiological counters is lifted by two (2) balloons to a maximum height of approximately 50,000 feet. Modulation of the radiosonde carrier frequency by a barograph and counter permits recording of rates and altitude on an Esterline-Angus recorder on the ground.

(2) Additional ground equipment includes filter unit, Geiger Counter and two (2) automatic recording counters.

c. Maintenance. Will be performed locally by SCALAR personnel.

d. Location of Stations. MAJURO, RONGERIK DMS 32 (QUICK) and DMS 37 (DAVISON). The DMS's will depart KWAJALEIN on X minus three (3) days, and will take their stations on an arc between WAKE ISLAND and MAJURO ATOLL on a radius of approximately six hundred (600) miles from ENIWETOK. Same for shots Y and Z.

e. Calibration. All instruments will be calibrated and calibration recorded.

f. Time Signals. (See paragraph 5b(3)(c), basic Operations Order No. 1) ARPACUS 3-1 will be used for time warnings of an impending atomic explosion.

g. Data Collection.

(1) At H-hour minus twenty-four (24) hours, an officer of FITZWILLIAM FORWARD in conference with the weather officer of JTF-7 will recommend to CTG 7.3 the positions to be assumed by the two (2) DMS's. These positions may be further adjusted up until H-hour plus four (4) hours on request from FITZWILLIAM FORWARD to CTG 7.3.

(2) At approximately H-hour plus five (5) hours, these balloons will be released at the direction of Hq. FITZWILLIAM FWD. based upon the predictions of the staff weather officer, JTF-7 of the travel of the radioactive cloud.

(3) All stations will launch eight (8) balloons at three (3) hour intervals to approximately H-hour plus twenty (20) hours. Each station has twenty-seven (27) balloons, only three (3) of which are for practice for the duration of FITZWILLIAM.

h. Reporting.

(1) Balloon teams will report results of airborne and ground level radiological tests to Office Naval Research representative at KWAJALEIN as soon as possible after data is collected.

(2) The following cryptographic systems will be used in accordance with paragraph 5 below:

(a) DMS's QUICK and DAVISON ----------ECM.
(b) MAJURO ----------one-time pad SIGVLK-1.
(c) RONGERIK ----------one-time pad SIGGTK-1.

The responsibility for encryption of MAJURO and RONGERIK FIRST-RATE messages is with Task Unit 7.4.4 Weather Detachment.

(3) The ONR representative at KWAJALEIN will forward the data reports from NRL stations in Joint Task Force SEVEN operating area to Chief AFMSW-1 by "Top Secret" priority radio messages as soon as he receives data reports from stations.

(4) All records and reports pertaining to NRL stations will be recorded, filed and referred to under the index numbers listed below which are either the international meteorological code designation of the Air Weather stations there at or are arbitrary identifying numbers assigned to the FITZWILLIAM activities at these stations by AFMSW-1.

(a) DMS DAVISON ---------- 9-016
(b) DMS QUICK ---------- 9-017
(c) MAJURO ---------- 4-964
(d) RONGERIK ---------- 4-934

4. a. Logistics. The Office of Naval Research, USN, has provided transportation for equipment and instruments procured by NRL for use on islands in the MARSHALLS area.

b. Administration. Each NRL station is manned by one (1) officer, seven (7) enlisted men and one (1) civilian. The personnel are attached for administration as follows:

(1) The team at MAJURO is attached to Task Group 7.7 for administration and logistic support but will billet and mess with Task Unit 7.4.4 AWS personnel. SCALAR personnel will assist with housekeeping duties and K. P.

(2) The team at RONGERIK will be attached to Task Group 7.7 for administration but will billet and mess with Task Unit 7.4.4. AWS personnel. SCALAR personnel will assist with housekeeping duties and K.P. Logistic support of this team on RONGERIK has been assumed by Task Group 7.5.

(3) The teams on the DMS's (QUICK and DAVISON) are attached to Task Group 7.3 for administration.

c. Roll-up. Upon completion of the FITZWILLIAM program following Z-day, Naval Research Laboratory personnel and their equipment will be returned to their proper stations.

(1) The Office Naval Research representative, KWAJALEIN, will make the necessary arrangements for this roll-up and will provide the necessary instructions.

(2) Commander Task Group 7.3 has agreed to provide assistance in the roll-up of U.S. Navy personnel and equipment that have been operating in the area of Joint Task Force SEVEN.

5. Communications.

a. DMS 32 - DMS 37 Teams. Message will be sent in E.C.M. from CTG 7.3 to ships giving positions to assume and when to commence launching.

b. MAJURO Team. Time to commence launching balloons will be sent from CTG 7.3 to Office Naval Research representative at KWAJALEIN. Latter will transmit to team at MAJURO through ISCOM MAJURO using standard Navy communications.

c. RONGERIK Team. ONR representative will transmit time to commence launching balloons received from CTG 7.3 to RONGERIK using an alphabetical subtractor one-time pad provided for the purpose. This message will be encoded by Office Naval Research representative Joint Task Force SEVEN, at KWAJALEIN. It will be sent as a plain message by AACS to PMGA (ENIWETOK) and relayed by that station to PM 6 B (RONGERIK) to be passed to the Navy balloon team by hand who will then decode the message.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY NAVAL ORDNANCE LABORATORY, KWAJALEIN

Annex "H" to Operations Order No. 1

1. Authority. The Naval Ordnance Laboratory will man six (6) seismic-sonic stations, three (3) sonic stations and a magnetometer in the operating area of Joint Task Force SEVEN under the general supervision of ONR project officer at KWAJALEIN.

2. General.

a. Seismic-Sonic. The purpose of the experiment is to determine the nature and intensities of the seismic and sound waves (resulting from atomic explosions) which travel between the point of the explosions and the instruments.

b. Magnetometer. See paragraph 2 Annex "E".

3. Specific.

a. Code-word. The military restricted code-word shipping designator for NOL seismic-sonic participation is TENSOR, and for the purposes of this annex is used to refer to the seismic-sonic operational project. The word TENSOR will not be ostensibly connected in any way with FITZWILLIAM or its purposes.

b. Equipment.

(1) Sonic.

(a) The sonic equipment consists of a single induction type transducer connected to a pipe network or array having five (5) separate terminations to the atmosphere. The microphone itself consists of an inductor which includes in its magnetic circuit a diaphram-mounted permalloy core. Variations in pressure applied to the microphone produce a marked variation in balance of the bridge circuit which in turn actuates the Esterline-Angus recorder. The individual terminations of

OPERATIONS PLAN "FITZWILLIAM"

ANNEX "N"

ROLLUP PLAN

Enclosure 1

ANNEX 'N' - INCL 1

[redacted]

[redacted]

[redacted]

PLAN FITZWILLIAM

ANNEX "I"

COMMUNICATIONS ORDER

Hq Airways and Air
Communications Service
Washington 25, D. C.
24 March 1948

(This Communications Order supersedes Communications Order dated 1 March 1948)

1. Tactical and Technical Information.

a. Assumption. It is assumed that all communications are subject to intercept and analysis by an unauthorized activity.

b. Participating Agencies.

(1) Airways and Air Communications Service, U. S. Air Force.

(2) Air Weather Service, U. S. Air Force

(3) Office of Naval Research, U. S. Navy

(4) U. S. Weather Bureau

(5) U. S. Coast Guard

(6) U. S. Coast and Geodetic Survey

2. General Plan.

a. General command and administrative traffic will be handled through normal communications channels.

b. Radiological reports from FITZWILLIAM stations (see Incl. 2 - Cryptographic Plan) will be addressed to Detachment 109th AACS Squadron, Washington National Airport, Washington 25, D. C. (Call sign WXIA) through channels detailed in paragraph 3.

3. Detailed Instructions.

a. AACS will:

(1) Furnish all Air Force communications for Project FITZWILLIAM, using existing AACS facilities.

(2) Act as issuing office for the distribution to all participating agencies of cryptographic instructions and materials required for radiological reporting.

(3) Coordinate with Department of the Navy and Civil Aeronautics Administration the tie-in of communications facilities of those agencies with AACS networks.

(4) Detachment 109th AACS Squadron will:

(a) Serve as the Washington terminus of all radiological reports for Project FITZWILLIAM.

(b) Provide necessary messenger service for delivery of such reports to AFMSW-1, Special Weapons Group, DCS/Materiel, Hq USAF.

(5) Special AACS Detachments attached to special JTF-7 weather stations at Rongerik and Majuro will furnish communications for the U. S. Navy-controlled FITZWILLIAM stations on those islands.

b. Office of Naval Research, U. S. Navy will:

(1) Provide communications for appropriate FITZWILLIAM stations operated by the Navy and the U. S. Coast Guard to the appropriate point of entry into AACS Communications network. (For exception, see paragraph 3a (5) above).

(2) Distribute cryptomaterial for Project FITZWILLIAM to appropriate Navy operated stations and the U. S. Coast Guard station on Birddog "FOX."

c. U. S. Weather Bureau will utilize Civil Aeronautics Administration facilities for the transmission of radiological reports from U. S. Weather Bureau operated stations (see Incl. 2) to appropriate points of entry into AACS networks.

d. U. S. Coast Guard will provide communications for its own stations and for U. S. Navy facilities served by them.

e. U. S. Coast & Geodetic Survey will utilize the AACS facilities at Eniwetok for necessary FITZWILLIAM communications.

x. General Instructions.

(1) Radiological reports will be submitted for encrypting on special message forms of the general types following:

(a) Message Form 1 - Aircraft Observation Report (See Incl.3).

(b) Message Form 2 - Automatic Recording Counter Report and Ground-Air Filter Observation Report. (See Incl. 4).

Changes to these message forms will be made on instructions from AFMSW-1 as needed to meet changing requirements for technical data.

(2) The bulk of communications traffic will be classified. Radiological report message will be classified a minimum of CONFIDENTIAL.

(3) The cryptosystem for encrypting report messages will be a one-time numerical subtractor pad (Short Title: SIGKBW).

(4) Distribution of cryptomaterial to stations will be made by major participating agencies, except that distribution to U. S. Weather Bureau stations at Wake and Arnette Islands will be made by AACS. Office of Naval Research, U. S. Navy will arrange distribution to the Coast Guard station Birddog "FOX."

(5) Group count will be included in the headings of all transmissions.

(6) Determination of proper precedence will be a responsibility of the originator.

(7) ALL FITZWILLIAM traffic will be accorded handling similar to that of all other traffic of similar classification and precedence.

(8) For normal administrative traffic, the term FITZWILLIAM will not be used. Shipping designators of (military) RESTRICTED classification, as furnished by USAF and USN, will be used to identify such messages. (See Incl. 5).

4. Supply Instructions. The Chief, Army Security Agency, Washington 25, D.C., is the office of record for SIGKBW. Authority for issue of SIGKBW is vested in Headquarters, AACS.

5. Joint Communications Instructions will govern all inter-service communications traffic.

BY COMMAND OF MAJOR GENERAL McCLELLAND:

R. C. MAUDE
Colonel, USAF
Chief of Staff

OFFICIAL:

s/Gordon T. Gould, Jr.
GORDON T. GOULD, JR.
Lt. Col., USAF
Assistant Chief of Staff,
Operations

CRYPTOGRAPHIC PLAN

| | CALL SIGN | Joint Army Navy Air | | | Army Air | | | AACS | | | | Pacific Area | | | |

CRYPTOGRAPHIC PLAN

	CALL SIGN	Joint Army Navy Air				Army Air				AACS				Navy, Air	State, Army,	Pacific Area																
		AOO1 SIGTON	AOO2 SIGHUB	AO22 SIGBEXT		1501 SIGTCRA	1503 SIGSTAN	1521 SIGTAEN		1713 SIGBREC	1721 SIGHOND	AACSIE		626 SIGOPS		4501 SIGASUT	4513 SIGMAH	4521 SIGNUT	SIGKEW (FITZWILLIAM)													
Albrook Fld., C. Z.	NZA					X	X	X		X	X	X							X													
Kindley Fld., Bermuda	NZT	X	X	X		X	X	X		X	X	X	X	X					X													
Elmendorf Fld., Alaska	NZX		X	X		X	X	X		X	X	X	X	X					X													
Wash. Nat'l. Airport	NZXA	X	X	X		X	X	X		X	X	X	X	X					X													
Majuro	UNK											X																			
Rongerik	UNK											X																			

CRYPTOGRAPHIC PLAN

U. S. NAVY	CALL SIGN		SIGNOW	(FITZWILLIAM)
Pearl Harbor	NPM		X	
DSM-32 USS QUICK	NXTO		X	
DSM-37 USS DAVISON	NXUF		X	
Birddog Four			X	
Truk	NVP		X	
Ulithi	NRV3		X	
Midway	NOM		X	
Johnston	NJD		X	
USS Gen Mitchell	NKIN		X	
USS Gen Diphda	NHFZ		X	
USS Gen.Titania	NEIA		X	
USS Gen Oglethorpe	NHLG		X	
Roving Ship (Unassigned)			X	
Roving Ship (Unassigned)			X	
Roving Ship (Unassigned)			X	
Roving Ship (Unassigned)			X	
Palau			X	

CRYPTOGRAPHIC PLAN

U. S. Coast Guard	CALL SIGN		SIGSALY	(FITZWILLIAM)
Birddog Fox USS Gresham	NODB		X	
U. S. Wx Bureau				
Annette Island			X	
Wake			X	

Message Form 1 - Aircraft Observation Report

SEQUENCE	NO. OF DIGITS	DATA
1	1	International Meteorological Organization List (1 thru -)
2	3	Weather Station International Index Number
3	4	Test Sample Number, arbitrarily and serially assigned by station beginning with ØØØ1.
4	6	Date Time Group at beginning of aircraft observation (GMT)
5	3	Length of observation in minutes
6	1	Standard Code Number for the Octant of the Globe at beginning of observation
7	4	Latitude of aircraft at time of beginning of observation
8	4	Longitude of aircraft at time of beginning of observation (hundred digit will be understood by reference to Octant and will not be included in message)
9	2	Altitude of aircraft during observation in thousands of feet
10	1	Standard Code Number for the Octants of the Globe at conclusion of observation
11	4	Latitude of aircraft at time of conclusion of observation
12	4	Longitude of aircraft at time of conclusion of observation (hundreds digit will be understood by reference of Octant and will not be included in message)
13	3	Wrap-around net rate per minute
TOTAL	40	

This form may also be used by Naval craft equipped with ground air filter. Weather station designators will be assigned a designator beginning with List No. 9.

MESSAGEFORM

MESSAGE CENTER NO.	TRANSMITTING MEANS	CRYPTOGRAPH OR CLEAR TEXT

CALLS	STA. SER. NR.	PRECEDENCE	TRANSMISSION INSTRUCTIONS	ORIGINATOR	DATE-TIME GROUP
V	NR				

ACTION	INFORMATION	EXEMPT	OPERATING SIGNALS	GROUP COUNT
				8R

SPACE ABOVE FOR SIGNAL CENTER ONLY

FROM: *(Originator)*

SECURITY CLASSIFICATION

ACTION TO:

-
-
-

PRECEDENCE FOR

ACTION	INFORMATION

☐ ORIGINAL MESSAGE

REFERS TO ANOTHER MESSAGE

IDENTIFICATION	CLASSIFICATION

INFORMATION TO:

SECURITY CLASSIFICATION — AUTHORIZATION

	SIGNATURE

ORIGINATING AGENCY

SYMBOL	DATE-TIME GROUP	OFFICIAL TITLE	PAGE OF

WD AGO FORM 11-168 15 JAN 1945 This form supersedes WD AGO Form 11-168, 28 Aug 44, and WD AGO Form 801, 12 Mar 43, which are obsolete.

16—43801-1 U. S. GOVERNMENT PRINTING OFFICE

Message Form 2 - Automatic Recording Device Reports and Ground-Air Filter Observation Report

(Report to be made every 12 hours.)

SEQUENCE	NO. OF DIGITS	DATA
1	1	International Meteorological Organization List
2	3	Weather Station International Index Number
3	6	Date-time group (GMT) at termination of 12 readings reported
4-15	3	Each 3 digits for one of the 12 readings reported, one at the end of each hour
16	3	Three zeros indicating the end of the automatic recording device report. At stations with no ground-air filters, this will mark the end of a message
17-28	3	Ground-air filter report. Filter readings in per minute. When number of filters is less than 12, the remaining boxes through 28 will be filled with zeros.
29	3	Three zeros indicating the end of filter readings
30	3	Background readings for filters
TOTAL	91	

Note: Where a given station is equipped with only one of the above instruments, i.e., either an automatic recording device or a ground-air filter, but not both, the message form blanks allotted for entering data of the missing instrument will be filled in with zeros.

MESSAGEFORM

MESSAGE CENTER No.	TRANSMITTING MEANS	CRYPTOGRAPH OR CLEAR TEXT

CALLS	STA. SER. No.	PRECEDENCE	TRANSMISSION INSTRUCTIONS	ORIGINATOR	DATE-TIME GROUP
V	NR				

ACTION	INFORMATION	EXEMPT	OPERATING SIGNALS	GROUP COUNT
				88

SPACE ABOVE FOR SIGNAL CENTER ONLY

FROM: (*Originator*)

SECURITY CLASSIFICATION

ACTION TO:

PRECEDENCE FOR

ACTION	INFORMATION

☐ ORIGINAL MESSAGE

REFERS TO ANOTHER MESSAGE

IDENTIFICATION	CLASSIFICATION

INFORMATION TO:

			000		
				000	

SECURITY CLASSIFICATION

AUTHORIZATION

SIGNATURE

ORIGINATING AGENCY

SYMBOL	DATE-TIME GROUP	OFFICIAL TITLE	PAGE OF

WD AGO FORM 11-168 15 JUN 1945

This form supersedes WD AGO Form 11-168, 23 Aug 44, and WD AGO Form 801, 12 Mar 43, which are obsolete.

16—45881-1 ☆ U. S. GOVERNMENT PRINTING OFFICE

OPERATION FITZWILLIAM

ANNEX "K"

STANDARD OPERATING PROCEDURE FOR

RADIOLOGICAL OBSERVATION STATIONS - FITZWILLIAM

OPERATION FIRSTRATE

20 March 1948

1. Meaning of FIRSTRATE. The codeword FIRSTRATE is classified as (military) RESTRICTED. For the purposes of these instructions it is used to designate the radiological portion of operation FITZWILLIAM.

2. Scope. These instructions, together with inclosures, supersede all conflicting instructions previously issued verbally or in writing concerning operation of equipment or methods of reporting observed data at FITZWILLIAM radiological stations. The instructions apply to all radiological stations and equipment operated under the supervision of the Air Weather Service, U. S. Air Force, and the Naval Research Laboratory, U. S. Navy, except the following:

a. NRL balloon-borne radiological counters operated from Pearl Harbor, Rongerik, Majuro, and two Destroyer Mine Sweepers.

b. NRL recording counters mounted in aircraft operating from Pearl Harbor and Guantanamo, Cuba.

c. Automatic recording counters located at twelve NRL contract stations in the Continental United States.

3. Responsibility.

a. Commanding officers of Air Weather Service stations and commanders of ship and shore stations as designated by the Office of Naval Research are responsible for the continuing operation of the equipment and the prompt reporting of data in accordance with these instructions.

b. Equipment operators will report to such commanders, advise them of the proper procedures, and assist them in every way to carry out their responsibilities. After equipment is in operation, watch-standing personnel should be procured from the commander concerned, and instructed in the operation and maintenance of the equipment. This is of particular importance in the case of certain Air Weather Service stations which, in accordance with the Roll-up plan of FITZWILLIAM, will continue in operation after completion of the present program about June 15th, 1948. After that time the equipment at these stations must be operated entirely by base personnel, with a minimum of assistance from higher authority.

4. Initial Reports

a. As soon as possible, equipment will be placed in operation and a report rendered to that effect to station WXIA, Headquarters, AACS, Washington, D. C., for Headquarters U. S. Air Force, DCS/M, Attention: AFMSW-1. Each operator will be furnished with three copies of a check-off list listing all radiological equipment involved in FIRSTRATE, assigned to his ship or station. As soon as all equipment has been located and assembled at the station, the lists will be filled out completely with comments added concerning special station requirements and describing the particular installation. One completed copy of this list will be forwarded to Tracerlab, Inc., Hickam Field, T. H., and one copy to the nearest Tracerlab field engineer. The third copy will be filed in the station loose-leaf notebook. Complete mailing addresses are given in paragraph 12 at the end of these instructions.

5. Location of Equipment

a. Wrap-around counters. The El-tronic scaler and Geiger tube used for making measurements of background, and activity on exposed filter papers, are best located on a large test bench or table. No special precautions need be taken in locating this equipment. In moving the lead chamber supplied with the Air Materiel Command wrap-around counter, it should be remembered that this unit weighs 375 pounds; no attempt should be made to move it unless adequate help is available.

b. Automatic Recording Counters:

(1) The large unit containing the seven Geiger tubes and the electronic equipment should be located preferably over water, as on a deck or pier. It should be sheltered by any type of shed suitable for protecting it from the weather, but should not be located in a massive concrete structure. If overwater location is impracticable, any suitable location in a shed or frame building may be used.

(2) The Esterline-Angus or traffic counter recording devices need not be located in the same spot as the large box containing the Geiger tubes. Any convenient location within the range of the interconnecting cables will be satisfactory for these parts of the equipment.

(3) Before the equipment is set up and placed in operation for the first time, the top should be removed from the large unit, and Geiger-Mueller tubes inspected for loose connections and possible damage, and all wiring inside the box checked for loose connections. With the cover removed, the equipment should then be connected to the

110 volt automatic current supply and put in operation. If everything appears to be operating normally and no erratic results are observed after a one or two-hour test run, the lid should be replaced with a few screws, and the equipment should be removed to its final location. The equipment should then again be placed in operation; and if after another one-hour test period it still appears to be working satisfactorily, all screws should be replaced and tightened. Thereafter, this portion of the equipment should be kept hermetically sealed except during calibration checks. The silicagel cartridges within the box should be changed whenever the indicator envelope shows excessive moisture. Should the supply of new silica-gel cartridges become exhausted, they may be restored by baking at a moderate temperature in an oven, or drying in a dry locker box containing light bulbs.

(4) Care should be taken that the physical surroundings of the equipment are maintained approximately constant. The equipment should not be located where large quantities of material will be moved in or out during the course of the test program. Locations such as supply warehouses, storage dumps, and motor transport depots are considered unsuitable.

(5) The final location should be chosen so that there is no fore-seeable necessity to change the location during tthe test program. If such a change in location is absolutely necessary, and is made, both Tracerlab, Inc., at Hickam Field, Hawaii, and the appropriate field engineer (see paragraph 12 d) should be notified by TWX immediately.

c. Operators are cautioned against the use of luminous dial wrist watches or clocks, or other luminous dial instruments, in the vicinity of the automatic recording or filter counting experiment. Any proposed permanent location of equipment, especially on shipboard, should be examined carefully to determine whether any radium dial instruments or other luminous dials or indicators are located in the vicinity. If practicable, equipment locations should be 100 feet or more from any such sources of radioactivity.

6. Maintenance of Equipment:

a. Each operator attending the training course conducted by Tracerlab Inc. at Fairfield-Suisun Air Force Base will be furnished with an electronics repair kit and accessories for use during Operation FIRSTRATE. Upon completion

of FIRSTRATE, these kits will remain with the equipment at the station, or will be shipped with the equipment, in accordance with the Roll-up Plan for Operation FITZWILLIAM. Complete spare parts will not be available at all stations.

b. Maintenance centers have been established at:

Fairfield-Suisun Air Force Base, California
Tokyo, Japan
Guam, Marianas
Anchorage, Alaska
Hickam Field, Honolulu, Hawaii

Exact addresses are given in paragraph 12 d. Each of these centers will be manned by a Tracerlab field engineer. If a piece of equipment becomes inoperative, the local operator should make every effort to locate the trouble and repair the equipment involved, using the diagrams and handbooks supplied during the training course, as a guide; and utilizing to the maximum the services of any electronic or radio talent available locally. If all local resources prove insufficient, the appropriate Tracerlab field engineer should be contacted by priority dispatch, with information copy to Tracerlab Inc., at Hickam Field. As much information as possible, such as probable nature of the trouble, description of spare parts probably required, symptoms, etc., should be included in this dispatch. As soon as feasible after receipt of such a dispatch, the field engineer will proceed with the required spares and service kit, to the station requiring assistance, and will endeavor to make the repairs necessary to restore the equipment to operation.

c. All equipment failures will be reported in the permanent log book which will be forwarded to Headquarters, United States Air Force, DCS/M, Attention: AFMSW-1, upon completion of Operation FIRSTRATE.

7. Calibration.

a. Each radiological instrument will be calibrated every twelve hours, and the results entered in the Original Data Sheet - Calibration (inclosure 4). Calibration data sheets will be prepared in duplicate. The original will be retained in the appropriate loose-leaf notebook, and the duplicate will be forwarded weekly with copies of all other Original Data Sheets (inclosures 1, 2 and 3), to Tracerlab Inc., Hickam Field, Hawaii. (See addresses, paragraph 12 c). All information called for by the data sheet for each instrument must be supplied for each calibration.

b. The calibrated radioactive standards to be used in making these calibrations will be kept at least 100 feet from the instruments except when actually in use; the storage location for standards, once selected, will not be changed. All calibration runs should be made with the radioactive standards in place on the instrument.

c. In addition to the regular twelve-hourly calibration checks, an additional calibration should be run every time an instrument is shut off.

d. If the counts obtained at 75 and 125 volts above threshold differ from each other by more than 20 per cent, and the deviation is not explainable, the discrepancy will be reported immediately to Tracerlab Inc., Hickam Field, Hawaii. (See paragraph 12 c).

8. Contamination.

a. Equipment used for measuring the filter paper may become contaminated with radioactivity if any filter papers containing radioactive material are measured. Such contamination will be indicated by a noticeable increase in the average background counting rate obtained for unexposed filter paper. If contamination is found following the measurement of filter paper containing radioactivity, it will be removed from the Geiger-Mueller tube by the use of a soap and water solution and a soft cloth or paper tissue. Great care should be used in applying the soap and water solution and rinsing water, since the walls of the Geiger-Mueller tube are extremely thin. The brass tube used to insert the filter paper in the chamber should also be carefully scrubbed with soap and water, rinsed and dried.

9. [redacted]

[redacted]

10. Recording and Reporting of Data.

a. Original Data Sheets. All data will be recorded on the appropriate Original Data Sheet. Separate forms are provided for:

Aircraft Filters	(Inclosure 1)
Automatic Recording Counters	(Inclosure 2)
Ground Air-Filters	(Inclosure 3)
Calibration Runs	(Inclosure 4)

Original Data Sheets will be prepared in duplicate. One copy will be kept in a loose-leaf notebook by the observer; the other copy will be sent weekly by Registered Air Mail in double envelope, to Tracerlab Inc., Hickam Field, Hawaii. (See paragraph 12 c).

b. Twice-Daily Reports by TWX to Washington.

(1) Each station concerned with Operation FIRSTRATE will report twice daily by TWX the results of radiological observations for the preceding twelve-hour period. Beginning and end of twelve-hour periods will be as determined by each station commander, but once established should not be changed. Reports will be addressed to station WXIA, Headquarters Air and Airways Communications Service, Washington, D. C. All such reports will have priority precedence, and will be handled in accordance with Annex I, Communications Order, Operations Plan FITZWILLIAM, a copy of which is being furnished each station. Reports will be prepared for encryption on Message Forms #1 and #2 (inclosures 3 and 4, respectively, to Annex I, Communications Plan, which are identical with inclosures 5 and 6, respectively, to these instructions). The present instructions supersede the instruction sheets accompanying inclosures 3 and 4 of the Communications Plan, FITZWILLIAM.

(2) The following data will be reported:

(a) Automatic Recording Counters. Average counting rate in counts per minute for each hour within the twelve hour period except the hours utilized for calibration. Complete instructions for filling out reporting form (Message Form #2) are given in inclosure 6.

(b) Ground Air-Filter Units. Average counting rate in counts per minute from exposed filters, for each three hour period, except as detailed below:

1. Ground Air-Filter units located within 600 miles of source of radiation will change filters and measure the count for every hour instead of each three hour period.

2. Signal Corps ground air-filter units, wherever located, will change and measure count on 2 x 2 foot filters only once every twelve hour period until an additional and plentiful supply of Signal Corps filter paper is available at the station. Thereafter, the average counting rate will be measured for Signal Corps units irrespective of location. The average background count will be taken at any convenient time within the twelve hour period, on an unexposed piece of filter paper from the interior of the pile. Complete instructions for filling out the reporting form for ground air-filter units (Message Form #2) are given in inclosure 6.

c. Aircraft filters - Net counting rate in counts per minute will be reported for each filter exposed in Air Weather Service aircraft participating in FITZWILLIAM. Complete instructions for filling out the reporting form (Message Form #1) are given in inclosure 5.

11. Handling of Filters.

a. General. All filter papers exposed in any filter unit will be classified as CONFIDENTIAL and safeguarded accordingly in a secure, dry place. Any filter paper which shows an activity count in counts per minute equal to or greater than twice, the background will be sent immediately by fastest available transportation to Tracerlab Inc., Hickam Field, Hawaii. All other exposed filter papers will be securely packaged, not less frequently than weekly, and mailed (or sent by any convenient means consistent with security) directly to McClellan Air Force Base, Sacramento, California, Attention: CO, 101st Air Weather Reconnaissance Group, for storage. Such packages will be marked just below the destination address with the station code and the serial numbers of all samples in the package; for example: 5-433 (1 to 11, 15, 17 to 20).

The following methods of packaging are suggested:

(1) Signal Corps Ground Filter Unit filter samples should be slightly compressed and placed in the same box in which the paper rolls were received.

(2) AMC or NRL Ground Filter Unit filter samples should be folded once, with dust sample inward, and packaged as may be convenient.

(3) Aircraft filter samples should be kept in the original envelopes (see par. 11c following) and packaged as convenient, except that they must be packaged separately from ground filter unit samples.

Exposed filter papers received by laboratories and not destroyed in analysis will be similarly packaged, marked, and forwarded to the storage points as quickly as practicable, except that the letters "TL" will be suffixed to the prescribed marking; for example: 5-433 (12 to 14, 16) TL. Chemical preparations from filter samples will, if practicable, be put back in the envelopes in which the sample was received. Security classification assigned to packages due to the grouping of numerous samples may require the use of an officer courier for their transportation to the storage point. (See special security instructions inclosure 7 hereto).

b. Ground Filters. Prior to inserting the filter paper in the ground-air-filter unit, the paper will be stamped with the rubber stamp supplied by Tracerlab Inc., and the data called for by the rubber stamp form will be completely filled in. Each station having a ground air-filter unit will establish a single number sequence beginning with one (1) for the first filter measured at that station. Thereafter, filters exposed in all ground air-filter units at that station will be numbered consecutively, regardless of the piece of equipment in which the activity of the paper is measured. This identifying number, coupled with the station sequence number, will be entered on all records pertaining to that particular filter. Stations lacking a Tracerlab rubber stamp will mark the filter paper with the station sequence number and identify the station in the same manner as for Sequences 1 and 2 of Message Form #2 (inclosure 6).

c. Aircraft Filters.

(1) Certain stations in the FIRSTRATE program are equipped with two or more Air Materiel Command wrap-around Geiger counters. These stations are located at the bases for special Air Weather Service weather flights which are participating in Operation FIRSTRATE. The aircraft are equipped with a dual air-filter unit mounted below the fuselage in the space normally occupied by the rear turret. The filter dimensions are the same as those of the filters for the Air Materiel Command ground air-filter units.

(2) Prior to a flight, the radiological observer at a station handling aircraft filters will prepare the correct number of filters, by marking the filters as indicated above, and placing each filter in a separate envelope with a copy of the Original Data Sheet - Flight Data (inclosure 1) on which the same identifying number has been entered; and will hand these envelopes to the aircraft commander

before taking off. The number of filters required by any flight will be determined by the aircraft commander and the radiological observer together, based on the vectoring instructions received by the Weather Service Detachment Commander from FITZWILLIAM Advanced Headquarters at Eniwetok.

(3) Aircraft commanders have been instructed in the handling of filters in flight. As the exposure of each filter is completed, it will be sealed in its envelope, together with the accomplished Original Data Sheet - Flight Data (inclosure 1).

(4) Upon return to base, all sealed envelopes will be returned to the radiological observer, who will turn them over to the local Tracerlab representative for counting at Guam, Kwajalein, and Barbers Point (Hickam Field, Hawaii, T. H.), or will himself make a radiological count on the Air Materiel Command wrap-around counters at Fairfield-Suisun, [redacted] Elmendorf, Fairbanks, Shemya and Bermuda.

(5) Full instructions for filling out the reporting form (Message Form #1), are given in inclosure 5. NOTE that the reporting procedure for aircraft filters is different from that for ground air-filters.

d. For details of security in handling all radiological filters and related forms and records, see special security instructions (inclosure 7).

12. Addressees.

a. AFMSW-1 — Headquarters, U. S. Air Force, DCS/M
(Attention AFMSW-1)
Washington 25, D. C.

b. Station NKIA. — Headquarters, AACS
Building T-7, Gravelley Point
Washington 25, D. C.

c. Tracerlab Inc.

Outer Envelope:
CDG Officer
31st Weather Squadron
Hickam Field
Honolulu, T. H.

Inner Envelope:
Marked CONFIDENTIAL
Project FIRSTRATE
Attn: Mr. W. H. Faulkner, Jr.
Tracerlab, Inc.

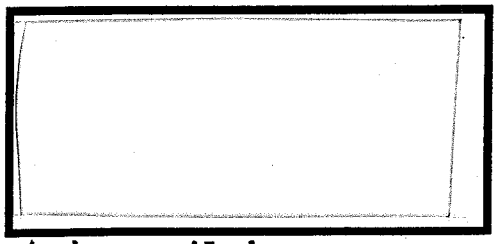
d. Tracerlab Field Engineers.

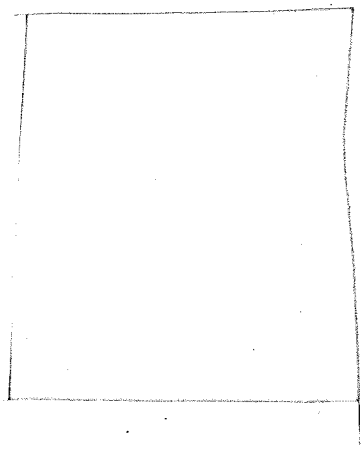
Fairfield-Suisun

Mr. Jay T. Thomas
Tracerlab, Inc. Technician
308th Recon. Gp., (Weather)
Fairfield-Suisun AFB
California

Guam

Mr. George E. Howser
Tracerlab, Inc. Technician
30th Weather Squadron
Guam, Marianas Islands





Anchorage, Alaska

Mr. Roger A. Coulombe
Tracerlab, Inc. Technician
7th Weather Group
Anchorage, Alaska

Honolulu, Hawaii

Mr. W. Harrison Faulkner, Jr.
Tracerlab, Inc. Technician
31st Weather Squadron
Hickam Field, Honolulu, T.H.

Inclosure 1
to
SOP for ROS
FIRSTRATE

ORIGINAL DATA SHEET

A. FLIGHT DATA

1. Time filter paper was inserted into filter assembly ..... _____
   day GMT month hour GMT
2. Length of exposure of filter paper in minutes..... _____
3. Octant of point in which filter paper was inserted*..... _____
4. Latitude when filter paper was inserted ..... ____deg.___min. N S
5. Longitude when filter paper was inserted ..... ____deg.___min. E W
6. Altitude of aircraft during exposure (Express in terms of feet and indicate coordinates where altitudes were changed during the period the filter paper was exposed.)

   _____

7. Octant of point at which filter paper was extracted*..... _____
8. Latitude when filter paper was extracted*..... ____deg.____min. N S
9. Longitude when filter paper was extracted..... ____deg.____min. E W

*NOTE: Octant will be determined from the following table:

North Latitude

0 Deg. W to 90 Deg. W ... 0
90 Deg. W to 180 Deg. W .. 1
180 Deg. E to 90 Deg. E ... 2
90 Deg. E to 0 Deg. E 3

South Latitude

0 Deg. W to 90 Deg. W ... 5
90 Deg. W to 180 Deg. W .. 6
180 Deg. E to 90 Deg. E ... 7
90 Deg. E to 0 Deg. E 8

Inclosure 1
to
SOP for POS
FIRSTRATE
Continued

B. MEASUREMENT DATA - AIRCRAFT FILTERS

STATION _____ DATE_____ OPERATOR _____ SCALER NO. _____

1	2	3	4	5	6	7	8	9
Filter Paper No.	Time FP on	Time FP off	Time of Start of Count	Time of End of Count	Scaler reading		Total Counts	Counts Per Minute
					Register	Lights		

Subtract background count in Counts per minute: _____
to get
Net Count in Counts per minute: _____

Note: The background count is to be a count obtained for an unexposed sheet of filter paper selected from the interior of the pile and measured during the day exposed paper is measured.

The above net count is transmitted directly as obtained and not coded. Negative net counts to be designated by 000.

Inclosure 2
to
SOP for ROS
FIRSTRATE

ORIGINAL DATA SHEET

AUTOMATIC RECORDING COUNTERS

(Use for both EA motors and TR counters)

Station _____ Date _____ Time _____ GMT to _____GMT

Operator _____Instrument: Type EA TR No. _____

	1	2	3	4
	Reading	Scale Factor	Av. Counts per Min.	Code
1				
2				
3				

12				

Column:

1 - Estimated average reading of Esterline-Angus recorder expressed as a decimal over period of one hour or stamped hourly reading of Traffic Counter.
2 - Scale factor for TR is 1.07. Scale factor for EA is setting of Scale Selector Switch.
3 - Multiply Column 1 by Column 2 to nearest whole number.
4 - First two figures from Column 3 rounded to nearest significant figure. Third figure designates number of figures in Column 3 less one.

Example:

For EA - Column 1 - .81 Column 2 - 6000
For TR - Column 1 - 346 Column 2 - 1.07

Column 3 - 4860 Column 4 - 493
Column 3 - 370 Column 4 - 372

Inclosure 3
to
SOP for ROS
FIRSTRATE

ORIGINAL DATA SHEET

GROUND AIR - FILTER UNITS

STATION _____ DATE _____ TIME _____ GMT to _____ GMT _____

OPERATOR _____ SCALER NO. _____ FILTER EQUIPMENT NO. _____

SHIP STATIONS ONLY: POSITION AND COURSE: _____

1	2	3	4	5	6	7	8	9	10
FP NO	Time FP on	Time FP off	Time St ct	Time Stopct	Scaler Reading Register	Lights	Total Counts	Counts PerMin	Code
1									
2									
3									

12									

Column:
1 Filter paper number recorded on paper prior to inserting in filter equipment.
2,3 Time of inserting and removing paper in filter equipment. Three hours is normal time except for designated stations which will change filters every hour.
4,5 Time of count while wrapped around GM tube. Count should be taken for 15 min.
6,7 Register reading and total of interpolating lights on.
8 Multiply column 6 by 64 and then add column 7.
9 Divide column 8 by time of count (column 5 - column 4).
10 First two figures from column 9 rounded to nearest significant figure. Third figure designates number of figures in column 9 less one.

Exaple: Column 1 - 31
2 - 0312
3 - 0612
Column 4 - 0900.14
5 - 0915.18
6 - 15
Column 7 - 40
8 - 1000
9 - 67
10 - 671

Filter papers with counting rates of at least twice background shall be sent to Honolulu base immediately.

Inclosure 4
to
SOP for ROS
FIRSTRATE

ORIGINAL DATA SHEET

CALIBRATION RUNS

STATION _____ DATE _____ OPERATOR _____ TIME _____ (GMT)
INSTRUMENT TYPE _____ NO. _____ STANDARD NO. _____
LINE FREQUENCY _____ CYCLES. LINE VOLTAGE _____ VOLTS. THRESHOLD VOLTAGE ___ V.

Fill out only one of the following sections, depending on the type of instrument calibrated. Use separate sheet for each instrument calibrated.

A. For Traffic Recording Type Automatic Recording Counter:
Standard Reading (15 Min) at threshold plus 75 volts _____ CPM
$\frac{64 \times TR \text{ reading}}{15}$ = counts/min. (CPM) Reading with Std. at TV plus 125 v _____ CPM

B. For Esterline-Angus Type Automatic Recording Counter:
Average standard recorder reading (15 Min) as decimal at threshold plus 75 volts.
_____ Scale Selector setting _____ _____ CPM
Average standard recorded reading (15 Min) as decimal at threshold plus 125 volts.
_____ Scale Selector setting _____ _____ CPM
Average recorder reading x scale selector setting = counts/min.

C. For Wrap-Around Geiger Counter: 15 minute standard count at threshold plus 75 volts. Start time _____ Stop time _____ Register Reading _____
Lights _____ _____ CPM
15 minute standard count at threshold plus 125 volts.
Start time _____ Stop time _____ Register Reading _____
Lights _____ _____ CPM
15 minute filter background count:
Start time _____ Stop time _____ Register Reading _____
Lights _____ _____ CPM Code _____
Counts/min(CPM) 6 $\frac{\text{Register reading x 64} \div \text{Lights}}{\text{Time in minutes}}$

Data for only one instrument shall be recorded on this sheet which contains space for one set of calibrations (12 hrs). Variation between counting rate at threshold plus 75 volts and threshold plus 125 volts in excess of 20% must be investigated. If reason for deviation is not explainable or if repair assistance is required, the repair base station shall be contacted. Copies of all communications to Repair Base shall be sent to Honolulu.

Do not operate at voltage in excess of threshold plus 75 volts except as required for calibration.

Inclosure 5
to
SOP for ROS
FIRSTRATE

MESSAGE FORM #1

(For use only with Filters from Aircraft Filter Units)

SEQUENCE	NO. OF DIGITS	DATA
1	1	International Meteorological Organization List (1 thru -)
2	3	Weather Station International Index Number
3	4	Test Sample Number, arbitrarily and serially assigned by station beginning with ####1.
4	6	Date Time Group at beginning of aircraft observation (GMT)
5	3	Length of observation in minutes
6	1	Standard Code Number for the Octant of the Globe at beginning of observation
7	4	Latitude of aircraft at time of beginning of observation
8	4	Longitude of aircraft at time of beginning of observation (hundred digit will be understood by reference to Octant and will not be included in message)
9	2	Altitude of aircraft during observation in thousands of feet
10	1	Standard Code Number for the Octants of the Globe at conclusion of observation
11	4	Latitude of aircraft at time of conclusion of observation
12	4	Longitude of aircraft at time of conclusion of observation. (hundreds digit will be understood by reference of Octant and will not be included in message).
13	3	Wrap-around net rate per minute
TOTAL:	40	

Sequences 1 and 2 refer to the stations at which the counter data are obtained. Sequence 3 will be taken from the original data sheet - flight data (Incl 1). Sequences 4 to 12 inclusive will be taken from the flight data sheet. If assistance is required in filling out sequences 4 to 12, consult the aircraft commander. Sequence 13. Enter the net counting rate in counts per minute (without coding). The net counting rate is defined as the difference between the exposed filter paper in counts per minute and the measurement on an unexposed filter paper (background) in counts per minute. See bottom right hand corner of Incl 1 for calculation of the net counting rate.

THE METHOD OF TAKING THE FIRST TWO SIGNIFICANT FIGURES AND THE NUMBER OF DIGITS LESS ONE WILL NOT BE USED IN REPORTING FOR AIRBORNE FILTERS.

Do not be alarmed by the fact that this method provides only for a maximum net count of 999. The probability of exceeding 999 is very small. Due to statistical sampling methods, the net count may be negative. In such cases send 000 as the net count.

NOTE that provision is made for four complete reports on airborne filters on each Message Form #1.

MESSAGEFORM

MESSAGE CENTER No.	TRANSMITTING MEANS	CRYPTOGRAPH OR CLEAR TEXT

CALLS	STA. SIG. No.	PRECEDENCE	TRANSMISSION INSTRUCTIONS	ORIGINATOR	DATE-TIME GROUP
V	NR				

ACTION	INFORMATION	EXEMPT	OPERATING SIGNALS	GROUP COUNT
				88

SPACE ABOVE FOR SIGNAL CENTER ONLY

FROM: (Originator)

SECURITY CLASSIFICATION

ACTION TO:

PRECEDENCE FOR ACTION / INFORMATION

☐ ORIGINAL MESSAGE

REFERS TO ANOTHER MESSAGE IDENTIFICATION / CLASSIFICATION

Message Form #1.

INFORMATION TO:

Msg. 1

Msg. 2

Msg. 3

Msg. 4

SECURITY CLASSIFICATION — AUTHORIZATION

SIGNATURE

ORIGINATING AGENCY

SYMBOL | DATE-TIME GROUP | OFFICIAL TITLE | PAGE OF

WD AGO FORM 11-168 18 JUN 1948

This form supersedes WD AGO Form 11-168, 28 Aug 44, and WD AGO Form 501, 15 Mar 43, which are obsolete.

16—48001-1 U. S. GOVERNMENT PRINTING OFFICE

Inclosure 6
to
SOP for RCS
FIRESTRATE

REPORTING INSTRUCTIONS

MESSAGE FORM # 2

(For use with Automatic Recording Counters and Filters from Ground-Air Filter Units.

SEQUENCE	NO. OF DIGITS	DATA
1	1	International Meteorological Operation List
2	3	Weather Station International Index Number
3	6	Date Time Group (GMT) at termination of 12 readings reported
4-15	3 ea.	3 digits for each one of the 12 readings reported, one at the end of each hour.
16	3	Three zeros indicating the end of the automatic recording device report. At stations with no ground-air filters, this will mark the end of a message.
17-28	3 ea.	Ground-air filter report. Filter readings in counts per minute.
29	3	Three zeros indicating the end of filter readings.
30	3	Background reading for filters.
TOTAL	91	

Additional sequences for WBL Roving Ships only
(Additional blocks to be added on Message Form #2.)

31	1	Standard Code number for the Octants of the Globe at the end of the 12 hour period of observation.
32	4	Latitude of ship at the end of the 12 hour period of observation.
33	4	Longitude of ship at the end of the 12 hour period of observation. (Hundreds digit will be understood by reference of Octant and will not be included in message).

Instructions for completion of Message Form #2

Message Form #2 is designed for reporting both automatic Recording Counters and ground air filters. The message will be transmitted by each station at twelve hour intervals. The two (2) twelve-hour report periods may be selected to suit the convenience of the station, but once selected will not be changed.

Sequence 1: The International Meteorological Organization list number will be obtained from the Air Weather Service Officer, Naval Aerological Officer or the Weather Bureau office at the station.

Sequence 2: Weather station international index number assigned to the station and may also be obtained from the abovementioned officers.

Sequence 3: Date Time Group. The first two figures are day of the month (GMT) at the end of the observation period being reported; the remaining four figures are the time (GMT) at the end of the period of observation. GMT may be obtained from the Air Weather Service, Aerological or Weather Bureau officers. GMT must be used for recording all data and in all communications.

Sequences 4 - 15 inclusive (used only for Automatic Recording Counters): The report on the Automatic Recording Counter will be entered in sequences 4 to 15 inclusive, each consisting of a 3-digit group. In each group of 3 digits the coded data for each hour of the preceding twelve-hour period, should be entered. Enter the coded data for the first hour in the first group, and so on. The first two digits of each three digit group should be the first two significant figures of the average reading of the automatic recording counter for the appropriate hour. The third digit will be the characteristic of the logarithm of this reading. For example, the average hourly reading 4280 counts per minute would be reported as 433. (428 = 43, characteristic of log 4280 is 3). The background is not subtracted in any of these readings.

If no data are available during one or more of the one-hour periods due to equipment failure, or other causes, the code 999 will be inserted in the appropriate group. The same code 999 will also be inserted in the appropriate group for any hours lost during calibration and testing.

NOTE: In the special case of stations not equipped with automatic recording counters, sequences 4 to 15 inclusive, will be fillted with the code 000.

Sequence 16: Consists in every case of a group of three zeros, indicating the end of the report on the automatic recording counters. This group has been preprinted on message form #2.

In the case of stations not equipped with ground air-filter units, the message will end with this group of 000 immediately following the twelve groups for the automatic recording counter data, and the communications section should be so notified.

Sequence 17 - 28 inclusive: (Used only for ground air-filters). The report on ground air filters will be entered in sequences 17 to 28 inclusive, each consisting of a 3-digit group. Twelve groups of three digits each are provided for reporting ground-air-filter data. The first two digits of each 3-digit group are the first two significant figures of the reading. The third digit is the characteristic of the logarithm of the reading. The background is not subtracted in any of these readings.

The data, coded in the above manner, for each measurement of a filter will be inserted in the group corresponding to the last hour in which the filter was in the blower unit. The other hours will be indicated by filling the appropriate groups with 000.

Example I. A filter is in the blower unit for 3 hours. It will be reported by two groups of 000 followed by the group containing the coded data for that filter.

Example II Filters are removed from the blower unit every hour. Each group will then contain the coded data for a filter.

Missing data due to equipment failure will be indicated by the group 999 inserted in the hour group which would ordinarily contain the data for this measurement period. If less that the required number of filters are measured during the twelve hour period, due to causes other than equipment failure, unused groups will be filled with 000. IT IS OF THE UTMOST IMPORTANCE THAT NO GROUP BE LEFT EMPTY.

Sequence 29: Consists in every case of three zeros indicating the end of the report on the ground air-filters. This group has been preprinted on message form #2. Sequence 29 will separate the report on ground air-filters from the background for the ground air filters.

Sequence 30: Will be used to report the background counting rate for ground air filters in counts per minute (first two significant figures and characteristics of logarithm) obtained from the measurement of an unexposed filter paper.

In the special case of stations transmitting data from two ground air filter units, a second Message Form #2 will be used to transmit the data for the second blower unit, and all groups usually allotted to the data from the automatic recording counter will be filled with the group 000.

SPECIAL INSTRUCTIONS FOR NRL ROVING SHIPS ONLY

Sequence 1: Substitute the number of your Roving Ship in place of "International Meteorological Organization List."

Sequence 2: Enter 000 in place of Weather Station International Index Number.

Sequences 31, 32 and 33: Use the additional blocks to locate the position of the ship at the end of the twelve-hour period of observation as shown on page K-14, Inclosure #6.

MESSAGEFORM

MESSAGE CENTER No.	TRANSMITTING MEANS	CRYPTOGRAPH OR CLEAR TEXT

CALLS	STA. SER. No.	PRECEDENCE	TRANSMISSION INSTRUCTIONS	ORIGINATOR	DATE-TIME GROUP
V	NR				

ACTION	INFORMATION	EXEMPT	OPERATING SIGNALS	GROUP COUNT
				88

SPACE ABOVE FOR SIGNAL CENTER ONLY

FROM: *(Originator)*

SECURITY CLASSIFICATION

ACTION TO:

-
-
-

PRECEDENCE FOR

ACTION	INFORMATION

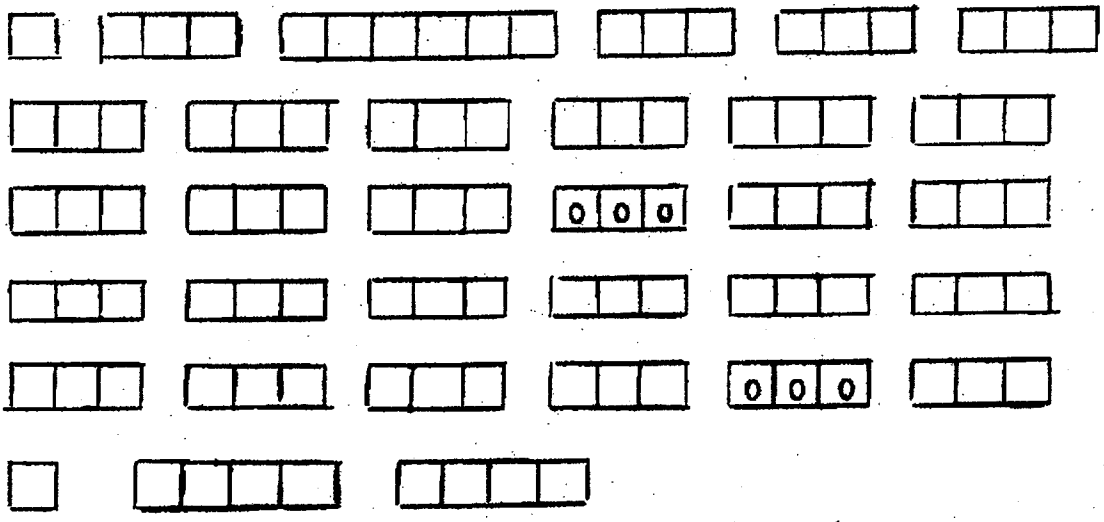
☐ ORIGINAL MESSAGE

REFERS TO ANOTHER MESSAGE

IDENTIFICATION	CLASSIFICATION

INFORMATION TO:

Message Form #2



SECURITY CLASSIFICATION

AUTHORIZATION

SIGNATURE

ORIGINATING AGENCY

SYMBOL	DATE-TIME GROUP	OFFICIAL TITLE	PAGE OF

WD AGO FORM 11-168 15 JAN 1943

This form supersedes WD AGO Form 11-168, 25 Aug 44, and WD AGO Form 501, 12 Mar 43, which are obsolete.

16—45801-1 U. S. GOVERNMENT PRINTING OFFICE

Inclosure 7
to
SOP for ROS
FIRSTRATE

DETAILED SECURITY PLAN FOR HANDLING GAS SAMPLES AND SIGNIFICANT FILTERS

1. a. Gas sample bottles and data sheets will be held at the operating base at Kwajalein by an Air Weather Service Officer, designated by Project Officer, FITZWILLIAM. This designated officer will supply gas sample bottles and data sheets for flights, will collect the filled gas sample bottles and completed data sheets, and will forward the gas sample bottles and data sheets to the designated receiving laboratory by officer courier.

b. At the laboratory designated to perform radio-chemical analyses on the gas samples, a receiving agent ("Q" cleared) will receipt for the gas sample bottles and accompanying data sheets.

c. The receiving agent at the laboratory will be responsible for the requisite security and compartmentation in the laboratory of such Restricted Data as may be obtained from radio-chemical analyses and the compilation of such analyses.

d. Upon completion of the radio-chemical analyses and the compilation and research connected therewith, the designated receiving and security agent of the laboratory will forward by officer courier the research report will all original data, copies, and records of radio-chemical analyses to Dr. Peter H. Wyckoff, Watson Laboratories, Air Materiel Command, Belmar, New Jersey, for transmission to AFMSW-1 through the appropriate secured channels.

2. a. Significant filter papers sent in to any one of the four (4) designated laboratories for radio-chemical analysis will be dispatched to the designated laboratory. Filter papers will be inclosed in double envelopes and the inner envelope marked CONFIDENTIAL.

b. Upon reception at the analyzing laboratory a designated agent or his alternate will receive and receipt for such filter papers. Such agent will be "Q" cleared.

c. The tabulation of the results of separate radio-chemical analyses shall be done in accordance with the requisite security and compartmentation as determined by the receiving agent. Such security and compartmentation become the responsibility of the receiving agent.

d. The research report with all original data, copies and records on radio-chemical analyses will be forwarded by officer courier to Dr. Peter H. Wyckoff, Watson Laboratories, Air Materiel Command, Belmar, New Jersey, for transmission to AFMSW-1 through the appropriate secured channels.

OPERATION FITZWILLIAM

ANNEX "L"

LOGISTICS PLAN

20 March 1948

1. General. Equipment has been procured by various participating agencies as indicated in Annex "B". Also shown in Annex "B" are: distribution of equipment to stations; responsible operating agencies; and numbers of special operating personnel.

2. Transportation. Except as specified below, each participating agency will coordinate through AFMSW-1 the movement of its own aircraft, ships, equipment, supplies, and personnel to its operational stations.

a. AFMSW-1 will provide general overall supervision and necessary coordination between agencies concerning the movement of supplies and instruments from manufacturer to operational agency and station.

b. Office of Naval Research will provide necessary transportation for equipment and instruments:

(1) Procured by ONR for use at stations to be operated under supervision of Naval agencies: from source to operating station.

(2) Procured by ONR for use at stations under supervision of Air Weather Service, USAF: from source to points designated by AWS.

(3) Procured by Signal Corps, U.S. Army, and Air Materiel Command, U.S. Air Force, for use at stations to be operated under supervision of Naval agencies; from points designated by ONR to operating stations.

c. Air Weather Service, U. S. Air Force, will provide:

(1) Transportation by special Air Weather Service aircraft, or other means, for equipment and instruments for certain AWS stations, as specified by AFMSW-1.

(2) Necessary transportation for equipment and instruments to and from the Tracerlab Radiological School at Fairfield-Suisun Air Force Base, California, as required.

(3) Necessary shipping instructions to Air Materiel Command for equipment and instruments for use on stations to be operated by AWS.

d. Air Materiel Command USAF will provide transportation for equipment and instruments:

(1) Procured by AMC for use at stations to be operated under supervision of AWS and Naval agencies: from source to points designated by AFMSW-1 or by AWS as applicable.

(2) Procured by AMC for use at AMC operated stations; from source to operating stations.

(3) Procured by Signal Corps and ONR and delivered to AMC for trans-shipment to stations under operational supervision of AWS: from Wright-Patterson Air Force Base to points designated by AWS.

(4) As required by Tracerlab Inc. for its operation.

e. Signal Corps, U.S. Army will provide transportation for equipment and instruments:

(1) Procured by the Signal Corps for use at stations operated under supervision of the Signal Corps: from source to operating stations.

(2) Procured by the Signal Corps for use at stations to be operated by AWS and Naval agencies: from source to points designated by AFMSW-1.

f. Joint Task Force Seven will provide transportation for personnel and equipment within the SANDSTONE area as requested by "FITZWILLIAM, Forward", and approved in each case by the Commanding General, JTF-7.

3. Supply.

a. General Supply. FITZWILLIAM observation teams and individuals will be attached for routine supply and maintenance assistance as directed by the participating agency responsible for the operation of the FITZWILLIAM station. The U. S. Coast & Geodetic Survey team at Eniwetok will be attached to the AWS detachment at that location.

b. Technical Supply - FITZWILLIAM Equipment.

(1) Maintenance spares and operational supplies sufficient for sixty (60) days will be furnished, with all equipment and instruments, by procuring agencies.

(2) Re-supply will be by requisition through special supply channels to be established by participating agencies.

(3) Emergency requisitions for supplies and spare parts will be processed with highest priority consistent with established procedures of each participating agency.

c. Accountability. Participating agencies will maintain suitable records to indicate location and status of each piece of special equipment listed in Annex "B", at stations under its supervision.

4. Maintenance.

a. Special FITZWILLIAM Equipment.

(1) Each participating agency will perform necessary maintenance and repairs.

(2) Special teams of civilian scientists (Tracerlab Inc.) will be attached to the U.S.A.F. Air Weather Service Stations on Kwajalein, Guam, and Hickam Field, T.H., and at Tracerlab Inc., Boston, Massachusetts, for trouble-shooting and repair assistance on radiological observation equipments upon call by operating stations. In addition, one Tracerlab scientist will be attached to station weather office,

b. Aircraft Maintenance. Air Materiel Command and Air Weather Service, USAF, will operate aircraft (C-54, B-29, B-17 types) in the Pacific area in connection with FITZWILLIAM. These agencies will make all arrangements for maintenance of such aircraft.

5. Construction and Utilities.

a. Air Theater Commanders and the Commanding General, JTF-7, have been requested to provide such services and facilities as may be required for the operation of FITZWILLIAM special equipment.

b. Existing typhoon regulations will be adhered to.

6. Fiscal. Current fiscal procedures of participating agencies will apply. Monthly fiscal reports are required in accordance with notification from the Air Comptroller, USAF allotting Atomic Energy Commission funds.

7. Storage and Surveillance.

a. All ground filter units, wrap-around counters, automatic radiological counters, and filter papers not required for the interim net will be

stored in a building under military jurisdiction as near as practicable to Fairfield-Suisun Air Force Base. The Air Weather Service will arrange for this storage and control future removal of the equipment.

b. All exposed filter papers will be stored as near as practicable to Fairfield-Suisun Air Force Base, but not in the same location as the equipment. The Air Weather Service will arrange for this storage and continuously assure that the following precautions are taken:

(1) Packages will be arranged unopened in accordance with a locating system based upon the code prescribed in Annex "K", Change to Paragraph 11. Samples may be withdrawn for examination from time to time but only u under authority of AFMSW-1.

(2) Radiological safety and fire prevention measures will be determined in collaboration with Tracerlab, Inc. and will be strictly applied.

(3) Military security precautions will be set forth in a letter from this headquarters.

* * * * * * * * *

OPERATION FITZWILLIAM

ANNEX "M"

DISTRIBUTION LIST

25 March 1948

DISTRIBUTION "A":
(Complete with annexes)

	COPY NO.	NO. OF COPIES
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DCS/Materiel	105	1
The Air Adjutant General	106	1
The Air Comptroller	107	1
The Air Inspector General	108	1
The Commissioner, Atomic Energy Commission (through Military Liaison Committee)	109-111	3
[redacted]	112-113	2
Chairman, Research & Development Board	114-115	2
Commander, Joint Task Force-7	116-125	10
Chief, Armed Forces Special Weapons Project	126	1
CG, Air Force Special Weapons Group	127	1
CG, Far East Air Force	128	1
CG, Pacific Air Command	129	1
CG, Alaskan Air Command	130	1
CG, Caribbean Air Command	131	1
CG, Air Transport Command	132	1
CG, Air Materiel Command	93-94	2
CG, Signal Corps, U. S. Army	135-136	2
Chief, Air Communication Group	137	1
CG, Air Weather Service	45-51	7
Chief, Office of Naval Research	3 - 9	7
Commander, Fitzwilliam Forward	138	1

DISTRIBUTION "B":
(Partial Operations Plans)

Chief, Office of Naval Research	
ANNEX	
Annex "C"	10-12 & 3-9
Annex "D3" only	10
Annex "E"	10-44 & 3-9
Annex "F"	10-44 & 3-9
Annex "G"	10-44 & 3-9
Annex "H"	10-44 & 3-9
Annex "I"	10-84 & 3-9
Annex "K"	10-31
Annex "L"	10-44 & 3-9

[redacted]

Operation FITZWILLIAM - Annex "M" 25 March 1948

DISTRIBUTION "B": - Continued
(Partial Operations Plans)

	COPY NO.
CG. Air Weather Service	
ANNEX	
Annex "C"	13-22 & 45-51
Annex "E"	52-92 & 45-51
Annex "G"	52-92 & 45-51
Annex "H"	52-92 & 45-51
Annex "I"	152-192
Annex "K"	52-92
Annex "L"	52-92 & 45-51
Annex "K" - For Tracerlab, Inc.	32-39

[redacted]

06-MDR-054
Part2

[redacted]

[redacted]

AUTHORITY OF CHIEF OF STAFF
SECRET BY WRF
AFOAT-1
DATE 8 Mar. '45

Report
of
Operation Fitzwilliam

VOL I TAB B Copy No. 35

OPERATIONS ORDER
FITZWILLIAM FORWARD

BY

Headquarter's FITZWILLIAM Forward

UNITED STATES AIR FORCE

SECRET

~~SECRET~~

Report
of
Operation Fitzwilliam

VOL I TAB B Copy No. 35

OPERATIONS ORDER
FITZWILLIAM FORWARD

BY

Headquarter's FITZWILLIAM Forward

UNITED STATES AIR FORCE

~~SECRET~~

SECRET

REPORT

OF

OPERATION FITZWILLIAM

Vol I TAB B Copy No. _____

OPERATIONS ORDER

FITZWILLIAM FORWARD

by

Headquarter's FITZWILLIAM Forward

UNITED STATES AIR FORCE

This document contains information affecting the National Defense of the United States within the meaning of the Espionage Act, 50 U. S. C., 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

SECRET

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

OPERATIONS ORDER)
Serial No. 1)

1. Authority.

a. FITZWILLIAM is a "Secret" code name having to do with a "Top Secret" project assigned by the Secretary of Defense to the Chief of Staff, USAF, and by him in turn to the Chief, Special Weapons Group, Headquarters, USAF. It is handled in the office of the Air Force Special Weapons Group by AFMSW-1.

2. General.

a. Various agencies of the U. S. Government are participating in project FITZWILLIAM in the operating area of Joint Task Force SEVEN under the supervision of AFMSW-1. See Annex "A".

b. Commander, Joint Task Force SEVEN, has agreed to support the FITZWILLIAM project in the MARSHALL ISLANDS so long as it does not interfere with the primary mission of SANDSTONE.

c. Commander MARSHALLS SUB-AREA has agreed to support the FITZWILLIAM project MARSHALL ISLANDS insofar as possible with the personnel and equipment at his disposal.

d. Headquarters FITZWILLIAM FORWARD has been established in the operating area of JTF-7 as the forward office of the FITZWILLIAM project whose home office is AFMSW-1.

3. Specific.

a. Headquarters FITZWILLIAM FORWARD will:

(1) Be an operating and not an administrative headquarters.
(2) Supervise and co-ordinate the work of FITZWILLIAM agencies in the operating area of JTF-7.
(3) Co-ordinate FITZWILLIAM matters pertaining to Operation SANDSTONE with Headquarters, Joint Task Force SEVEN.
(4) Insure that the security of SANDSTONE and FITZWILLIAM operations are not compromised by FITZWILLIAM personnel in the operating area of JTF-7.

b. General.

(1) Training.
Participating agencies are responsible for training of personnel required for the operation and maintenance of special FITZ-WILLIAM equipment.

(2) Security.

(a) All FITZWILLIAM personnel in the operating area of JTF-7 will be governed by the provisions of:

(1) Annex "D" (revised 21 Jan. 48) - Security - to Field Order No. 1, Joint Task Force SEVEN.
(2) AAF Letter 46-22, dated 27 June 1946.
(3) AAF Letter 46-22A, dated 5 May 1947.
(4) AAF Letter 46-24, dated 10 March 1947.
(5) AAF Letter 46-24A, dated 24 October 1947.

(b) Personnel Security Clearances.

(1) Security clearances required for personnel engaged in Operation FITZWILLIAM will be in general as prescribed in the references cited above or in comparable U. S. Navy regulations.

(2) Participating agencies are responsible for obtaining personnel security clearances for their personnel and for co-ordinating the clearance status of their personnel with JTF-7 Security Officers at KWAJALEIN and ENIWETOK as applicable, and with Hq FITZWILLIAM FORWARD.

(3) Personnel will be cleared at the level necessary for the handling of classified material necessary to the performance of the allotted job assignments. The granting of a security clearance at a certain level authorizes the person so cleared to have access to only such material, classified at or below the level of his security clearance, as is necessary in the job assignment.

(c) Classification of correspondence, data and equipment.

(1) Classification of correspondence and data as "AEC Restricted Data" will be determined in accordance with the cited references, especially AAF Letters 46-22 and 46-22A.

(2) Equipment used on FITZWILLIAM is, of itself, unclassified but as used will be classified Military "Restricted".

(3) Data not connected by time, place, or purpose with Operation SANDSTONE or FITZWILLIAM, will, in general be classified Military "Restricted". The establishment of any connection of data with the two (2) above operations will immediately result in the necessity for higher classification and more secure handling.

(4) See Annexes covering various agencies.

(5) Technical data of all kinds collected by FITZWILLIAM personnel in the operating area of JTF-7 will be classified and marked as prescribed in Annexes and Appendices to this Operations Order. Office Naval Research representative at KWAJALEIN will collect data from all Naval agencies and send by officer courier all data to proper Naval agencies in Washington, D. C. Officers of FITZWILLIAM FORWARD will collect all other data and films and send same by officer courier to AFMSW-1 Washington, D. C.

(6) Film.

(a) Unexposed film brought into the operating area of Joint Task Force SEVEN by FITZWILLIAM agencies will be reported to J-2, JTF-7, and cleared for use in FITZWILLIAM tests and data recording.

(b) Exposed film will be developed as set forth in Annexes and Appendices hereto.

(c) No film in hands of FITZWILLIAM personnel will be used for any purpose other than FITZWILLIAM data recording.

(7) The code word FITZWILLIAM is classified "Secret" and will be so handled. If connected with the purpose of FITZWILLIAM the code word and accompanying data of correspondence will be classified military "Top Secret" and so handled. In general, the code word FITZWILLIAM will <u>not</u> be used in connection with its purpose.

(d) The security of time signals for AFMSW-1 participation in Operation SANDSTONE will be maintained through the restriction of knowledge of such signals to personnel requiring them in the actual performance of their duties. See paragraph 3b(3) below.

(e) Photographs of FITZWILLIAM personnel and installations taken by authorized JTF-7 photographic agencies will be processed in accordance with Appendix 1 to Annex "L"- Photographic - Field Order No. 1, JTF-7. All film to be used in MARSHALL ISLANDS during Operation SANDSTONE has been marked serially. Whenever JTF-7 photographers take film(s) of FITZWILLIAM personnel or equipment, the senior FITZWILLIAM person present will ask the photographer for the serial number(s) of the film(s), make a record of same, and include within the daily diary (see paragraph 4c(3)(b) below) a description of the still or movie shot(s) taken. This will aid in assuring that the film will reach the proper FITZWILLIAM agencies in the United States after review and classification by the AEC in the United States.

(3) Time Notification.

(a) It is of the utmost importance that the time at which explosions are to occur be known only to those individuals whose duties make it imperative that they have such knowledge. No persons directly engaged in Operation FITZWILLIAM at FITZWILLIAM stations will require knowledge of the exact time of any explosion, in advance of the explosion. However, because of the nature of the projects and the characteristics of the equipment, the stations listed in Annex "C" will require time notification of the approximate times of explosions.

(b) Joint Task Force SEVEN has prepared, and the Army Security Agency USARPAC has distributed, a cryptographic system for notifying appropriate overseas FITZWILLIAM station of the approximate timing of the explosions. The Key List of this Timing Signal Encryption System (short title ARPACAS 3-1) will be furnished to one (1) individual (with "Q" clearance or for whom a "Q" clearance has been initiated at each of the stations listed in paragraph 3a(3) of Annex "C").

(c) Joint Task Force SEVEN will broadcast ARPACAS 3-1 on the following frequencies:

(1) 6.490 megacycles.
(2) 17.865 megacycles.
(3) 11.305 megacycles.

Agencies participating in FITZWILLIAM will provide suitable radio receivers and personnel capable of copying and translating Morse Code transmitted (repeatedly) at a very slow rate. No part of the broadcast concerned with ARPACAS 3-1 will be rebroadcast under any circumstances.

(d) In addition to ARPACAS 5-1, JTF-7 will broadcast continously from KWAJALEIN a series of one (1) second time signals. This broadcast will be transmitted on frequencies of 6.375 and 10.665 megacycles.

(e) See appropriate annexes covering various agencies.

4. a. Logistics.

(1) Under the general overall supervision of AFMSW-1, each participating agency has procured equipment and special operating personnel, and has transported same to station sites in the MARSHALL ISLANDS area. See appropriate annexes and appendices for distribution of equipment, responsible operating agencies and numbers of special operating personnel.

(2) Joint Task Force SEVEN has agreed to provide transportation for personnel and equipment within the SANDSTONE area as requested by FITZWILLIAM FORWARD, and approved in each case by the Commanding General, Joint Task Force SEVEN.

(3) General supply of FITZWILLIAM stations, teams and individuals in operating area of JTF-7 will be handled by the unit of JTF-7 to which attached for administration. See paragraph 4c(3) below and appropriate annexes covering various agencies.

(4) Technical Supply - FITZWILLIAM Equipment.

(a) Maintenance spares and operational supplies sufficient for sixty (60) days will be furnished, with all equipment and instruments, by procuring agencies.

(b) Re-supply will be by requisition through special supply channels to be established by participating agencies.

(c) Emergency requisitions for supplies and spare parts will be processed with highest priority consistent with established procedures of each participating agency.

(5) Accountability. Participating agencies will maintain suitable records to indicate location and status of each piece of special equipment at stations under its supervision.

(6) Maintenance.

(a) Special FITZWILLIAM Equipment. Each participating agency will perform necessary maintenance and repair.

(b) Aircraft Maintenance. Aircraft operated by FITZWILLIAM agencies in the MARSHALL ISLANDS area will be maintained by Task Group 7.4 assisted by the crews assigned to the aircraft.

(c) Each participating agency will be responsible for disposition of supplies and equipment under its control in accordance with regulations and instructions of the military service to which the property belongs. ABC property being returned to Fairfield-Suisun Air Base will be addressed to Air Freight Terminal, Air Transport Command, Fairfield-Suisun Air Base, California, ATTN: Commanding Officer, 308th Air Weather Reconnaissance Group.

(d) All stations will carefully preserve packing boxes and crates for reshipment of the instruments to the destinations indicated upon completion of Project FITZWILLIAM.

(e) All instruments and apparatus will be plainly marked with the list and index number which corresponds to the station at which they are operated. In the event that there are duplications of instruments at any one location, they will carry the suffix "a", "b", "c", etc. The list number is the first integer and the index number is the next three integers of the station identification.

(f) More detailed instructions for roll-up will be published at a later date.

b. Roll-up.

(1) Personnel. Each participating agency will be responsible for proper disposition of personnel (assigned or attached) involved under its supervision in FITZWILLIAM.

(2) Disposition of Property.

c. Administration.

(1) Various agencies participating in project FITZWILLIAM in the operating area of JTF-7 will be attached to units of JTF-7 for administration. See appropriate annexes covering various agencies.

(2) Except where otherwise explicitly stated in the text of this plan and annexes the phrases "will be attached for administration", "has agreed to support", etc. will be understood to include only such support of FITZWILLIAM personnel as billeting, messing, supplies (other than FITZWILLIAM technical), transport, and provision of normal station facilities such as post-exchange, laundry, and postal service.

(3) The following administrative procedures will be complied with by each of the persons in charge of activities covered in annexes D to J inclusive, and by their subordinates in charge of each station or team in the operating area of Joint Task Force SEVEN.

(a) Keep Headquarters FITZWILLIAM FORWARD informed of personnel participating in project FITZWILLIAM.

(1) Original roster.
(2) Changes in personnel assignments.
(3) Where individuals are located.
(4) The agency individuals represent.
(5) Type of clearance individuals have applied for.
(6) Whether or not individuals' clearances have been granted.

(b) Prepare daily diaries covering each day's activities pertaining to project FITZWILLIAM, and transmit as frequently as practicable (at least once a week if possible) to Headquarters FITZWILLIAM FORWARD, ATTN: HISTORICAL OFFICER.

(c) Keep Headquarters FITZWILLIAM FORWARD informed of equipment used in project FITZWILLIAM.

(1) Type of special technical equipment.

(a) Whether in or out of commission.
(b) If out of commission, when expected in.

(2) Type of radio receivers and transmitters.

(a) Whether in or out of commission.
(b) If out of commission, when expected in.

(3) Equipment and supplies needed but not obtained.

d. Station and team chiefs will prepare check lists and submit them to Headquarters FITZWILLIAM FORWARD prior to 12 April 1948 covering activities necessary to be performed by stations and teams prior to, during and following atomic explosions.

5. a. Distribution.

(1) The Distribution List (Annex B) gives the distribution breakdown of both the complete order and separate sections and annexes thereof.

(2) Additional copies of the order or of separate annexes or inclosures for such additional distribution will not be reproduced by participating agencies, but will be requisitioned by letter to Chief, FITZWILLIAM FORWARD. Such requisitions will be accompanied by detailed proposed distribution, and an explanation of the necessity therefor.

b. Communications. Communications facilities of JTF-7 augmented by Army, Navy, and Air Force world-wide Communications systems are available and will be employed to carry out the requirements of FITZWILLIAM activities.

c. Location of Headquarters.

(1) Headquarters FITZWILLIAM FORWARD is on ENIWETOK ISLAND, ENIWETOK ATOLL.

(2) The address of Headquarters FITZWILLIAM FORWARD is as follows:

(a) Radio. The radio address of FITZWILLIAM FORWARD will be "Commander, Task Group 7.2" (CTG 7.2). The word "FITZWILLIAM" will appear in the body of every message sent to FITZWILLIAM FORWARD, and every message will be classified either "Secret" or "Top Secret" depending on content.

(b) Mail. The mailing address will be "Commander Task Group 7.2, APO 187, c/o Postmaster, San Francisco, California". All mail will go by courier. The word FITZWILLIAM will not appear on the outer envelope, but will appear on the inside envelope which will be marked either "Secret" or "Top Secret" depending on contents.

6. This Operations Order will be distributed to each FITZWILLIAM agency in the SANDSTONE area to show the relation and respective responsibility of FITZWILLIAM stations in accordance with the directives of Commander, Joint Task Force SEVEN. Where this order conflicts with instructions from a station's or team's higher headquarters, the latter's instructions will prevail.

/S/ W. E. Kepner
/T/ W. E. KEPNER
Major General, USAF
Chief, FITZWILLIAM FORWARD

Annexes:
A. Agencies in MARSHALLS.
B. Annex & Distribution Lists.
C. Duties of FITZWILLIAM FORWARD.
D. to K. Annexes covering Participation by
Incl. Various FITZWILLIAM agencies in MARSHALLS.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2,
APO 187, c/o Postmaster
San Francisco, Calif.

17 May 1948

TRACERLAB FIELD ANALYSIS LABORATORY TESTS, KWAJALEIN

Inclosure L to FITZWILLIAM FORWARD Report

At the inception of FITZWILLIAM, the Air Materiel Command , through Watson Laboratories, contracted with Tracerlab Incorporated, BOSTON, MASSACHUSETTS, to supervise the entire radiological phase of the project, and in addition, to set up three (3) radiochemical analysis field laboratories at HAWAII, GUAM and KWAJALEIN. Each laboratory was to be fully equipped and staffed to analyze filter papers which had been contaminated with radioactive fission particles obtained from both ground and aircraft filter units. Each laboratory staff was to consist of six (6) radiochemists. The laboratory at KWAJALEIN was so located in order to adequately cope with the enormous amount of activity anticipated due to the cloud-chasing aircraft equipped with airborne filters. Immediately upon the landing of aircraft at KWAJALEIN, the filter papers were to be counted for radioactivity, and especially "hot" papers were to be analyzed by radiochemical means to determine the types and amount of radioactive particles.

The purpose of the field laboratory was to make radiochemical quantitative and qualitative analyses of the fission products collected on filter papers. This was to be accomplished by a chemical separation of several of the radioactive fission isotopes, followed by an analysis of the radiations given off by the separated fractions of the original samples. This is done by obtaining absorption and decay data. Decay data gives the rate of decrease in activity with time. Absorption data gives the measure of penetration of radiation from radioactive substances and aids in characterizing them.

The objectives sought were as follows:

1. To determine the presence and yield of key fissions products in various samples submitted.

2. To determine if fission product yield varies with the type of sample and location where sample was collected.

3. To compare activity of filter samples with chemical analysis yield data thus obtaining correlation between radiochemical analysis results and radiological counter results.

The field laboratory at KWAJALEIN was equipped with a lead-shielded counter, a radiation monitor and various other laboratory apparatus.

The lead-shielded counter consisted of Geiger-Mueller tube surrounded by a lead shield (to minimize cosmic radiation), and connected with a scaler and mechanical register to record the number of counts. One model operated manually and the other two (2) units operated automatically.

The radiation monitor consisted of a Geiger-Mueller tube connected to a counting rate meter to detect radioactivity. This unit was used to check for radioactive contamination of laboratory equipment and for a casual check of laboratory personnel.

Bottles containing oxygen and rock gasses were used as heating elements. There was also a complete line of chemicals and apparatus required for the separation of fission particles.

The below listed personnel were assembled and trained in Tracerlab at BOSTON, MASSACHUSETTS and transported to San Francisco by commercial air and to KWAJALEIN by ATC aircraft:

Dr. Lloyd R. Zumwalt	Q clearance	Laboratory Chief
Dr. D. F. Comstock	PSQ clearance	Chemist
Mr. Alexander Thomas	PSQ clearance	Electronics Engineer
Mr. D. C. Thompson	Q clearance	Instrument Engineer
Mr. Leslie Burris	Q clearance	Chemist
Mr. R. A. Brighton	PSQ clearance	Chemist
Mr. O. F. Hoss	PSQ clearance	Chemist
Mr. Y. Sakakura	PSQ clearance	Chemist
Mrs. M. J. Barker	Q clearance	Stenographer

On 27 March 1948, Mr. Thomas arrived and started to set up the laboratory. A suitable building was furnished by the ATC (1535th AFBU) and reconditioned by TG 7.4. The following had to be accomplished: The rear part of the quonset hut was outfitted with benches, shelves, an exhaust hood and electrical wiring; the front part was set up as a counting room and office, with benches, tables, desks, a refrigerator and racks.

Four (4) enlisted men were borrowed from the 31-8 AWS Detachment to operate the automatic sample counters and plot the data.

On 7 April 1948 the remaining personnel arrived, headed by Dr. Zumwalt, in a C-54 furnished by AMC, and carrying the laboratory equipment. All personnel were quartered in the Able area of the Task Group 7.4, with the exception of Mrs. Barker who was billited in the Women's BOQ.

As of 14 April 1948 the laboratory was set up, chemicals were in place on shelves, equipment was calibrated, and tests were being made of the tentative analytical procedures. It was discovered that the automatic sample changers had to be operated manually; this was done by the enlisted men borrowed from the weather detachment. All communications were sent and received thru the 31-8 Air Weather Detachment commander.

Orders and directives were received from two sources:

1. Tracerlab, Inc. at OAHU through Dr. W. C. Peacock, Field Technical Director, and Dr. F. C. Henriques, Jr., Tracerlab Technical Director.
2. Headquarters FITZWILLIAM FORWARD.

The first "hot" filter paper was received 15 April 1948 at 0345Z. The analysis of six (6) filter papers was started on the first day. In this process, one-half of a paper was taken for analysis and the other half was saved for filing and future reference.

In the period between X-day and Y-day 343 airborne filter papers were received and counted using the El-tronic Wrap-around Counters. Of this number, 126 filter papers registered over 1000 c/m and 58 papers were too hot to count (c/m greater than 50,000). Chemical analyses for the "key" fission products, barium, strontium, tellurium and ruthenium, were started on thirtyone of the papers during this period.

Since the analytical procedure was in an unperfected state, difficulties were experienced in the analyses. Revisions were made to improve the procedure. About fifteen of these samples were considered to be satisfactorily analyzed. A few satis factory absorption and decay curves were obtained of the radiations characteristic of the separated fission activities.

Despite limited success in the X-test analyses, progress was made in developing procedures and techniques and in the training of personnel. In the latter connection, four (4) enlisted men assigned to help obtain counting data were trained, and after a few days were doing quite satisfactory work.

In accordance with the plan to coordinate the radiochemical analyses between the three (3) laboratories at HICKAM FIELD, GUAM and KWAJALEIN, a conference was arranged at KWAJALEIN to discuss the results of the first test and to decide on the radiochemical analyses procedure to be used during the Y-test. The conference was held 24-25 April 1948 with E. H. Turk of GUAM and J. W. Jones and W. C. Peacock from HICKAM FIELD in attendance in addition to the KWAJALEIN staff. Experiences and ideas for improvement were discussed and a "best" analytical procedure was adopted. Rules for the recording of data and the saving of samples were made. During the conference it was decided to transfer O. F. Moss, Jr., to HICKAM from KWAJALEIN to strengthen the chemistry staff there.

The laboratory was put into readiness for Y-day and the revised analytical procedure was tested by analyzing some of the X-test filter papers.

The first hot filter paper of test Y was received 1 May 1948 at 0535Z. As of 5 May analyses were completed on seventeen filter papers (four (4) of these were ground filter papers). About fifteen (15) of those analyses were considered satisfactory. A number of good absorption curves were obtained and were analyzed. Decay data was taken on all samples of appreciable activity. Data was worked upon a comparison of the fission activity yields for samples taken at various locations during the Y-test. A comparison of Y-test yields were also made with activity yields obtained in the X-test.

On 11 May 1948 a conference was held at KWAJALEIN with Dr. Zumwalt, Mr. Turk, GUAM, and Dr. Peacock, Field Technical Director from HICKAM FIELD, HAWAII. Analysis procedure technique as agreed to in previous conferences was discussed, and in the light of experience gained in Y-test, some

modifications were made with resulting increase in analysis precision. Roll-up details were discussed to the effect that the KWAJALEIN laboratory would close about 1 June 1948, and the final report incorporating all field analysis laboratory data would be compiled at Tracerlab, BOSTON, MASSACHUSETTS.

Radiochemical analysis results of filter papers were similar to previous tests. Experience aided in obtaining increased precision. Preliminary analysis of the data continued.

All instruments, tools, spare parts and some chemicals and chemical apparatus are scheduled to be packed and shipped via ATC to Tracerlab, BOSTON, MASSACHUSETTS, on 1 June 1948. Acids and inflammables are to be disposed of because it would be hazardous to ship them by air.

All laboratory data, records, notes, filter papers and chemical analysis samples are to be packed and couriered to AFMSW-1 by Major Harry Crim, FIRSTRATE Project Officer, acting as officer courier accompanied by Dr. L. R. Zumwalt. Remaining personnel will return to Tracerlab, BOSTON, MASSACHUSETTS via ATC within a few days after the roll-up.

Although the field laboratory analysis work will have been completed, a complete re-evaluation will be made at Tracerlab, BOSTON, MASSACHUSETTS. Thus, the following recommendations are only tentative:

1. A field laboratory analysis team should be assembled, organized and trained as a unit at least three (3) months before proceeding to a field location. This would eliminate much loss of time in setting up and would minimize possibility of sending out inept personnel.

2. Electronic instruments and equipment should be thoroughly tested at the home laboratory in order to train maintenance personnel, to determine adequate spare parts kits, and to determine if subject instruments are suitable for field use.

3. All pertinent data and information required pertaining to fission products analysis should be made available to the team chief prior to departure into the field.

4. Research be done to develop a more suitable type filter paper for radiochemical analysis, since it is believed that some of the analysis difficulties encountered in these tests were due to the chemical nature of the filter paper used.

5. That a radiological-safety expert be assigned as a member of or as a consultant to each team or area, in order to monitor and control "health physics." Also that appropriate instruments be provided to measure radiation exposure of personnel working in close proximity to radioactive materials.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/c Postmaster
San Francisco, Calif.

17 May 1948

MAGNETIC DETECTOR TESTS

Inclosure M to FITZWILLIAM FORWARD Report

Among the exploratory projects considered for FITZWILLIAM it was proposed to employ high sensitivity magnetometers to determine the feasibility of a future study of electromagnetic effects of atomic explosions due to dynamo action in the ionosphere resulting from the sonic or hydromatic waves.

Three (3) magnetic airborne detectors (magnetometers) designed by NOL for aerial magnetic survey work and modified for high sensitivity magnetic measurements in the vicinity of large explosions, were supplied by NOL for these tests. The instrument is essentially a second harmonic detector arranged for recording on an Esterline-Angus recorder. The sensitivity is of the order of the 10 to the minus 5 gausses.

Two (2) of these magnetometers were installed under the direction of Mr. C. J. Aronson, NOL technician of Task Group 7.1, on ENIWETOK ISLAND, and were operated by Task Unit 7.4.4 AWS personnel during the test. The third magnetometer was set up and operated on KWAJALEIN ISLAND by the NOL seismic-sonic station technicians.

The two (2) magnetometers for installation on ENIWETOK ISLAND were brought to the forward area by Mr. Aronson on the AV-5 (USS ALBEMARLE). Major L. H. Pribble, the AWS officer at ENIWETOK, designated S/Sgt. R. J. Ridenour and PFC R. E. Houda of Task Unit 7.4.4 to assist in installing this equipment and to operate it during the tests.

Mr. Aronson brought the equipment to ENIWETOK ISLAND on 1 April 1948 and with the assistance of this office selected as a site a quonset hut about three hundred (300) yards south of the Air Base Operations. This site was selected as it appeared to provide the least interference from electrical disturbances and from magnetic disturbances from passing vehicles.

Before departing Mr. Aronson prepared an instruction and check list and tested the equipment after installation. One set was in good working order but the second set had an inoperative detector head and a defective recorder. Mr. Aronson was satisfied with Sgt. Ridenour's technical ability and authorized him to work on the defective equipment. Sgt. Ridenour was able to repair these parts and as a result both sets were in operation on X and Y-tests, but one (1) was out of commission on Z-day due to a burned-out tube for which there was no replacement available.

The following instruction and check list was prepared by Mr. Aronson for use by the AWS personnel operating the equipment:

1. Two (2) hours before the shot turn on the power. The control box should be set at sensitivity and 0-20 knots.

2. Wind the clock mechanism of the E-A.

3. Put in a fresh roll of recorder tape.

4. Let the recorder run at slow speed until one (1) hour before the shot.

5. While recorder is running at slow speed (about shot time minus ninety (90) minutes).

   a. Check to see that power voltage is between 28 and 30 volts.

   b. Check to see that neutralizing voltage on control box is between 15 and 17 divisions (3.0-3.4 on scale).

6. Balance the instrument.

   a. Set at 0-20 knots and 1 sensitivity.

   b. Turn latitude correction knob in the direction the needle has to come on scale until the needle crosses the scale. Disregard any false balance where the needle crosses in the opposite direction to the direction in which you are turning the knob. Keep turning until the needle again crosses this time in the direction you are turning. Now turn the field control knob in the direction the needle has to travel to get back on scale. Center the needle using the X1 and X100 dials. Unless you have a false zero the needle motion will go in the direction that the field control knobs are turned. If you have trouble getting a balance proceed more slowly; sometimes the balance slips by too quickly. Turn up the sensitivity to 2 and rebalance. Repeat at higher and higher sensitivities until it is balanced on sensitivity 5.

   c. Record on the tape the latitude switch setting and setting of the X1 and X100 dials.

7. One (1) hour before the shot, record the following data on the tape:

   a. Number of the roll of tape.

   b. Number of the set (1 or 2).

   c. The date.

   d. The sensitivity step number to be used for the tun (use step five (5) if possible).

e. The knot setting: Set No. 1, use 50-120. Set No. 2, use 0-20.

f. The latitude and dial settings (see par 6c).

8. Turn recorder on high speed and mark the local time on the tape. (three (3) inches per minute).

9. Mark the local time on the tape about every fifteen (15) minutes for an hour before and an hour after the shot.

10. Indicate the time of the shot on the tape as accurately as possible.

11. Mark the local time on the tape every half hour from one hour to three hours after the shot.

12. If the instrument slowly drifts off scale, change the X1 and X100 dials as required and record the new settings on the tape where the change was made. (Adjust only after the instrument has been set on 0-20 knot setting).

13. If there are rapid and frequent deflections which take the pen off scale reduce the sensitivity from 5 to the highest level at which the pen remains on scale. Record the new sensitivity setting on the tape.

14. About three (3) hours after the shot, turn off the instrument as follows:

a. Record the local time.

b. Turn to 0-20 knots.

c. Rebalance latitude and field control dials. Record on tape.

d. Set on 0 sensitivity.

e. Check and record voltages on control box.

f. Check and record voltage of main power supply.

g. Put your initials on the tape and mark it "End of Roll No..... Set No.....

15. Close E-A recorder after removing roll of tape. Replace used tape in an empty box and label it.

16. I am stationed on the USS ALBEMARLE and can be reached at AD 859 or call the ADAMS quarter-deck and have me paged.

17. After the operation is completed this gear is to be repacked and shipped to:

Officer-in-charge, NAVAL ORDNANCE LABORATORY,
Naval Gun Factory, Washington 25, D.C. ATTN:
C. J. ARONSON, Bldg. 210 Room 314L.

18. Data is to be submitted to Colonel B. G. HOLZMAN.

The equipment was checked and operated on a dry run on PX-day. Dr. G. K. Hartman and Mr. Aronson visited ENIWETOK ISLAND on 10 April 1948 to inspect the records and give the AWS operators additional instructions and advice.

The AWS operating crew prior to Y-day, charged batteries and inspected and tested equipment in preparation for the test.

On X-day the equipments were operated in accordance with the instructions and check list.

Fair to good records were obtained by both sets, but no positive indication of any magnetic phenomena was recorded by either set. Slips were recorded on the tapes as a result of passing vehicles and aircraft indicating that the equipment was working properly. Tapes were turned over to this office for transmittal to AFMSW-1. These tapes were held until after Y-day for Mr. Aronson's appraisal.

The same procedure was carried out, and the same results obtained on Y-day as on X-day.

Mr. Aronson visited ENIWETOK ISLAND on Y plus 3 days (May 4th), to inspect the tapes and discuss the writing of a report. He stated that Task Group 7.1 directive stated that all tests conducted within 30 miles of any ZERO ISLAND were to be classified and covered by written reports by TG 7.1 personnel. This would have necessitated his taking the records with him and including them in his report. It was explained to him that our instructions from Major General Kepner were to the effect that all records were to be returned by "Q" cleared official courier to AFMSW-1 where classification would be arranged with AEC and reports prepared as desired. Mr. Aronson agreed to discuss this with Captain J. S. Russel, USN, CTG 7.1, and if no objections were forthcoming, that he, Mr. Aronson,.would forget the whole matter.

During this same visit Mr. Aronson inspected Y and Y-day tapes from the ENIWETOK magnetometers, and the X-day tapes from KWAJALEIN, and stated that in his opinion there was no indication of magnetic phenomena recorded. He stated that it was possible that a careful and exacting study of these tapes might show some indications but that it did not appear that this system would be of any value in the long range detection of atomic explosions. These tapes together with the X-day tapes from KWAJALEIN were packaged and dispatched by official courier to AFMSW-1 on 6 May 1948.

The operations for Z-test were similar to and showed the same results as obtained on X and Y-days except that one (1) of the instruments at ENIWETOK was out of commission, and except that the NOL operator at KWAJALEIN seemed to believe he had some significant data on his magnetometer tape.

AFS personnel who operated the ENIWETOK equipments, repacked the equipments in the original shipping containers, and these were sent to the AV-5 for return to NOL under the personal supervision of Mr. Aronson.

The NOL representative at KWAJALEIN who operated that equipment during the test prepared and shipped it with other NOL equipments back to the NOL laboratories.

Unless careful and detailed studies of these records show some positive indications not apparent on inspection in the operating area, it is recommended that this system receive no further consideration as a means of long range detection of atomic explosions.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, Calif.

17 May 1948

ATMOSPHERIC CONDUCTIVITY TESTS

Inclosure N to FITZWILLIAM FORWARD Report

The Watson Laboratories of the Air Materiel Command contracted for the services of Doctors O. H. Gish and G. R. Wait, scientists of the Department of Terrestial Magnetism of Carnegie Institution, WASHINGTON, D. C. The scientists arranged for a leave of absence and reported to Watson Laboratories for contractual details and discussion of their project. The scientists are well recognised in the field of atmospheric electricity, having been associated with the Air Force study of thunderstorm activity.

The purpose of this experiment was to measure the radioactivity in the air due to increased ionization over normal background caused by an atomic explosion and resulting air ionization. This was accomplished by measuring simultaneously the conductivity and the voltage gradient of the atmosphere and combining these two (2) parameters to obtain a value for the earth-to-air electrical current. An important feature of this apparatus was the instantaneous indication of any change in the air ionization.

The apparatus and equipment was mounted in a B-29 aircraft. The air duct, through which the air passes for measurement, was mounted underneath the left wing, and consisted of a streamlined cylinder incorporating two (2) air ducts about three (3) inches in diameter, mounted between electrodes. This unit was electrically wired to voltmeters and ammeters mounted on a panel in the aircraft. Also mounted on the panel were an altimeter, clock, airspeed meter and an outside air temperature guage. A standard 35mm movie camera was mounted to continuously record the readings of all the dials on the panel. Power was derived from the aircraft's twenty-eight (28) volt system through converters.

The B-29 aircraft was loaned to the project by the Air Weather Service, 308th Reconnaissance Group (Weather), FAIRFIELD-SUISUN, CALIFORNIA. Maintenance assistance was afforded by Task Unit 7.4.4, to which it was attached.

An air filter unit was installed at GUAM on 19 April 1948. This permitted a more accurate comparison of results from filtering and from the air-conductivity apparatus.

The experimental team consisted of two (2) scientists, three (3) weather forecasters on special loan from Air Weather Service, and the aircraft crew, as listed:

Dr. O. H. Gish	"Q" clearance	Physicist
Dr. G. R. Wait	"Q" clearance	Physicist
1st Lieutenant P. M. Crumley	"P" clearance	Pilot
Captain Paul J. Scarboro	"P" clearance	Co-Pilot
1st Lt. Richard H. Finnell	"P" clearance	Navigator
1st Lt. J. J. Trudel	"P" clearance	Weather Observer
2nd Lt. Nestor Grechny	"P" clearance	Engineer
T/Sergeant R. W. Lovelace	"P" clearance	Engineer
T/Sergeant J. W. Young	"P" clearance	Radio Operator
S/Sergeant E. R. Grathwohe	"P" clearance	Weather Technician
S/Sergeant G. L. Turner	"P" clearance	Ass't Engineer
Sergeant L. J. Pratt	"P" clearance	Ass't Radio Operator

The team was assembled at WRIGHT-PATTERSON AIR FORCE BASE, DAYTON, OHIO, in the fall of 1947 for installation of equipment, and had done some research on the measurement of electricity in connection with thunderstorm activity.

The team arrived at KWAJALEIN on 7 April 1948, was met and briefed as to details of operations in the FITZWILLIAM FORWARD area by Colonels Jackson and Triffy. All personnel were billeted in Dog area of Task Group 7.4. A conference was held at ENIWETOK on 9 April 1948, Colonel Holzman presiding, concerning background data flights and test day operations. Background data collection flights were performed prior to X-day. Actual test day (and subsequent cloud-chasing flights) were ordered by Colonel Holzman, Headquarters FITZWILLIAM FORWARD, through Task Unit 7.4.4 by directing the aircraft to a certain point from which to fly a fifty (50) mile radius. Following the X-day explosion, flights were made chasing the low atomic cloud as far west as GUAM. Following the Y-day explosion, flights were made chasing the high atomic cloud as far east as HAWAII, with flights emanating from HAWAII until Y plus six (6) days. For the Z-day explosion, the same pattern as for Y-day was adhered to, but instead of returning to KWAJALEIN, the team proceeded to WASHINGTON, D. C.

The processing of the team's record film (35mm X 100 feet) presented quite a problem due to the absence of adequate laboratory facilities. An attempt was made at the Naval photo lab at KWAJALEIN, but due to crude facilities the effort was abandoned because of the danger of destroying the film. Without the access of their processed film to check the progress of their work, it was decided that the scientists would keep "running " notes. The undeveloped films were picked up at regular intervals classified TOP SECRET and sent to AFMSW-1 by official courier, where they were processed and retained until the scientists' return.

All personnel and equipment was transported to and from the target area aboard the B-29, thereby eliminating logistical problems.

All personnel and equipment departed KWAJALEIN on Z-day plus two (2) and operated from BARBERS POINT, HAWAII, until Z plus seven (7), at which time they proceeded to their home station aboard their B-29. This constituted their roll-up.

Results of operations for the three (3) atomic explosions were as follows:

1. Following X-day explosion; flights were made at H plus twenty-four (24), forty-eight (48), ninety-six (96) and one hundred forty four (144) hours through areas predicted for the lower atomic cloud which moved westward. Positive significant results were recorded in all but the last flight.

2. Following Y-day explosion; flights were made at H plus twelve (12), thirty-six (36), sixty (60), one hundred twenty (120) hours. The first positive indication was found at lower levels east of "zero" point, but negative results were found at predicted levels of 5,000, 10,000 and 20,000 feet. The area of contamination found at H plus twelve (12) hours was resurveyed on two (2) subsequent flights and revealed that due to extremely strong winds, the atomic cloud had been quickly dispersed over a lateral distance of 300 miles.

At H plus 168 hours, three (3) significant traces were located near KWAJALEIN, WAKE ISLAND and HAWAII.

3. Following Z-explosion; flights were made to the east at H plus twelve (12), thirty six (36), sixty (60), one hundred eight (108) and one hundred sixty eight (168) hours to trace the upper atomic cloud. There was no reason to suspect that any but significant results were obtained however the last three (3) flights emanated from BARBERS POINT, HAWAII, and immediately thereafter the team proceeded to its home station, WASHINGTON, D. C. The results obtained are unknown.

A final evaluation of results was not available. However, the favorable trend definitely showed a need for further research and development of the air conductivity apparatus. In that light, the following tentative recommendations are offered:

1. That the air duct instrument be redesigned to increase aerodynamic efficiency.

2. That the possibility be explored of incorporating the air-duct inside the wing.

3. Since the total equipment is light and compact, that two (2) such sets be used in one aircraft in future tests which will afford a method of comparison.

4. That the air-conductivity equipment be incorporated with a direct counting (Geiger-Mueller tubes) arrangement to give comparative date.

5. That the sensitivity of the present apparatus be increased in order to detect lesser quantities of radioactivity or air ionization.

6. That some kind of shield be developed to prevent precipitation from entering the air ducts while in flight. This might be done by blocking off the front end of the ducts by using a "drop-deflection." This would decrease the efficiency of the apparatus because radioactive particles are present in clouds especially cumulo-nimbus types due to the

clouds strong convection air currents.

7. That some method of automatic flushing of the air ducts be developed in order to decontaminate the inside of the air ducts.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2,
APO 187, c/o Postmaster,
San Francisco, Calif.

17 May 1948

IONOSPHEROGRAPH TEST, KWAJALEIN

Inclosure O to FITZWILLIAM FORWARD Report

This experiment from the time of arrival of the equipment at ENIWETOK on 10 April 1948 until its departure on 26 April 1948 was the subject of controversy and confusion. There appeared to be no factual indication, and Dr. D. K. Frohman, Task Group 7.1 and his group, could see no theoretical indication that any positive results could be obtained with the equipment.

The purpose of this experiment as stated in Operations Plan FITZWILLIAM from AFMSW-1 dated 20 March 1948 was that "one (1) ionospherograph will be set up on the target atoll and operated by AWS personnel, to determine the magnitude of the dimples produced in the ionosphere by an atomic explosion."

This equipment was designed by the Bureau of Standards and manufactured by Communications Measurements Laboratory to record measurements of the heights of the various ionospheric layers. These measurements are used to prepare tables and predictions of optimum and maximum useable radio frequencies for various distances between stations at any location on the earth.

The ionospherograph consisted essentially of a pulsed radio transmitter, sweeping the frequency band of one (1) to twenty-five (25) mcs., with a minimum sweep repetition rate of 7½ seconds, a pulse repetition rate of thirty (30) to one hundred twenty (120) per second, a pulse length of fifty (50) or one hundred (100) micro seconds, and a peak pulse power output of 10 KW. The record was traced on an oscilloscope and photographed by special 16 or 35 millimeter cameras.

Mr. Louis Elterman and Mr. Lester Hammond together with all of their equipment arrived on ENIWETOK ISLAND on 10 April 1948.

Mr. Elterman, team chief, and Mr. Hammond, both radar technicians from the Watson Laboratories of the Air Materiel Command, accompanied the equipment from the United States to ENIWETOK ISLAND, and personally set the equipment up and operated it during practice tests.

Some difficulties were experienced in dealing with this team as [redacted] emergency "Q" clearance was refused. He was not informed of this fact and care was required to see that no vital information was given him.

Lieutenant Colonel Triffy made a tour of the island, and the boxing ring at the north end of the Island was selected as a site on which to set up the equipment. This site was selected in order to attempt to minimise interference to other radio equipments located in this area. A tent was obtained and set up over the ring to shelter the equipment. Power for this equipment was originally obtained by tapping into the island power supply. Later when a transformer burned out due to excessive voltage fluctuations in the island power, this office obtained a five (5) KW gasoline driven generator from the local Signal Supply Officer to provide the necessary power.

In discussing the operation of this equipment with Colonel C. H. Hatch, the JTF-7 Deputy Communications Officer in charge of the joint communications center on ENIWETOK ISLAND, he expressed great apprehension of the possibility of interference from this equipment.

At a conference on 11 April 1948 on the USS MOUNT MCKINLEY with Major General Kepner, Colonel T. L. Bryan, Colonel Holzman, Colonel Henry and Commander C. I. Engleman, The Task Force Communications Officer, the possibilities of interference to communications, blast measurements telemetering located on PARRY ISLAND, and to the drone aircraft control systems were discussed, and it was agreed to propose to CTG 7.1, Captain J. S. Russel, USN, and to Doctor Froman:

1. That the equipment be installed on ENIWETOK ISLAND, but not put into operation for X-day, as time did not permit determination of amount of interference that might possibly result.

2. That a test be made about X plus three (3) days to determine interference to communications, telemetering and drone control.

3. If no interference was experienced on this test, then equipment would be operated on ENIWETOK ISLAND on Y and Z-days.

4. If interference was experienced, then consideration would be given to relocating the equipment on ANIYAANII ISLAND or on a destroyer stationed outside the atoll.

Arrangements were made with Lieutenant Colonel Payne Jennings of TG 7.4, with Commander Engleman, and with [redacted] to run tests on X plus three (3) days.

On Sunday 18 April 1948 a conference was held aboard the AV-5 (the USS ALBEMARLE) with [redacted] and Dr. Froman. Dr. Froman was opposed not only to any operation of this equipment during Y and Z-day tests, but he was opposed to any test for interference to be conducted between X and Y-days. The reason advanced being that under no circumstances did he want this equipment operated during Y or Z-day tests, and that if interference tests were run and no interference was experienced, it would be difficult to justify his desire that the equipment not be operated on Y and Z-days. The possibility of moving this equipment to some other location was discussed. In this connection, Dr. Froman pointed out that if this equipment could not detect an atomic explosion at 200 to 300 miles then it certainly

was not suitable for long range detection. Colonel Henry put forward the argument that this equipment was not specifically designed for this test, and that in order to determine whether or not disturbances in the ionospheric layers are caused by an atomic explosion, and whether they can be detected, it was desirable to have this equipment located as close to the explosion as possible. Then if the phenomena is present, further work can be justified in developing special equipments that may be useable at great distances.

Dr. Froman and [redacted] finally agreed to conduct interference test on the night of 19-20 April 1948. After the conference Dr. Froman and his group stated that they could see neither by fact nor by theory how this equipment could detect any significant information.

At the JTF-7 staff meeting on 19 April 1948 Lieutenant General J. E. Hull, CJTF-7, made the decision that the ionospherograph would be tested, and that regardless of the tests the equipment would be moved to KWAJALEIN for Y and Z-day explosions.

Tests were conducted on the night of 20-21 April 1948 covering that period of the day that would effect the Y and Z-day test. All communications activities on ENIWETOK listened during the test period for any unusual interference. Telemetering reception on PARRY ISLAND listened during the evening and early morning hours at about the times the Y and Z-day tests would take place.

The results of the test were:

1. No interference to any communications system on ENIWETOK was detected.

2. Interference was picked up on telemetering receiver on PARRY ISLAND, but in opinion of Mr. J. K. Redmond who made the tests, the interference was of a type that would not interfere with reception of telemetering signals.

3. Definite interference was experienced by the drone while in close proximity to the ionospherograph that would dangerously effect control on take-off and probably while overhead on test days, due to vertical directivity of the ionospherograph's antenna system.

4. Commander Engleman reported he could hear the signal from the ionospherograph but it was of insufficient strength to effect communications on the USS MOUNT MCKINLEY.

As a result of these tests Mr. Elterman and Hammond were informed that their equipment must be moved, and could not be operated at ENIWETOK.

In the mean time a message had been sent to AFMSW-1 requesting their recommendation as to whether the equipment should be set up at KWAJALEIN or returned to the Watson Laboratories. Reply to this message recommended the

ionospherograph be returned to home station in the U. S. Major General Kepner's decision was to send this equipment back as recommended.

The equipment was repacked and Mr. Elterman and Hammond with their equipment departed for KWAJALEIN on 26 April 1948.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California.
1200 - 11 April 1948

PARTICIPATION BY SIGNAL CORPS, ENIWETOK

Annex "I" to Operations Order No. 1

1. Authority. The Signal Corps team conducting optical detector tests on ENIWETOK ISLAND is the responsibility of Joint Task Force SEVEN as latter had taken it on prior to FITZWILLIAM having entered the picture. Annex "C" to Field Order No. 1, Joint Task Force SEVEN charges the Commander, Air Forces, Joint Task Force SEVEN with the conduct of these Signal Corps experiments, but places on Commander, Task Group 7.1 the technical control thereof.

3. Specific.

a. Code-word. The military restricted code-word shipping designator for Signal Corps optical tests is CHEESECLOTH, and for the purposes of this annex is used to refer to the optical project. The word CHEESECLOTH will not be ostensibly connected in any way with FITZWILLIAM or its purpose.

b. Equipment. The optical observations will be made by four (4) types of equipment. Three of these utilize photographic detection while the other uses photo-electric detection and tape recording. This experiment

(1) This system consists of two thirty-five (35) milimeter movie cameras especially adapted to utilize lens of focal length forty (40) centimeters and F of 1.5. The shutters have been modified and synchronized to be exactly The speed is variable from one (1) frame a second to one (1) frame and one (1) and one-sixteenth of a second.

(2) Photo-electric Detection System. The photo-electric detection system utilizes a phototheodolite with a twelve (12) inch focal length lens with F of 2.5 modified to record on a paper tape by means of a photo-electric tube in a balanced circuit. This circuit enables constant background values to be balanced out. Thus only the change in illumination will be detected. The frequency

esponse of the system is limited by the recorder and is from irect current up to approximately eighty (80) cycle per second.

Streak Camera. The Streak Camera consists of a continuously moving film which is passed at a rate of about seven (7) feet per second past the image formed by 7 3/4" inch focal length lens of F of 2.5.

[redacted]

(4) A four (4) by five (5) inch camera has been adapted to utilize a twenty five (25) inch focal length lens of F of 1.0. It is planned to take time exposures before the firing, during the firing and after the firing.

[redacted]

c. Maintenance. Will be performed locally by Signal Corps personnel.

d. Calibration. Will be performed prior to shot days.

e. Time Signals. Representative of Headquarters FITZWILLIAM FORWARD remaining on ENIWETOK will advise Chief, Optical Detection Team, on X, Y, and Z minus one (1) day of approximate time of explosion. Latter has been furnished a radio receiver over which he can receive the voice time broadcast on 3.0 megacycles.

[redacted]

f. Data Collection. Will be done at H-hour on shot days.

g. Reporting. Film will be delivered to Joint Task Force SEVEN for developing and disposition.

h. Emergency Evacuation. In the event that it becomes necessary to evacuate ENIWETOK ISLAND after an atomic explosion, due to a high-altitude fall out of radioactive particles the Signal Corps optical detection team will be evacuated from the island by aircraft in accordance with instructions that will be furnished by FITZWILLIAM FORWARD.

4. a. Logistics. The Signal Corps, U. S. Army, has provided air lift for equipment and instruments to ENIWETOK.

b. Administration. The Signal Corps team consists of one (1) civilian and two (2) enlisted men, and is attached to Task Group 7.2 for administration.

c. Roll-up. Upon completion of the Signal Corps Team's participation in the FITZWILLIAM program, personnel and equipment will be returned to the Zone of the Interior.

(1) Personnel. Personnel will be returned to their proper station by air under arrangements that will be made by this headquarters.

(2) Equipment. Equipment will be recrated and shipped, by the Signal Corps Team, to the accountable officer in the Zone of the Interior.

(a) Extremely delicate instruments and items required for immediate use in the Zone of the Interior will be returned by air under arrangements that will be made by this headquarters.

(b) All other serviceable equipment will be returned by water under arrangements that will be made by this headquarters.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, California
1200 - 11 April 1948

PARTICIPATION BY COAST AND GEODETIC SURVEY, ENIWETOK

Annex "J" to Operations Order No. 1

1. Authority. A Coast and Geodetic Survey team will conduct seismic experiments on ENIWETOK ATOLL.

2. General. The purpose of the experiment is to determine the nature and intensities of the components of the seismic wave (resulting from atomic explosions) which travel the earth's surface between the point of the explosions and the instruments.

3. Specific.

a. Equipment.

(1) Coast and Geodetic Survey designed accelerograph intended to record acceleration of motion in three (3) components on rolls of sensitized paper 6" X 200".

(2) Transcievers on 27.0 or 27.1 megacycles for minus thirty (30) second start of seismographs.

(3) Short range radio receiver for picking-up time ticks from KWAJALEIN.

(4) Chronometers for absolute time.

b. Maintenance. Will be performed locally by Coast and Geodetic Survey personnel.

c. Location of Stations.

(1) The location of seismographs for the first and second test will be:

(a) North end RUNIT ISLAND.
(b) South end RUNIT ISLAND.
(c) ANIYAANII ISLAND.

(2) For the third test (to be employed only if the second test is unsuccessful) seismographics will be located:

(a) One (1) on ANIYAANII (Same as first and second test).
(b) Two (2) on PARRY ISLAND.

d. Calibration. Sensitized paper will be installed in the seismographs, starting and absolute time equipment will be checked fresh batteries will be kept available, and calibration data will be logged.

e. Time Signals. Representative of Headquarters FITZWILLIAM FORWARD remaining on ENIWETOK ISLAND will inform Chief, Coast and Geodetic Survey team, of date of required readyness for his stations. FITZ-WILLIAM representative will also before 1600 hours on X, Y, and Z minus two (2) days notify him of time to set clocks to turn on receivers at his test stations. Time signals for rating chronometers will be received by radio from KWAJALEIN and WWV WASHINGTON, D. C. Timing signals from the timing cable will be as shown in 3f(4) below.

f. Data Collection.

(1) Before X, Y, and Z days:

(a) On X and Y days minus two (2) days two (2) C&GS personnel in L-5 aircraft will be flown to RUNIT ISLAND and will ready stations #1 and 2.

(b) On X and Y minus one (1) day these two (2) C&GS personnel will be picked up at RUNIT at dawn by L-5 aircraft and flown to ANIYAANII where they will ready station #3. Aircraft will standby and return them to PARRY ISLAND about 1000 hours on X and Y minus one (1) day.

(c) In case of twenty-four (24) hour postponment before 1600 hours on X or Y minus one (1) day or a forty-eight (48) hour postponment at any time, the above procedure will be repeated. If twenty-four (24) hour postponment is announced aft 1600 hours of X or Y minus one (1) day, it will be necessary to start at dawn at RUNIT to ready stations and have the aircraft stand by at each island until readying of stations is completed.

(d) On Z-day minus one (1) day, L-5 aircraft will take two (2) C&GS personnel to ANIYAANII and stand by while stations #1 is readied. Aircraft will then return C&GS personnel to PARRY where they will ready stations #3 and 4.

(2) Three (3) C&GS personnel will stay on PARRY ISLAND during X, Y and Z days.

(3) After X, Y, and Z days: Coast and Geodetic Survey field chief traveling by boat or liaison aircraft will pick up photo records at stations 1, 2, and 3, as soon as possible and take records to photo lab and process.

(4) Starting of instruments.

(a) For the X-day test all equipment will be activated by radio signal on 27 or 27.1 megrocycles.

(b) For the Y-day test station #1 NORTH RUNIT and station #3 ANIYAANII will be activated by one (1) minute signal from timing cable, and will have one (1) second time mark placed on the record by signal from the timing cable. Station #2 SOUTH RUNIT will be activated by radio on 27 or 27.1 megrocycles.

(c) For Z-day test (if this equipment operated on Z-day)equipment on ANIYAANII will be activated by cable signal, and equipment on PARRY either by cable or radio as required.

(5) Data Film.

(a) Photographic paper, brought into Joint Task Force SEVEN operating area by C&GS team and turned over to Task Group 7.5 Film Auditing Agent at PARRY ISLAND will be drawn from said Task Group 7.5 agent on receipt for calibration, practices and test days. Chief C&GS team will keep a log of all papers he brought from the Zone of Interior.

(b) An officer of Headquarters FITZWILLIAM FORWARD accompanied by Chief C&GS team will take exposed paper to KWAJALEIN where he will witness its developing in the Naval Photographic Laboratory. He will:

(1) Assure that no copies are made of the film.

(2) Assure that no unauthorized persons see the film.

(3) Assure that the Chief C&GS team see film and take necessary "Secret" notes thereon.

(4) Make out a certificate for file in Headquarters FITZWILLIAM FORWARD showing:

(a) Date, time and place of developing.
(b) Who developed film.
(c) Who was present during developing.
(d) Who saw developed film.
(e) That no copy was made of film.

(5) Classify film military "Secret", package and dispatch to Chief AFMSW-1 by officer courier.

g. Reporting.

(1) Constants of instruments and orientation will be kept in a military "Secret" log and will be returned to AFMSW-1 by an officer courier upon completion of project FITZWILLIAM.

(2) Chief C&GS team will give Headquarters FITZWILLIAM FORWARD information for a brief "Top Secret" radio message to be sent to Chief AFMSW-1 as soon as possible after film is developed and studied following an atomic explosion, the message to indicate positive or negative results by station.

(3) All records and reports pertaining to the C&GS team will be recorded, filed and referred to under index number 9-019 which is an arbitrary number assigned to the FITZWILLIAM activities at ENIWETOK by AFMSW-1.

h. Evacuation. In the event that it becomes necessary to evacuate PARRY ISLAND after an atomic explosion because of high-altitude fall out of radio active particles, C&GS personnel will be evacuated from PARRY ISLAND by water in accordance with instructions that will be furnished by CTG 7.2, his PARRY ISLAND representative and by Hq FITZWILLIAM FORWARD.

4. a. Logistics. Air Transport Command has provided air lift for equipment and instruments to ENIWETOK.

b. Roll-up. Upon completion of the Coast and Geodetic Survey Team's participation in the FITZWILLIAM program, personnel and equipment will be returned to the Zone of the Interior.

(1) Personnel. Personnel will be returned to their proper stations by air under arrangements that will be made by this Headquarters.

(2) Equipment. Equipment will be recrated and shipped, by the Coast and Geodetic Survey Team, to the accountable office in the Zone of the Interior.

(a) Extremely delicate instruments and items required for immediate use in the Zone of the Interior will be returned by air under arrangements that will be made by this headquarters.

(b) All other serviceable equipment will be returned by water under arrangements that will be made by this headquarters.

c. Administration. The Coast and Geodetic Survey team consists of two (2) civilians and two (2) Air Force enlisted men attached for administration to Task Group 7.2.

AUTHORITY OF CHIEF OF STAFF
SECRET BY W.R.F.
AFOAT-1
DATE 5 Dec 57

Report
of
Operation FITZWILLIAM

VOL I TAB C Copy No. 35

Report of FITZWILLIAM Forward

UNITED STATES AIR FORCE

SECRET

[redacted]

Report of Operation FITZWILLIAM

VOL I TAB C Copy No. 35

Report of FITZWILLIAM Forward

UNITED STATES AIR FORCE

[redacted]

II

INTRODUCTION

The Chief of Staff, U. S. Army, assigned the mission of the long range detection of atomic explosions to the Commanding General, Army Air Forces, on 16 September 1947. [redacted]

In carrying out this responsibility, the Commanding General, Army Air Forces, was authorized to make maximum utilization of existing personnel and facilities, both within and without the War Department. He was directed to effect and maintain liaison with all participating organizations.

Legislation for the unification of the armed forces subsequently became effective, and on 14 November 1947 the Vice Chief of Staff, Headquarters U. S. Air Force, charged the Chief of the Air Force Special Weapons Group, Office of the Deputy Chief of Staff, Materiel, Major General William E. Kepner, with the overall responsibility of initiating and carrying out a plan for the long range detection of atomic explosions. He also designated the office of the Chief, Special Weapons Group, as the monitoring office for matters pertaining to the long range detection program.

In the meantime Joint Task Force SEVEN had been organized to establish an Atomic Energy Commission Proving Ground at ENIWETOK ATOLL in the MARSHALL ISLANDS, and to conduct tests of atomic weapons in the spring of 1948. Major General Kepner was designated Deputy Commander and Commander, Air Forces, JTF-7. On 9 December 1947, the Secretary of National Defense authorized trying out all possible methods for the detection of atomic explosions during the atomic tests of the pending operation known by the RESTRICTED code word of SANDSTONE.

A Long Range Detection Division, abbreviated AFMSW-1, was organized in the Air Force Special Weapons Group under Major General Albert F. Hegenberger. [redacted]

A SECRET project with the code name of FITZWILLIAM was established under the research and development phase of the long range detection project to take advantage of whatever could be learned about the long range detection of atomic explosions during the SANDSTONE atomic tests in the MARSHALLS. The Commander JTF-7 agreed to support the FITZWILLIAM project in the operating area of JTF-7 in so far as it did not interfere with his primary mission of SANDSTONE.

FITZWILLIAM was world wide with test detection stations from the PHILLIPPINES to GERMANY and from ALASKA to GUADALCANAL. Its purpose was to obtain positive and negative test results in order to establish the best detection theories and instruments for the long range detection of atomic explosions. The keynote was to economize on time and on money, and yet set up the best possible atomic explosion warning system.

Colonel Nelson P. Jackson, assigned to the Air Force Special Weapons Group and on temporary duty in the office of the Commander, Air Forces, JTF-7, was designated Project Officer for FITZWILLIAM activities in the operating area of JTF-7 on 28 January 1948. He was briefed on the FITZ-WILLIAM project by Major General Hegenberger and staff officers of AFMSW-1.

Colonel Jackson departed WASHINGTON, D. C. on 10 February 1948 with the office of the Commander, Air Forces, JTF-7, and arrived at Fort SHAFTER, T.H. on 12 February 1948. There FITZWILLIAM activities were coordinated with JTF-7, U. S. Army Pacific, Pacific Air Command, Hawaiian Air Materiel Area, Pacific Fleet, Army Security Agency, representatives of 308th Recon-naissance Group (Weather) from Fairfield-Suisun Air Force Base, California, and with representatives of AFMSW-1 who came out from WASHINGTON to give further briefings.

Major Russell W. Neely and Captain Carl E. Cloud of the 308th Reconnais-sance Group (Weather) visited OAHU from 26 to 28 February 1948 to coordinate the future B-29 operations of their organization out of HAWAII for FITZ-WILLIAM. The Commanding General, Pacific Air Command, Major General Ralph H. Wooten, arranged for the 308th to use BARBERS POINT Naval Air Station for their operations, and designated a Lieutenant Colonel Gunnison, chief of flight operations at HICKAM FIELD, as PAC Project Officer for the 308th's operations. Lieutenant Colonel Norman F. King, Commanding the 31st Weather Squadron at HICKAM FIELD was briefed on the 308th Group's scheduled opera-tions at HAWAII for FITZWILLIAM.

AFMSW-1 had requested CJTF-7 on 2 February 1948 for advance time notifi-cations of SANDSTONE atomic explosions and for one (1) second interval time signals on a continuous twenty-four (24) hour basis for FITZWILLIAM instal-lations as set forth in inclosure "B" to this report. The assistant communi-cations officer, JTF-7, Colonel Carl H. Hatch, drew up plans for an automatic keying device at FORT SHAFTER for transmitting three (3) letter code groups. A machine was built in the Signal Corps Depot on OAHU from these plans.

Lieutenant General John E. Hull, commanding JTF-7, held a conference with Major General Kepner, Colonel Jackson and members of JTF-7 staff on 3 March 1948 on the method of sending out time signal warnings without compromising the TOP SECRET classification of the dates and times of atomic explosions. It was agreed that the Army Security Agency, HAWAII, would prepare a code consisting of three (3) letter dummy and significant groups. The groups were to be selected at random and transmitted by radio from ENIWETOK ISLAND on three (3) frequencies simultaneously to cover the Pacific area.

Captain Wilfred C. Washcoe, ASA HAWAII, prepared and reproduced the code. Lieutenant General Hull authorized Captain Washcoe to give fifty (50) copies of this code to Major General Kepner for distribution to "Q" cleared heads

of FITZWILLIAM teams and stations needing time signal notifications, Lieutenant General Hull holding Major General Kepner responsible for the security of copies of this code.

About this time the following personnel arrived at CAHU from the Zone of the Interior, all involved in FITZWILLIAM activities:

Colonel Herbert W. Ehrgott and Major Pournaris of AFMSW-1 to bring Major General Kepner and Colonel Jackson up-to-date on the FITZWILLIAM Project. Colonel Draper F. Henry, USAF, on TDY with Office Commander Air Forces, JTF-7. Captain Howard B. Hutchinson, USN, Office of Naval Research, to head-up Naval FITZWILLIAM activities in MARSHALLS and MARIANAS. Commander H. I. Miller, USN, Office of Naval Research, to be ONR liaison officer at CINCPAC Headquarters for FITZWILLIAM activities. Mr. Aaron Heller, Naval Ordnance Laboratory, to be NOL field representative in MARSHALLS and MARIANAS.

All of these persons met with Colonel Jackson and worked out equipment, logistics and communications problems anticipated in the MARSHALLS area.

The office of the Commander, Air Forces, JTF-7, sailed from PEARL HARBOR for ENIWETOK on 8 March 1948 aboard the USS MOUNT MC KINLEY. Colonels Jackson and Henry accompanying. Colonel Ehrgott and Major Pournaris returned to AFMSW-1. Captain Hutchinson and Mr. Heller proceeded by air to KWAJALFIN where they set up their offices.

Aboard the MOUNT MC KINLEY from PEARL HARBOR to ENIWETOK Colonel Jackson drafted an operations plan for FITZWILLIAM activities in the operating area of JTF-7, requested by Major General Kepner. This plan was coordinated with staff officers of JTF-7, and upon arrival at ENIWETOK on 16 March 1948 it was coordinated with commanders of Task Groups in the MARSHALLS supporting FITZWILLIAM activities and with the Naval Commander, MARSHALLS SUB-AREA. It was published as Operations Plan, Serial Number 1-48, on 21 March 1948, and true extract copies were made and dispatched as pertained to each agency.

Also aboard the USS MOUNT MC KINLEY en-route from PEARL HARBOR to ENIWETOK a Command Post Exercise was held on 11th and 18th March 1948 in which Colonel Jackson participated for FITZWILLIAM operations, preparing dummy messages anticipated having to be sent preceeding, during and following atomic explosions.

III

HEADQUARTERS FITZWILLIAM FORWARD

Major General Kepner established Headquarters FITZWILLIAM FORWARD on ENIWETOK ISLAND on 17 March 1948 to supervise and coordinate FITZWILLIAM activities in the operating area of JTF-7. Major General Kepner designated himself Chief, FITZWILLIAM FORWARD. Colonel Jackson was assigned as Operations Officer and Colonel Henry as Communications Officer, Corporal Charles E. Kezner of the Office of the Commander, Air Forces, JTF-7 was detailed as Chief Clerk

for the headquarters, and Sergeant Harry R. Kubinski, a clerk typist from the same office, was loaned to Headquarters FITZWILLIAM FORWARD from 17 March to 6 April 1948.

Requisitions were made on AFMSW-1 for Lieutenant Colonel Sam P. Triffy, USAF, of AFMSW-1 and two (2) clerks typist. AFMSW-1 offered the services of Lieutenant Colonel Charles E. Gregory, USAF, which was approved by Major General Kepner.

Lieutenant Colonel Triffy arrived at ENIWETOK on 27 March 1948, Colonel Benjamin G. Holzman of AFMSW-1 on 29 March 1948, Lieutenant Colonel Gregory on 30 March 1948, and two clerks typist, Sergeant John H. Dixon and Private First Class Richard D. Cochran, on 12 April 1948. Colonel Holzman was designated Executive Officer, Lieutenant Colonel Triffy, Technical Requirements Officer and Lieutenant Colonel Gregory, Administrative Officer, Historian and TOP SECRET Control Officer.

Joint Task Force SEVEN set up a radio station on ENIWETOK ISLAND to broadcast three (3) letter code groups for time warning notifications of impending atomic explosions, and a radio station on KWAJALEIN ISLAND to broadcast time ticks.

IV

PARTICIPATING AGENCIES

Nine (9) methods for the detection of atomic explosions were to be tested in the operating area of JTF-7: sonic, radiological [redacted], seismic, field analysis laboratory, magnetic, atmospheric conductivity, gas sampling and ionospheric.

The sonic tests were to make use of extremely sensitive microbarophones to pick-up the direction and strength of low frequency sound waves. Two (2) agencies were to participate: the Naval Ordnance Laboratory and the Air Materiel Command.

The Naval Ordnance Laboratory located eight (8) sonic stations in the MARSHALLS at the following atolls: ENIWETOK, KWAJALEIN, BIKINI, UJAE, JALUIT, AILINGLAPALAP, MILI and MAJURO. Each of these stations consisted of two (2) microbarophone arrays separated by a distance of about ten (10) miles to obtain the angle of incidence of incoming pressure waves.

The Air Materiel Command operated a mobile sonic balloon team at KWAJALEIN on X-day. This team was equipped with large plastic balloons and ground sonic equipment. The balloons were helium-filled and designed by gas and weights to rise at five hundred (500) feet a minute to an altitude of 50,000 to 60,000

feet where they maintained a constant level. Theoretically, sound from a ground level explosion refracts through and travels unimpeded horizontally along this 50,000 foot corridor. Attached to each balloon was a microphone-transmitter combination which picked up the sound and transmitted it to a standard weather radiosonde receiver on the ground where the signals were recorded on tapes. The ground sonic equipment was to measure ground level sound impulses by means of converted World War II sound ranging devices.

The radiological detection tests were to be accomplished by measuring the amount of radioactivity in the air, and fell into two (2) categories: ground-level and airborne. Two (2) agencies were to participate in each: the Air Weather Service and the Naval Research Laboratory.

The Air Weather Service located a ground level radiological station at KWAJALEIN equipped with a ground filter unit, [redacted] wrap-around geiger counters and scalers, an automatic radiological counter and an ionization chamber.

The Naval Research Laboratory located four (4) ground level radiological stations in the operating area of JTF-7, one (1) each at MAJURO and RONGERIK and on each of two (2) destroyer mine sweepers sailing north-east of the MARSHALL on an arc between WAKE ISLAND and MAJURO ATOLL on a radius of 600 miles from ENIWETOK. Each of these stations was equipped with varying combinations of ground level radiological equipment (similar to those listed for the AWS stations in the preceeding paragraph) for filtering, measuring and recording radioactivity in the air.

Task Unit 7.4.4 (a detachment of the 514th Long Range Reconnaissance Squadron (Weather) from GUAM) had air filters installed in eight (8) B-29's at KWAJALEIN for the collection of radioactive particles while on scheduled meteorological flights in the south-west PACIFIC. These aircraft monitoried air currents from the PHILLIPPINES to JOHNSTON ISLAND and from WAKE to GUADALCANAL. Flights were sent out on courses determined by Colonel Holzman in his dual capacity as Staff Weather Officer, JTF-7, and as a member of Headquarters FITZWILLIAM FORWARD.

The Naval Research Laboratory had four (4) radiological balloon stations in conjunction with its ground level radiological stations at MAJURO, RONGERIK and on the two (2) DMS's just north-east of the MARSHALLS. Two (2) balloons were used to carry a radiological counter to an altitude of 50,000 feet to detect radioactivity in the upper atmosphere. The records were automatically transmitted to ground and ship stations by radio.

The Naval Research Laboratory had four (4) of its airborne automatic radiological counters installed in naval aircraft at OAHU for X-day. This equipment showed negative results following X-explosion, and AFMSW-1 had these

four (4) instruments sent to KWAJALEIN for installation in the B-29's of the 514th Long Range Reconnaissance Squadron (Weather) flying cloud tracking missions in closer proximity to the points of explosions. Some positive results were obtained with this equipment in the vicinity of the MARSHALLS.

The optical detector test was conducted by a Signal Corps team at ENIWETOK ISLAND and one at GUAM. [redacted] Such a flash was reported as having been seen following a thermonuclear explosion. This experiment was realised to have extremely limited value as it could be attempted [redacted] both the point of the explosion and the observation point and [redacted] not obscurred by clouds. Explosion Y was the best for this test, but a cloud intervened at ENIWETOK where the test was a failure; GUAM's results have not yet been determined.

Seismic detection tests were to be accomplished with seismographs to determine the characteristics of the earth tremor caused by an atomic explosion. Two (2) agencies were to participate: the Naval Ordnance Laboratory and the Coast and Geodetic Survey. The Naval Ordnance Laboratory located six (6) seismic teams in the MARSHALLS at the following atolls: ENIWETOK, KWAJALEIN, BIKINI, AILINGLAPALAP, MILI and MAJURO.

The Coast and Geodetic Survey had a seismic team at ENIWETOK operating three (3) seismographs for X and Y explosions and two (2) seismographs for Z-explosion. For X and Y explosions two (2) of its instruments were on RUNIT ISLAND and one (1) was on ANIYAANII ISLAND, and for Z explosion one (1) was on RUNIT and one (1) was on ANIYAANII.

Tracerlab under contract to Watson Laboratories of the Air Materiel Command set-up a field analysis laboratory at KWAJALEIN to separate and analyse radioactive particles obtained by airborne and ground filtering methods. All filter paper exposed on flights of the 514th Long Range Reconnaissance Squadron (Weather) terminating at KWAJALEIN were analysed in this laboratory.

Magnetic detector tests were conducted at ENIWETOK with two (2) magnetometers operated by Task Unit 7.4.4 air weather personnel and at KWAJALEIN with one (1) magnetometer operated by personnel of the NOL seismic-sonic station. These instruments had been designed originally by the NOL for aerial magnetic survey work and had been modified for high sensitivity measurements in the vicinity of large explosions.

The atmospheric conductivity tests were performed by two (2) scientists of Carnegie Institute of Washington under contract to Watson Laboratories of the Air Materiel Command. A B-29 was equipped with an airborne ionization device designed to measure earth to air electrical current, certain changes in which showed the presence of radioactivity. Flights were made from KWAJALEIN on courses laid out by Colonel Holzman.

Gas sampling tests were performed by the 514th Long Range Reconnaissance Squadron (Weather) at KWAJALEIN. Seven (7) B-29's with air filters were also equipped with air compressors and empty oxygen storage tanks. Air samples were collected on flights following atomic explosions. The tanks were then removed and were shipped by Air Transport Command from KWAJALEIN to BOSTON, MASS. where the contents were analyzed for gaseous radioactivity.

The Air Materiel Command located an ionospheric recorder station at ENIWETOK ISLAND to determine the deviations from normal ionospheric reflection caused by an atomic explosion. However, a practice test of the equipment was reported to have interfered with the control of drone aircraft in the vicinity of ENIWETOK, and to have interfered with Task Group 7.1 telemetering between PARRY ISLAND and the bomb detonation points, and so it was ruled off of ENIWETOK ISLAND by Commander Joint Task Force SEVEN. Arrangements were made to set up the equipment on KWAJALEIN but since it could not be used on ENIWETOK ATOLL, AFMSW-1 ordered it returned to the Zone of the Interior. It was returned without having been tested in conjunction with an atomic explosion.

V

SETTING UP

The office of the Chief, FITZWILLIAM FORWARD was maintained aboard the USS MOUNT MC KINLEY as was the office of the Executive Officer, Headquarters FITZWILLIAM FORWARD.

Commander Task Group 7.2 assigned office space to Headquarters FITZWILLIAM FORWARD in the headquarters building of ISCOM ENIWETOK on ENIWETOK ISLAND. The Operations Officer, Communications Officer, Technical Requirements Officer and Administrative Officer and the three clerks of Headquarters FITZWILLIAM FORWARD worked in this office on ENIWETOK ISLAND.

Letters of administrative instructions to FITZWILLIAM agencies in the MARSHALLS were sent out from Headquarters FITZWILLIAM FORWARD from 19 to 24 March 48.

Captain Hutchinson, USN, was appointed Headquarters FITZWILLIAM FORWARD Liaison Officer to Commander MARSHALLS SUB-AREA on 21 March 1948.

From the time Headquarters FITZWILLIAM FORWARD was established on 17 March 1948, officers of the headquarters assisted FITZWILLIAM teams and stations in the MARSHALLS to set-up and become operational. Arrangements were made with units of JTF-7 for sites, administration of personnel, power and for miscellaneous equipment needed by FITZWILLIAM teams but not brought with them. Major General Kepner gave Headquarters FITZWILLIAM FORWARD the additional responsibility of assisting the Signal Corps optical detector team [redacted] in any way necessary for its proper functioning, which assistance was given.

Several of the FITZWILLIAM activities arrived in the operating area of JTF-7 with film for use in their tests. As all SANDSTONE film had been serialized and had to be handled with utmost security under JTF-7 regulations, it was necessary to have Task Group 7.5 personnel inventory all FITZWILLIAM film in the area, and set-up strict accounting procedures therefor. Although this was inconvenient it did not interfere with FITZWILLIAM projects.

A request for four (4) jeeps was sent to AFMSW-J on 26 March 1948. Those jeeps were furnished by the 1535th Base Unit (ATC) at KWAJALEIN. Two (2) were assigned to the chief of the ground level radiological station at KWAJALEIN for the use of FITZWILLIAM teams and stations on that island. The other two (2) were flown to ENIWETOK, arriving on 7 and 11 April 1948. One (1) of these was assigned to the chief of the Coast and Geodetic Survey team on PARRY ISLAND and the other was kept at Headquarters FITZWILLIAM FORWARD. CTG 7.2 also assigned a jeep to Headquarters FITZWILLIAM FORWARD.

The FITZWILLIAM plan from AFMSW-1 dated 20 March 1948 was received on 2 April 1948, and additional inclosures arrived on 8 April 1948.

Headquarters FITZWILLIAM FORWARD published the emergency evacuation plans for FITZWILLIAM personnel on ENIWETOK ATOLL on 6 April 1948.

A full-dress rehearsal for the first SANDSTONE atomic explosion was designated PX-day and was held on 8 April 1948. Colonel Henry remained on ENIWETOK ISLAND charged with the responsibility of the following on PX minus two (2) days: first, preparing a roster of FITZWILLIAM personnel remaining on ENIWETOK ISLAND, who would require air evacuation in case of emergency (a copy of this roster to be turned over to the local Air Base Commander); second, check that all personal equipment was available including rain coats, mess kits, booties and goggles; third, see that two (2) L-5 aircraft departed at 1500 to take Mr. Cloud and one technician to C&GS seismic stations for last check; fourth, see that the automatic code system was operating to send the twenty-four (24) hour warning at appropriate time. On PX minus one (1) day Colonel Henry was to first, check execution of twenty-four (24) hour signal on three (3) letter time code system (dummy for PX-day); second, at 0600 hours local time to telephone results of muster of FITZWILLIAM personnel to local Air Base Commander; third, check that two (2) L-5 aircraft were prepared to depart to pick-up Mr. Cloud and his assistant; fourth, inform all FITZWILLIAM agencies on ENIWETOK of time to start their equipments. On PX-day Colonel Henry was to first, check execution of minus four (4) hours, minus two (2) hours and start your program signals on three (3) letter time code machine; second, insure that all personnel are available in case of emergency evacuation (a practice evacuation was carried out on PX-day except actual leading into aircraft).

Colonel Holsman participated in pre PX-day and after PX-day activities anticipating his weather-plotting duties and the cloud tracking messages that he would have to send for an actual atomic explosion.

Colonel Jackson and Lieutenant Colonel Triffy flew to KWAJALEIN on 7 April 1948, coordinated FITZWILLIAM activities there and participated in Task Group 7.4's air activities. Lieutenant Colonel Gregory, Sergeant Dixon and PFC Cochran were evacuated from ENIWETOK ISLAND on the USS PICKAWAY, and Corporal Wezner went to the USS MOUNT MC KINLEY where he worked in the office of the Executive Officer, Headquarters FITZWILLIAM FORWARD.

Operations orders for Headquarters FITZWILLIAM FORWARD that had been in the process of preparation for several weeks were published on 11 April 1948 and were distributed to FITZWILLIAM agencies without delay.

The ionospheric recorder and its two operators had arrived at ENIWETOK ISLAND on 10 April 1948, but because there was not time to set it up and test it in conjunction with JTF-7 equipment before X-day (scheduled for 15 April 1948) it was decided by Major General Kepner that it would not participate in X-day tests. However, a test of the ionospherograph was scheduled for X plus four (4) days. The test took place as arranged on 19 April 1948 and was reported by CTG 7.4 as having interfered with the operation of B-17 remote controlled aircraft (drone), and by CTG 7.1 as having interfered with telemetering between PARRY ISLAND and ACMON ISLAND. It was decided by CJTF-7 that the ionospherograph would not be used on ENIWETOK ISLAND but could be operated at KWAJALEIN. Arrangements were made to move the equipment to KWAJALEIN, but AFMSW-1 advised that unless it could be operated at ENIWETOK it might as well not be tested, and so it was ordered returned to the Zone of the Interior by Major General Kepner. It was recrated and left ENIWETOK by ATC for return to Watson Laboratories of the Air Materiel Command on 26 April 1948.

VI

EXPLOSION X

Colonel Jackson and Corporal Wezner went aboard the USS MOUNT MC KINLEY on X minus two (2) days to remain for X-explosion on 15 April 1948. On X minus one (1) day Major General Kepner and Colonels Jackson and Holsman briefed the following VIP's aboard the MOUNT MC KINLEY on the FITZWILLIAM project:

Admiral DeW. A. C. Ramsey, USN.
Lieutenant General Lewis H. Brereton, USAF.
Brigadier General James McCormick, Jr., USA, AEC Military Applications.
Congressman W. Sterling Cole.
Congressman Melvin Price.
Mr. John A. Derry, AEC.
Mr. F. B. Rhodes, Secretary to Congressional Committee.

Colonel Henry and Lieutenant Colonels Triffy and Gregory remained on ENIWETOK ISLAND to carry out the responsibilities of Headquarters FITZWILLIAM FORWARD enumerated for PX-day in Part V above.

Colonel Holsman plotted the travel of the atomic cloud following the explosion and sent courses to the 514th Long Range Reconnaissance Squadron (Weather) and to the 308th Reconnaissance Group (Weather) for tracking radioactive diffusion with air filter-equipped B-29's. He also positioned the DMS's QUICK and DAVISON, and sent out balloon release messages to radiological balloon teams.

Sergeant Dixon and PFC Cochran were evacuated from ENIWETOK ISLAND aboard the USS PICKAWAY.

Immediately following X-day Colonel Jackson and Corporal Wezner returned to ENIWETOK ISLAND and Sergeant Dixon and PFC Cochran returned from the PICKAWAY. Coast and Geodetic Survey seismic films were picked up on ENIWETOK ATOLL and taken to KWAJALEIN by Lieutenant Colonel Triffy (accompanied by the chief of the C&GS team) where they were developed and studied by the team chief. They were then marked TOP SECRET and sent by officer courier to AFMSW-1.

An effort to develop the data film of the atmospheric conductivity team at KWAJALEIN failed, and the undeveloped film was marked TOP SECRET and sent by officer courier to AFMSW-1 for processing as there were no facilities in the MARSHALLS available for developing it.

The data tapes of the two (2) magnetometers at ENIWETOK and the one (1) at KWAJALEIN were collected by Headquarters FITZWILLIAM FORWARD and retained for inspection of Mr. C. J. Aronson from NOL on duty with Task Group 7.1.

Captain Hutchinson, USN, collected the data from NOL and NRL stations in the MARSHALLS by air officer courier using a Navy PBY, by TOP SECRET electrical means and a special one-time-code for two (2) of his stations. Information was transmitted to Headquarters FITZWILLIAM FORWARD, AFMSW-1, Staff Weather Officer, JTF-7 and Chief of ONR by Classified messages. The record tapes were packaged and returned to ONR and NOL by Navy officer courier for further evaluation and compilation on which conclusions to AFMSW-1 will be based.

VII

EXPLOSION Y

The disposition and duties of Headquarters FITZWILLIAM FORWARD leading up to Y-day, on Y-day (1 May 1948) and following Y-day were similar with those for X-explosion except that Lieutenant Colonel Triffy flew to KWAJALEIN on Y minus two (2) days, and participated in Task Group 7.4's air activities in an air rescue B-17, and Sergeant Dixon remained ashore at ENIWETOK ISLAND to assist Colonel Henry and to perform K.P. in the island commander's mess.

Major General Kepner and Colonels Jackson and Holsman briefed the following officers on the FITZWILLIAM project aboard the USS MOUNT MC KINLEY

on Y minus two (2) days.

Major General Laurence C. Craigie, USAF.
Colonel Herbert L. Grills, USAF.
Captain Schade, USN, NRL.
Colonel Daniel C. Doubleday, USAF.
Colonel John R. Sutherland, USAF.
Colonel Milton F. Summerfelt, USAF.

VIII

EXPLOSION Z

The disposition and duties of Headquarters FITZWILLIAM FORWARD personnel leading up to Z-day, on Z-day and following Z-day were similar with those for X-day. However, Lieutenant Colonel Triffy departed ENIWETOK on 13 May 1948 for return to AFMSW-1, and his duties on ENIWETOK ISLAND were taken over by Colonel Jackson. There was no FITZWILLIAM briefing for VIP's in connection with Z-explosion.

IX

ROLL-UP

After Z-day the following FITZWILLIAM teams, stations or agencies were the only ones remaining in the operating area of JTF-7 to be rolled up and returned to the Zone of the Interior, the others having completed their tests and left the area prior to Z-day:

1. Magnetometer stations at ENIWETOK and KWAJALEIN.
2. NOL and NRL stations in the MARSHALL ISLANDS area.
3. Coast and Geodetic Survey team at ENIWETOK.
4. Atmospheric Conductivity team at KWAJALEIN.
5. 514th Long Range Reconnaissance Squadron (Weather) at KWAJALEIN.
6. Ground Level Radiological station at KWAJALEIN.
7. Tracerlab Field Laboratory at KWAJALEIN.
8. ONR representative's office, KWAJALEIN.
9. Headquarters FITZWILLIAM FORWARD, at ENIWETOK.

Each agency was responsible for its own roll-up but Headquarters FITZWILLIAM FORWARD assisted in coordinating the various details connected with the roll-up of the various stations and teams.

Headquarters FITZWILLIAM FORWARD arranged for the Air Weather Officer, ENIWETOK, to recrate the two (2) magnetometers that he had been responsible for operating. These were delivered on 17 May 1948 to Mr. C. J. Aronson of NOL on temporary duty with Task Group 7.1 for return by water and rail transportation to the NOL at WHITE OAKS, MARYLAND.

The roll-up of the NRL and NOL stations was coordinated by the ONR representative, KWAJALEIN, and accomplished by the Commander, Task Group 7.3.

Since the Coast and Geodetic Survey team was asked by Task Group 7.1 to change one of its stations for Z-day in order to provide Task Group 7.1

with checks on their instrumentation, Headquarters, FITZWILLIAM FORWARD arranged with JTF-7 for assistance in arranging for the departure of the team's personnel by air on 17 and 19 May 1948 and for the departure of the team's equipment by water and rail transportation, leaving ENIWETOK approximately 21 May 1948.

The 514th Long Range Reconnaissance Squadron (Weather) being a unit of Task Group 7.4, JTF-7 was responsible for the organization's roll-up. Headquarters FITZWILLIAM FORWARD, however, arranged for the air filter equipment to remain installed on the aircraft and for the removal of the NRL airborne automatic radiological counters and the gas sampling equipment. The airborne radiological counters were returned to the ONR representative, KWAJALEIN, for return to the Zone of the Interior with the other Naval equipment. The gas sampling equipment was recrated and returned by air to the Air Materiel Command.

The Ground Level Radiological station and the Tracerlab Field Laboratory at KWAJALEIN would not complete their missions until approximately 31 May 1948 and were, therefore, the last of the FITZWILLIAM stations scheduled to depart from the area. Their personnel and equipment are to be returned to the Zone of the Interior by air under arrangements that have been made by the Air Weather Officer, KWAJALEIN and the A-4, Task Group 7.4.

Headquarters FITZWILLIAM FORWARD was officially disbanded at 2400 hours on 17 May 1948 by General Order Number 2, Headquarters FITZWILLIAM FORWARD, dated 10 May 1948. Lieutenant Colonel Triffy departed for WASHINGTON, D. C. on 14 May 1948. Lieutenant Colonel Gregory departed for KWAJALEIN on 15 May 1948, Sergeant Dixon and PFC Cochran departed for OAHU on 16 May 1948 where they joined the Office of Commander, Air Forces, JTF-7. Colonels Jackson and Henry and Corporal Wezner rejoined the Office of the Commander, Air Forces, JTF-7, and continued working on FITZWILLIAM matters until the final details were cleared up and until the history of FITZWILLIAM FORWARD was completed. They were scheduled to depart for OAHU on 20 May 1948.

X

RESULTS

From what could be determined in the field the following results were obtained from FITZWILLIAM tests in the operating area of JTF-7: the airborne radiological activity test (B-29 air filters, atmospheric conductivity and NRL radiological counters) turned out very well; the seismic and sonic tests turned out fairly well; and the ground level radiological tests turned out only fair. The other tests were negative or undetermined.

XI

RECOMMENDATIONS

In considering recommendations for future operations of long range detection it must be born in mind that FITZWILLIAM was a "crash" program that came into the SANDSTONE picture at a relatively late date. As a result, many of the difficulties and omissions were due to lack of time for complete and careful planning and preparation.

Keeping the above in mind, for future operations in connection with long range detection it is recommended:

1. That in future detection tests in conjunction with atomic weapons tests, the responsibilities of the Commander of the Task Force conducting the tests be clearly defined in the mission assigned him by the Joint Chiefs of Staff in so far as they relate to long range detection experiments.

2. That every agency participating in long range detection tests insure by direct knowledge of facilities available in the test area or by supplying their field teams before they depart with all required equipment, that their teams will have all materiels and facilities required in the operating area. An apparently inconsequential item like a hammer took on considerable value when there wasn't one obtainable for uncrating equipment, especially since the crates would have to be reused for returning the equipment to the Zone of the Interior upon completion of the tests.

3. That personnel participating in the field tests be carefully selected not only for technical knowledge but also for field experience or ability.

4. That personnel clearances be initiated in sufficient time to weed out any questionable characters prior to arrival in the operating area.

5. That each agency participating have a system of field visits set-up from it's home office whereby frequent periodic checks are made on the operations of it's teams or stations.

6. That AFMSW-1 have a system of field visits set-up from it's home office whereby the participating agencies can be checked to see if the directives of AFMSW-1 are being followed.

7. That all tests to be performed are coordinated in advance with other activities in the test area to assure that there will be no interference one with the other.

   a. Long range detection tests should mesh smoothly with other tests being conducted in the vicinity.
   b. Whether or not long range detection test equipment (such as the ionospherograph) will interfere with other equipment in the vicinity should be established by more testing then there was time for on FITZWILLIAM before movement to the operating area.

8. That a forward headquarters or field office of AFMSW-1 be set up in advance and function much as the office of the Commander, Air Forces, JTF-7 did for SANDSTONE.

a. The main forward office should be with the staff of the joint task force, which for SANDSTONE would have been aboard the USS MOUNT MC KINLEY and should include:

One (1) officer or chief of the forward office.
One (1) officer for deputy chief.
One (1) operations officer.
One (1) technical requirements officer.
One (1) communications officer.
One (1) logistics officer.
Two (2) clerks typist (one (1) for chief clerk).
One (1) clerk stenographer.
One (1) supply sergeant.

b. A sub-field office should be set up in the area at a centrally located position to coordinate the long range detection activities focusing at that point, which for SANDSTONE would have been KWAJALEIN, and which office should be staffed by two (2) officers and one (1) clerk under AFMSW-1 and in which office should function field supervisors of ONR, NOL, NRL, etc., totalling about four (4) officers, two (2) civilians and two (2) clerks, all under the direct supervision and control of AFMSW-1.

c. Field teams should be set up as needed to coordinate the activities at major local points, which for SANDSTONE would have been at ENIWETOK and at GUAM, and which teams should consist of one (1) officer and one (1) clerk typist.

XII

INCLOSURES

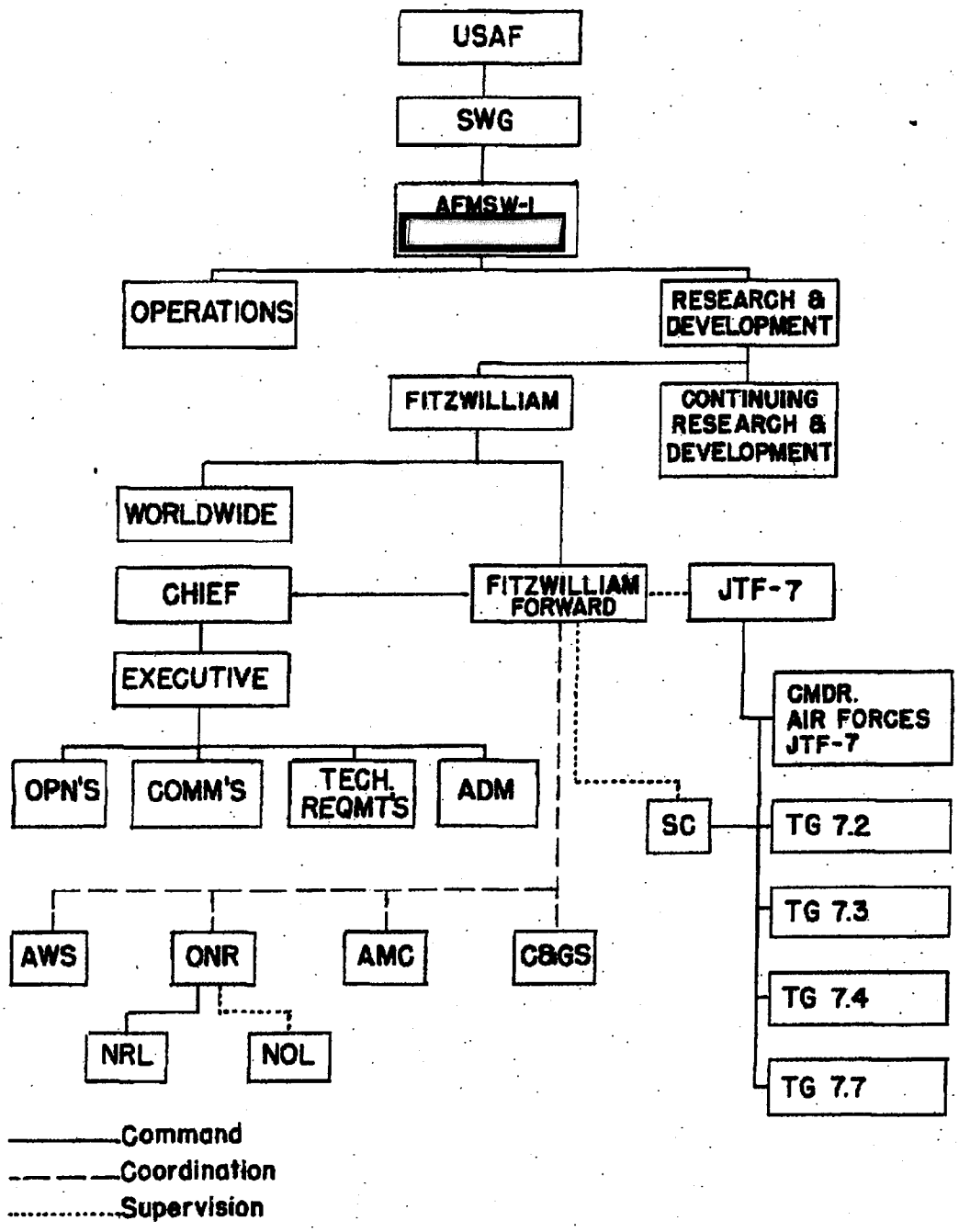
A. Functional Chart, Headquarters FITZWILLIAM FORWARD.
B. Communications, Codes and Time Signals.
C. Weather and Cloud Tracking.
D. Office of Naval Research Representative, KWAJALEIN.
E. Naval Ordnance Laboratory Seismic and Sonic Tests.
F. Naval Research Laboratory Balloon and Ground Level Radiological Tests.
G. Sonic Balloon Test, KWAJALEIN.
H. AWS Ground Level Radiological Tests, KWAJALEIN.
I. Airborne Air Filter, Gas Sampling and NRL Automatic Radiological Counter Test.
J. Optical Detector Tests, ENIWETOK.
K. Coast and Geodetic Survey Seismic Tests, ENIWETOK.
L. Tracerlab Field Analysis Laboratory Tests, KWAJALEIN.

M. Magentic Detector Tests.
N. Atmospheric Conductivity Tests.
O. Ionospherograph Test, KWAJALEIN.

FOR THE CHIEF, FITZWILLIAM FORWARD:

/s/ Nelson P. Jackson
NELSON P. JACKSON
Colonel, U.S.A.F.
Operations Officer

ORGANIZATION CHART
HEADQUARTERS FITZWILLIAM FORWARD



HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2,
APO 187, c/o Postmaster
San Francisco, Calif.

17 May 1948

COMMUNICATIONS, CODES AND TIME SIGNALS

Inclosure B to FITZWILLIAM FORWARD Report

A study of the existing communication facilities of the Army, Navy, and Air Force augumented by the special communications provided by JTF-7 for SANDSTONE indicated that these facilities would meet the requirements of project FITZWILLIAM. With the exception of a few minor difficulties with code systems for transmitting special reports, which will be discussed later, these facilities proved to be adequate and satisfactory.

As a result of Headquarters FITZWILLIAM FORWARD being established on ENIWETOK ISLAND and Major General Kepner and Colonel Holzman remaining aboard the JTF-7 Headquarters Ship the USS MOUNT MC KINLEY, it was necessary to work out a system of addressing incoming messages to assure prompt handling and delivery to the proper office for action. Since Headquarters FITZWILLIAM FORWARD was not assigned a JTF-7 task group number, it was arrenged to have all incoming mail and messages for FITZWILLIAM FORWARD addressed to CTG 7.2 ENIWETOK and to have CTG 7.2's mail and message facilities deliver them to Headquarters FITZWILLIAM FORWARD. This system worked very well until the volume of messages requiring personal action by Major General Kepner and Colonel Holzman reached considerable proportions. When this situation was reached, some time after X-day, all originators were requested to address all messages to both FITZWILLIAM FORWARD and to the MOUNT MC KINLEY, designating the action addressee if possible. This system worked well, requiring only that action taken be coordinated between the two offices.

Other than special time signal codes to be discussed under the subject of time signals, the normal communication systems provided all codes necessary for communications with but two exceptions. A one-time pad system was procured by the ONR representative at KWAJALEIN, Captain Hutchinson, USN, from Naval sources, to provide a secure system of communications between his office at KWAJALEIN and the NRL balloon team on RONGERIK ATOLL. This system was required to enable ONR representative KWAJALEIN to relay the "time to launch balloon" messages from Colonel Holzman on the MOUNT MC KINLEY to the balloon team on RONGERIK. A second system was required to provide a secure means of forwarding radiological reports from the various FITZWILLIAM stations. A one-time numerical subtractor pad (Short Title: SIGKBW) was provided for this purpose. Two difficulties were encountered in the employment of these codes; first, a lack of familiarity by the users resulted in considerable confusion and a number of service messages in the early parts of the tests. Later, as personnel became more adept in the use of these codes, this trouble was eliminated.

Second, the radiological readings were of a much greater magnitude than was anticipated. Since the code was capable of encoding only a maximum count of 999, all readings above 999 had to be transmitted at this maximum figure of 999. Final records will correct the preliminary records but provision should be made in any future tests for codes of ample scope to permit encoding of the highest anticipated radiological counts from the filters.

The requirements for time signals of FITZWILLIAM experimental stations during the SANDSTONE tests were of two basic types; first, there was a requirement for a time notification to permit equipment to be started at the proper time prior to the phenomena resulting from the explosion reaching the particular stations. Secondly, certain stations required an accurate time tick at one (1) second intervals that could be superimposed on recording tapes or papers.

For security reasons it was vital that the time at which explosions were to occur be known only to those individuals whose duties made it absolutely necessary that they have such information. The problem then for the first basic requirement, ie, "Start Your Program" signals, was one of utmost security combined with fast and dependable transmission. The second basic requirement, since no security was involved as the time ticks were in no way connected with the time of explosion, was far easier to meet, requiring only a radio signal actuated by an accurate chronometer.

Stations requiring "Start Your Program" signals fell into two catagories: those in the continental United States area and those in the Pacific Ocean Area.

Stations in the Continental area were as follows:

1. Naval Ordnance Laboratory, WHITE OAKS, MARYLAND.
2. Detachment, Watson Laboratory AMC, ALAMOGORDO, N.M.
3. Naval Electronics Laboratory, SAN DIEGO, CALIFORNIA.

A tentative system, to provide these stations with a minus twenty-four (24) hour time and an approximate time of explosion, was worked out early in March at FORT SHAFTER by members of Major General Kepner's staff and Colonel Ehrgott of AFMSW-1. It was proposed that encoded dummy weather messages be sent from the operational area back to AFMSW-1. Certain weather elements, such as clouds, rain and drizzle, would mean certain times, such as minus twenty-four (24) hours, explosion occured (approximately) and cancellation. AFMSW-1 was to pass this information on to the stations listed above by pre-arranged telephone code. While enroute to the operating area aboard the MOUNT MC KINLEY, Colonels Henry and Jackson refined this code to provide greater security. As finally evolved, and approved by J-2, JTF-7, and the Army Security Agency representative from HAWAII (Captain Washcoe), it consisted of "wind aloft" reports that gave wind direction and velocity. A number of random messages, none repeating, were prepared. These were to be sent at random times throughout the tests. Certain of these messages were given certain meanings: minus twenty-four (24) hours, explosion (approximately) and cancellation. All times were relative to the internal date-time-group that was included in the dummy weather message. The method prepared for AFMSW-1 to get this information out to the continental stations was not considered sufficiently secure by either Headquarters FITZ-WILLIAM FORWARD or by J-2, JTF-7. It being impractical to evolve a code from

this end, it was decided that responsibility for this phase must be with AFMSW-1 and approved by AEC and ASA in WASHINGTON, D.C. They were so informed, and devised a system that was satisfactory to the AEC and to ASA. The completed "dummy weather code" was submitted to JTF-7 for final approval. JTF-7 staff at this time was considering the procedure for notifying the JCS and other high level government agencies in WASHINGTON of explosion times in advance of tests. They recommended, since their message going back would pass through the JTF-7 rear office in WASHINGTON, that arrangements be made for AFMSW-1 to get the minus twenty-four (24) hour and "explosion occured" messages from that agency. AFMSW-1 was so advised and this system was used satisfactorily throughout the tests. The dummy weather message code was forwarded to AFMSW-1 to be held for emergency in case the direct message system should not prove satisfactory.

The need for time notifications of impending atomic explosions to FITZWILLIAM stations in the Pacific Ocean area was set forth in a memorandum from Colonel Holsman dated 2 February 1948 to the Staff Signal Officer, JTF-7 stating that the following FITZWILLIAM stations would require time signals as indicated:

LOCATION	AGENCY	SIGNAL REQUIRED
MIDWAY	AMC	7 days; 1 day; 2 hours; 10 minutes.
GUAM	NEL	7 days; 1 day; 4 hours.
HONOLULU	NEL	7 days; 1 day; 4 hours.
SAN DIEGO	NEL	7 days; 1 day; 4 hours.
BIKINI	NOL	7 days; 1 day; 2 hours; 10 minutes.
BIKINI	NOL	7 days; 1 day; 2 hours; 10 minutes.
KWAJALEIN	NOL	7 days; 1 day; 2 hours; 10 minutes.
KWAJALEIN	NOL	7 days; 1 day; 2 hours; 10 minutes.
MAJURO	NOL	7 days; 1 day; 2 hours; 10 minutes.
MAJURO	NOL	7 days; 1 day; 2 hours; 10 minutes.
PONAPE	NOL	7 days; 1 day; 2 hours; 10 minutes.
TRUK	NOL	7 days; 1 day; 2 hours; 10 minutes.
AILINGLAPALAP	NOL	7 days; 1 day; 2 hours; 10 minutes.
PALAU	NOL	7 days; 1 day; 2 hours; 10 minutes.
ENIWETOK	NOL	7 days; 1 day; 2 hours; 10 minutes.
HONOLULU	NRL	7 days; 1 day.
RONGERIK	NRL	7 days; 1 day.
MAJURO - 2 ships	NRL	7 days; 1 day.
ENIWETOK	C&GS	Signal to start seismic clock.

Work was begun on 1 March 1948 at FORT SHAFTER by JTF-7 staff, Signal Staff USARPAC (United States Army Pacific) and the Army Security Agency representative HAWAII, (Captain Wilfred C. Washcoe) to produce a code system for furnishing time signals to FITZWILLIAM stations in the Pacific Ocean Area. Captain Washcoe of the ASA went far beyond his normal responsibility to produce this system in the very limited time available, and arranged to have the necessary machines built in the local shops at no cost to FITZWILLIAM.

The required characteristics of this code were security, speed, and dependability. Lieutenant General Hull insisted that the security be such that even in event of a compromise of the code the actual time of an explosion would not be disclosed.

Work was begun at once by Colonel Hatch, Deputy Communications Officer for JTF-7 and by Captain Washcoe of the local ASA office to produce such a code. The code (short title ARPACAS 3-) consists basically of random three (3) letter code groups. A large number of these groups, none of which were repeated, were produced. Certain of these groups were picked at random and assigned the following meanings:

Seven (7) days from today is significant.
The next twenty-four (24) hours or less are significant.
The next four (4) hours are significant.
The next two (2) hours are significant.
Start your program.
Stop your program.

The remainder of the groups to be used as dummies for cover purposes.

Lieutenant General Hull decided on 7 March 1948 to deliver prepared codes to Major General Kepner and hold him responsible for the distribution of those codes to the users. Major General Kepner sent a message to the Chief of Staff, USAF, outlining at some length the situation regarding the establishment of this time signal code.

Final distribution of ARPACAS 3-1 was as follows:

NOS.	LOCATION	ORGANIZATION	NAME OF HOLDER
1-16 incl.	ENIWETOK	Hq. FITZWILLIAM FORWARD	Spares
17	GUAM	Signal Corps	Mr. Southard
18	KWAJALEIN	Air Materiel Command	Dr. Crary
19-21 incl.	WASHINGTON	AFMSW-1	3- continental stns.
22	WASHINGTON	AFMSW-1	Colonel Ehrgott

The following were distributed by Captain Hutchinson, USN, ONR representative KWAJALEIN:

NOS.	LOCATION	NAME OF HOLDER
23	PEARL HARBOR	T. McMillian, (NRL).
24	PEARL HARBOR	Lieutenant (jg) B. C. Wilson, USN (NRL).
25	MAJURO	Ensign R. L. Vader, USN (NRL).
26	RONGERIK	Ensign G. O. Robertson, USN (NRL).
27	DMS 32	Ensign W. F. Tiemann, Jr., USN (NRL).
28	DMS 37	Ensign Seymore Yalen, USN (NRL).
29	TRUK	Jay Phelps Leary, (NOL).
30	TRUK	Robert Kenneth Fox, (NOL).
31	PALAU	Kenneth Stanley Bonwit, (NOL).
32	PALAU	Lieutenant Commander Walter E. Greene, USN.
33	BIKINI	Richard Lee Knodle, (NOL).
34	BIKINI	Lieutenant (jg) Luther Walter Lauback, USN.
35	KWAJALEIN	Aaron Heller, (NOL).
36	KWAJALEIN	Aaron Zed Robinson, (NOL).
37	AILINGIAPALAP	Robert Francis King, (NOL).
38	AILINGIAPALAP	Lieutenant (jg) Gordon E. Kaufman, USN.

NOS.	LOCATION	NAME OF HOLDER
39	ENIWETOK	William Thomas Whistler, (NOL).
40	ENIWETOK	Lieutenant (jg) Gordon E. Kaufman, USN.
41	MILI	George Robert Lund, (NOL).
42	MILI	Ensign Richard H. Wilson, USN.
43	JALUIT	Lieutenant Robert W. Givens, USN.
44	JALUIT	Lieutenant Robert W. Givens, USN.
45	UJAE	Lieutenant Robert W. Givens, USN.
46	JUAE	Lieutenant Robert W. Givens, USN.
47	MAJURO	Whitefield Randall Cook, (NOL).
48	MAJURO	Whitefield Randall Cook, (NOL).
49	GUAM	Doctor Gilbert H. Curl, (NEL).
50	MARSHALL IS. SUB-AREA	Captain H. B. Hutchinson, USN.

A machine was built in the Signal Corps depot at OAHU to automatically send these three (3) letter code groups on three (3) frequencies simultaneously, namely 6.49 mcs, 11,305 mcs and 17.865 mcs, in order to give complete coverage of the Pacific area. This equipment, including 100% stand-by spares was installed at the JTF-7 communications center on ENIWETOK ISLAND. Headquarters JTF-7 placed this system in operation at ENIWETOK ISLAND on 25 March 1948. Dummy groups were transmitted for random lengths of time varying from five (5) minutes to eight (8) hours. Random silent periods were also employed to provide time for maintenance of the equipment. At the end of the transmission time for all groups (both dummy and significant) a long dash was sent, the stopping or chop of this dash indicating the time of execution. The time for all signals except the start your program were received from JTF-7 by TOP SECRET message through CTG 7.2 ISCOM ENIWETOK. The time for the "start your program" was received via direct under-water cable from the timing control tower on PARRY ISLAND. Station chiefs requiring these time notifications were directed to provide themselves with appropriate receivers, and to copy all signals transmitted. It was the responsibility of the Deputy Communications Officer, JTF-7, to maintain and operate this equipment, and the responsibility of Headquarters FITZWILLIAM FORWARD that the appropriate significant signals were transmitted at the proper time.

After the system had been in operation for some time before X-day, the ONR representative KWAJALEIN pointed out that the meanings of the significant groups as shown in ARPACAS 3-1 were not exact enough for their purposes. As an example, the code read "The Next Twenty-Four (24) Hours or Less are Significant." Actually their requirements were for an approximate twenty-four (24) hour warning to permit readying their stations. As a result it was agreed in a memo from Headquarters FITZWILLIAM FORWARD dated 9 April 1948 that:

1. Minus twenty-four (24) hours signal will be based on predicted H-hour, and will be accurate within plus or minus thirty (30) minutes.
2. Minus four (4) hour signal will be based on predicted time and will be within plus or minus thirty (30) minutes.
3. Minus two (2) hour signal will be based on predicted time and will be within plus or minus five (5) minutes.

4. Minus ten (10) minute signal will be accurate to plus or minus one (1) second.
5. One or more five (5) minute postponements may be introduced between minus two (2) hours and minus ten (10) minute signal.
6. No postponements will be introduced after minus ten (10) minutes. If for any reason the test is cancelled after minus ten (10) minute signal, a new H-hour will be a minimum of forty-eight (48) hours later.

Three (3) incidents took place during the operation of this system, which required appropriate action to insure the security of the system.

The first incident occured late in March some time before X-day. It was learned by the ONR representative at KWAJALEIN (Captain Hutchinson, USN) that an NOL technician, Mr. Bordelon, in charge of the station at PALAU and holding a copy of ARPACAS 3-1, was going to be refused his emergency "Q" clearance. Captain Hutchinson took immediate action to retrieve the code and sent Mr. Bordelon to BIKINI to operate latter station. The Captain of the AMS SWALLOW anchored in the BIKINI lagoon was to hold the code and pass directions to Bordelon to start his equipment. Refusal of Mr. Bordelon's emergency "Q" clearance was allegedly on account of his German-born wife. Captain Hutchinson did not doubt Bordelon's loyalty so the facts were presented to Colonel Thomas J. Sands, J-2, JTF-7, and decision was reached that no compromise had taken place.

The second incident occured shortly after X-day. On 16 April 1948 Headquarters FITZWILLIAM FORWARD was notified by AFMSW-1 that Mr. Aaron Heller, the NOL Field Supervisor, had been rejected for his final "Q" clearance.

The matter was discussed and, after consultation with Lieutenant Colonel Phillip R. Cibotti, CTG 7.5, and Captain Ramsey, of J-2, a message was sent to Lieutenant Colonel Triffy at KWAJALEIN explaining the situation and outlining the action that he and Captain Hutchinson would take in connection with handling the various phases of the matter.

Since there was a possibility that ARPACAS 3-1 could have been compromised, Colonel Henry, Lieutenant Colonel Gregory, Captain Gale of the ASA, HAWAII and CWO Woodward of the Communications Center worked up a new set of effective three (3) letter coded time signals, cut the stencils, ran off the copies, numbered them, bound them and prepared them for distribution. A report of the possibility of compromise was transmitted to ASA, HAWAII and a request was made for a teleconference for 0800 local time the next morning.

On 17 April 1948, teleconference with Captain Washcoe, ASA, HAWAII was held and it was learned that Captain Washcoe had replacement system---ARPACAS 3-2 and 4-2. Captain Washcoe agreed to make immediate distribution, the new system to be effective upon receipt of notice from JTF-7. A message was sent to Lieutenant Colonel Triffy and to Captain Hutchinson, USN, giving them details concerning the distribution.

At KWAJALEIN, Lieutenant Colonel Triffy received Colonel Jackson's wire regarding Mr. Heller and contacted Captain Hutchinson, USN NOL representative, Captain Brynildsen, Task Group 7.5 representative, and Captain Vest, USN, the

Island Commander. Captain Vest cabled CJTF-7 for additional information while Captain Hutchinson arranged for a general inventory of Mr. Heller's classified material. All classified material was impounded, and Lieutenant Colonel Triffy dispatched a message to Colonel Jackson outlining action taken.

Fifty (50) copies of ARPACAS 3-2 and the encode copy ARPACAS 4-2 arrived at KWAJALEIN by officer courier at 1015 hours on the 19th of April. Sufficient copies were turned over to ONR representative KWAJALEIN, Captain Hutchinson, USN, for distribution to agencies on KWAJALEIN and in the MARSHALLS AREA. Spare copies for this office, and copies for agencies on GUAM, TRUK and PALAU together with the encode system ARPACAS 4-2 were brought to ENIWETOK by Lieutenant Colonel Triffy. Colonel Triffy departed that night for GUAM with General Kepner, and made distribution next day of codes for GUAM, and delivered those for PALAU and TRUK to Naval agencies for transmittal to those islands by aircraft.

Major General Kepner concurred in placing ARPACAS 3-2 into effect on the condition that distribution could be made in time. On the 20th of April a message was sent to all holders that placed ARPACAS 3-2 in effect at 21/1201 Zebra Time. This message stated that those agencies that had not received the 3-2 copy prior to the effective time would record the signals received during the interim and interpret them after ARPACAS 3-2 was received.

To further insure that no compromise was possible, the time of execution on the "start your program" message signal was changed to minus eight (8) minutes instead of minus ten (10) minutes and ONR representative KWAJALEIN was so notified.

A third question of compromise occured on 5 May 1948. This involved another NOL technician, Jay Philps Leary operating the NOL station on TRUK. Investigation indicated that no compromise had taken place, so the only action was to have ASA, HAWAII send out a replacement system, for storage in the forward area in case a replacement should become necessary.

A minor difficulty, not connected with security in any way, was encountered when two "none transmission" periods fell consecutively resulting in a silent period of about thirteen (13) hours. This was reported by FITZWILLIAM agencies on GUAM. They had feared that some trouble had developed and resulted in their not getting the time signals. The encode tables were inspected and no further long double silent periods were evident so no further action was required.

Distribution was completed in sufficient time for all holders to decode the significant signals for X-day tests. The system worked satisfactorily for the balance of the tests.

At the conclusion of the tests disposition of these codes was as follows: Captain Hutchinson, USN, collected all codes issued by him, accomplished destruction, reported destruction direct to Army Security Agency, HAWAII, and notified this office of action. AFMSW-1 collected and destroyed all copies issued by them, holding their copy for files as directed by Major General Kepner. Mr. Southard's copy was retrieved when he visited ENIWETOK enroute to the Zone of the Interior. Doctor Crary turned his copy in direct to ASA, HAWAII.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2,
APO 187, c/o Postmaster
San Francisco, Calif.

17 May 1948

WEATHER

Inclosure C to FITZWILLIAM FORWARD Report

I

INTRODUCTION

The Staff Meteorologist, JTF-7, Colonel B. G. Holzman, was also Executive Officer of Headquarters FITZWILLIAM FORWARD. The launching of the NRL balloon-borne radiological counters and the cloud chasing activities of the weather reconnaissance aircraft located at KWAJALEIN, HAWAII and FAIRBANKS, ALASKA were entirely dependent upon the winds conditions at the time of the explosions and upon subsequent changes in speed and direction of the winds throughout the height to which the atomic bomb cloud reached. Colonel Holzman was responsible for alerting and directing the operations of the NRL balloon teams and cloud chasing units.

The fixed NRL balloon-borne units were located at RONGERIK, MAJURO and HAWAII. Also, two (2) mobile units were located aboard the Destroyer Mine Sweepers QUICK and DAVISON. These two (2) ships were planned to be located on a radius of 600 miles to the eastward of ENIWETOK, the exact positions to be determined by Colonel Holzman on the basis of the wind conditions at H-hour and subsequently.

The cloud chasing units were located at KWAJALEIN, HAWAII and LADD FIELD, ALASKA. The aircraft at KWAJALEIN were a part of Task Group 7.4. The primary mission of the KWAJALEIN unit was weather reconnaissance for the Weather Center located aboard the USS MOUNT MC KINLEY. Orders for missions over specified tracks were directed daily by the Executive Officer of FITZWILLIAM FORWARD. The B-29 units at HAWAII and LADD FIELD were for the sole purpose of FITZ-WILLIAM cloud chasing activities as outlined in Plan DOUBLEDAY of the Air Weather Service.

II

PX-DAY

A full dress rehearsal simulating an explosion day was scheduled by JTF-7 for 8 April 1948 at 0621 local time. The local time used was zebra plus twelve (12) hours. The rehearsal day was called PX-day.

PX-day was used as a practice day by FITZWILLIAM FORWARD mainly to test communications to the NRL balloon-borne stations and to see if the weather reconnaissance unit at KWAJALEIN would understand the instructions for cloud chasing. The HAWAII reconnaissance unit did not participate in this practice because the unit was not scheduled to arrive at BARBER'S POINT, T.H., their operating base, until 13 April 1948. LADD FIELD also did not participate. With regard to the latter unit, although it was alerted to execute Plan DOUBLE-DAY, it became increasingly doubtful whether it would participate in the operation. The reason for this was that there seemed to be little possibility of intercepting any part of the main trajectory path of the cloud from its scheduled operating base at SHEMYA. All of the daily trajectory paths calculated by Colonel Holzman indicated that the main explosion debris from the different atomic bursts would flow eastward and westward in a belt between the equator and 20° north latitude.

The problems of communication to the DMS's QUICK and DAVISON were quite simple. These vessels were under the operational control of CTG 7.3, and regular ship to ship communication was used. In preparation for PX-day the QUICK was positioned on 4 April 1948 on an arc 600 miles north of an east-west line, and the DAVISON was positioned on the same arc about 150 miles to the south of the east-west line.

Communications to RONGERIK and MAJURO offered some complications mainly because of the necessity of transmitting the instructions for launching their balloons in a secret code. Captain Hutchinson, USN, the ONR representative stationed at KWAJALEIN, arranged for the necessary codes. It was then agreed that Colonel Holzman would send launching directions to Captain Hutchinson who would then relay the instructions in a proper code to RONGERIK and MAJURO.

For HAWAII the launching instructions were transmitted direct to the ONR representative at PEARL HARBOR from Colonel Holzman.

Alert messages for the PX-day exercise giving instructions when and how frequently to launch were sent to all of the NRL balloon teams. The alert messages were confirmed by a subsequent dispatch with orders to launch one (1) practice balloon. All of the communications worked smoothly and it was felt that these teams were in perfect readiness for X-day explosion.

The cloud chasing activities for the weather reconnaissance unit at KWAJALEIN offered no complications whatsoever. Since this operation could not be distinguished from that of their routine daily weather reconnaissance missions, the PX-day exercise for this unit was not considered necessary. The flights for cloud chasing were designated Vulture Seven flying to the west and Vulture Eight flying to the east.

III

X-DAY

X-day was scheduled for 15 April 1948 with H-hour at 0617 local time. The NRL balloon teams were ready and the air weather reconnaissance unit at KWAJALEIN was operating routinely. A detachment of the 308th Long Range Reconnaissance Group (Weather) at FAIRFIELD-SUISUN arrived at BARBERS POINT, T.H. and was ready for the X-day operation on 13 April 1948.

The alert and launch messages for the NRL balloon-borne teams were prepared and transmitted without incident. The QUICK and DAVISON were so positioned that the QUICK was most likely to intercept the center of gravity of the path of radioactive contamination, whereas, the DAVISON was positioned to flank the edge of the predicted contaminated area. Also in the event of an erroneous forecast, the error would be such that the radioactive area would be most likely to pass over the DAVISON and flank the QUICK. The timing of the launchings was based upon wind conditions prior to H-hour. This was necessary in order to permit adequate time for transmission of the coded messages and to allow time for readying the balloons. It was also planned that the first balloon launched would be sent aloft before any chance of the radioactive debris would have reached the station. The data from this first run would be used as a background check. The subsequent balloons were to be launched at 2, 3, 4, or 5-hourly intervals, depending on the magnitude of the area of radioactive contamination. The latter was determined by using the difference in the wind velocities and direction at two different levels and applying a one (1) to ten (10) lateral diffusion of the contamination. If the horizontal projection of this volume were large, then a greater time interval was used between the launchings; for a small contamination area the interval between launchings was proportionately smaller. The following was the schedule for launching for X-day:

STATION	FIRST BALLOON	SECOND BALLOON	LAUNCHING INTERVALS AFTER 2ND BALLOON
RONGERIK	150130Z	150630Z	2 hours
MAJURO	151330Z	151830Z	3 hours
QUICK 15° 55N 171-20 E	151330Z	151830Z	3 hours
DAVISON 13° 30N 172-10 E	151330Z	151830Z	3 hours
HAWAII	162030Z	170630Z	5 hours

The Vulture Seven and Eight cloud chasing flights were flown by the reconnaissance unit at KWAJALEIN in accordance with Headquarters FITZWILLIAM FORWARD Opns. Order No. 1. The details of these flights are reported by Major Fackler, Commanding Officer of Task Unit 7.4. (Reconnaissance) in the Historical Report of JTF-7.

The flight procedures for the 308th detachment at BARBERS POINT presented the problems. First, it was quite possible that the wind shear separating the eastward moving top portion of the atomic cloud from the westward moving lower portion might occur well above 30,000 feet. If this were the case these aircraft would necessarily have to fly at 30,000 feet or higher, and this flight procedure would cause difficulties because of the higher maintenance requirements on the small number of aircraft available for the DOUBLEDAY missions. It was soon realized that a tremendous lateral and down-ward diffusion process was taking place in the atmosphere, thus minimizing the need to fly at extreme altitudes.

Second, the cloud chasing technique at distances beyond 500 to 1000 miles was soon discovered to be unsatisfactory. For example, two (2) passes might be made on two (2) consecutive days to a presumed center of gravity of contamination, and then the contaminated area would most likely be beyond the range of the aircraft located at BARBERS POINT. Further, the data from this procedure would be most difficult to interpret. It was then decided to

abandon searches attempting to locate the center of contamination, and instead to fly a routine daily mission over a fixed track traversing at right angles the trajectory of the atomic cloud. This latter operating procedure would give a maximum of data and permit calculation of rates of dispersion. In addition, a background reading for the track could be established so that contamination from subsequent atomic explosions might be differentiated.

The first instructions issued on 16 April 1948 at 0454 Z for flights to be operated out of BARBERS'S POINT read as follows:

"At 30,000 feet predicted search points are as follows: At 150600 Z 13.0 North 165 East at 160600 Z 15.8 North 171.8 East at 170600 Z 18.5 North 178 West at 180600 Z 17.8 North 164 West at 190600 Z 17.1 North 150.5 West at 200600 Z 18.0 North 134.6 West. Search radius for each point a minimum of sixty (60) miles. Request you commence along predicted trajectory daily search missions compatible with your operational capabilities. Search point positions will be amended if wind analysis here justifies. Advise Commander Air Forces, JTF-7 your daily missions and when total search operations for this trajectory completed. Only 30,000 feet trajectory given because little or nothing expected below this level".

These flight instructions were amended on the next day 17 April at 2230 Z to the following:

"After present mission abandon search along trajectory given in my 160454 Z. Desire search mission to 10 North 150 West to be intercepted at about 181500 Z. Suggest accent gaining 30,000 feet at least one hour before reaching point. Repeat this track daily with take-off at your discretion until a total of seven (7) missions including trajectory search have been flown. If nothing found on filters permission to abandon search flights before completion of seven (7) missions granted. Stand by for second phase of program in about ten (10) days".

On 17 and 18 April 1948 the BARBERS POINT missions successfully detected the front of the radioactive contamination from X-day. This had startling significance to the FITZWILLIAM program.

IV

Y-DAY

Y-day was originally scheduled for 30 April 1948 with H-hour at 0609 local time. Because of the unsatisfactory wind conditions predicted and observed for 30 April 1948, Y-day was postponed to 1 May 1948 with the same H-hour. (See Meteorological Report, JTF-7).

The NRL balloon-borne stations operated routinely for Y-day. Some balloons were launched during showery conditions. The schedule for launching of balloons was as follows:

STATION	FIRST BALLOON	SECOND BALLOON	LAUNCHING INTERVAL AFTER SECOND BALLOON
QUICK 13-00N 172-20E	010100Z	010600Z	3 hours
DAVISON 15-00N 171-45E	010100Z	010600Z	3 hours

STATION	FIRST BALLOON	SECOND BALLOON	LAUNCHING INTERVAL AFTER SECOND BALLOON
RONGERIK	302030Z	010130Z	3 hours
MAJURO	010900Z	011800Z	4 hours
HAWAII	020400Z	021600Z	5 hours

With regard to the cloud chasing program it became increasingly evident that routine reconnaissance over a fixed track which would be most likely to intersect the course of the atomic cloud would furnish far more significant data for the design of future detection procedures than the heterogenous cloud chasing efforts aimed at finding the center of gravity of the contamination. In view of this, a message on this subject was sent on 24 April 1948 at 2050 Z to AFMSW-1 through AEC channels. These channels were necessary because J-2, JTF-7 believed the context of the message contained AEC Restricted Data. The message was as follows:

"Aircraft filter sampling techniques appear to have great potential usefulness [redacted] X-day explosion created cloud to 65,000 feet. Westerly winds above 20,000 passed the bulk of the cloud and maximum radioactive concentrations eastward. Nearly all daily trajectories calculated here show that air above 30,000 feet migrates eastward clustering about the 20 degrees north latitude. There also appears to be a definite fall-out and diffusion downward of radioactive debris from these high levels. It is believed that very vital and significant information for [redacted] might be obtained if daily aircraft filtering flights could be made, for example: MIAMI to PANAMA or SAN DIEGO southward at varying altitudes up to 30,000 feet for next four (4) weeks beginning 1 May 1948 or as soon thereafter as possible. Willing to cancel SHEMYA operation now if some such plan as indicated can be worked out with AWS".

On 27 April 1948 AFMSW-1 requested filtering flights both north and south out of HAWAII at least one day prior to Y-day. The purpose of these flights was to obtain a good check on the background radioactive contamination in the atmosphere. However these additional flight requirements were beyond those called for in the DOUBLEDAY Plan and a decision was made to carry out the DOUBLEDAY operation unless directed otherwise from AFMSW-1. The basis of this decision was that background flights were being contemplated by Colonel Holzman within the operational capabilities of the detachment at BARBERS POINT.

On 29 April 1948 at 0414Z another message was received from AFMSW-1 requesting a total of twenty (20) flights at maximum ranges from HAWAII. This again far exceeded the total of seven (7) flights planned for Y-explosion in the DOUBLEDAY Plan, and it would be impossible to comply with this request without augmenting the aircraft at BARBERS POINT. AFMSW-1 was so informed in a message on 30 April 1948 at 0100Z.

In a message of 1 May 1948 at 0018Z AFMSW-1 suggested a plan for flight operations from BARBERS POINT and LADD FIELD which was compatible with the operational capabilities of these units as outlined in Plan DOUBLEDAY. Accordingly every effort to comply with the suggested flight procedures was made. Reference messages 020615Z, 020111Z and 020109Z.

Six missions were scheduled for LADD FIELD as follows:

2 May 1948---LADD FIELD to BARBERS POINT at 30,000 feet.
3 May 1948---BARBERS POINT to LADD FIELD at 10,000 feet.
4 May 1948---LADD FIELD to BARBERS POINT at 30,000 feet.
5 May 1948---BARBERS POINT to LADD FIELD at 1000 feet.
6 May 1948---LADD FIELD to BARBERS POINT at 30,000 feet.
7 May 1948---BARBERS POINT to LADD FIELD at 1000 feet.

The flights procedure for the 308th Detachment at BARBERS POINT was originally planned for a slow climb reaching 30,000 feet one (1) hour before reaching the end point of the track and then maintaining 30,000 feet for one (1) hour on return with a slow descent to home base thereafter. Because of the tardiness in receiving the flight plan as suggested by AFMSW-1 the first two (2) missions for Y-day had already been flown, but the subsequent missions were flown as desired by AFMSW-1. It was decided to fly a maximum range track on course HAWAII to PALMYRA. In most cases the end point of this track was very near two (2) degrees south and 164 degrees west. The Air Weather Service had made available an extra aircraft at BARBERS POINT, and as a result nine (9) missions were flown following Y-explosion to approximately 2° S 164° W. These missions were completed as follows: 2 May 0435Z, 3 May 0700Z, 4 May 0750Z (two (2) missions), 5 May 0920Z (two (2) missions), 6 May 0800Z, 7 May 0942Z, and 8 May 0755Z.

Vulture Seven and Eight missions by TU 7.4.4 were flown in accordance with FITZWILLIAM FORWARD Operations Order Number 1-48 in a manner very similar to that flown on X-day. There were however two (2) important differences; first, because of the tremendous lateral diffusion, the search procedure outlined in Operations Order Number 1-48 was abandoned; second, one (1) aircraft called the Rad-safe aircraft which flew in the orbit at H-hour and whose mission was to determine the outline of the flanks of the radioactive cloud for six (6) or eight (8) hours after H-hour was not used for FITZWILLIAM purposes as in X-day. Because of the highly active filters that were obtained by this aircraft on X-day it was believed that very significant information relating to the drone operation might be obtained if the filter in this aircraft was not changed periodically. It was desired to obtain a maximum of radioactive intensity which would permit a comparison with the activity obtained by the drone filter samples. Accordingly this filter was given to AEC for comparison purposes. It is recommended that AFMSW-1 obtain a report of the analysis of this filter as compared with the drone samples.

V

Z-DAY

The Z-day bomb was scheduled to be fired on 15 May 1948 with H-hour at 0604 local time. The detonation occurred on schedule in favorable weather but the resulting atomic cloud rose only to a height of 33,000 feet. This resulted in some complications to the NRL balloon-borne program. The NRL balloons were designed to record radioactive data mainly in levels near 50,000 feet. Thus at the outset it should be concluded that only small amounts of activity should be detected at levels above 33,000 feet for the Z-day firing. Further, the launching times for all these teams were calculated on the basis

of 40,000 to 50,000 feet winds which were averaging 20 to 30 knots greater than that at 30,000 feet. As a result the front of contamination from Z-day probably reached the RONGERIK, QUICK and DAVISON stations several hours later than anticipated. This however, should not have seriously interfered with the experiments because the internal launching time was adequate to insure some success in the later balloon launchings. Because of the height to which the cloud rose on Z-day and the nature of the trajectory paths it is highly improbable that anything significant would have been detected at MAJURO, although some slight chance of success exists for the HAWAIIAN launchings. The launching schedules were as follows:

STATION	FIRST BALLOON	SECOND BALLOON	LAUNCHING INTERVAL AFTER SECOND BALLOON
RONGERIK	142000 Z	150000 Z	3 hours
MAJURO	150100 Z	150500 Z	3 hours
HAWAII	160600 Z	161700 Z	5 hours
QUICK 12° 30' N 172° 20' E	142300 Z	150400 Z	3 hours
DAVISON 11° 30' N 172° 25' E	142300 Z	150400 Z	3 hours

The Vulture Seven and Eight flights were operated as for the Y-day explosion. Here again the B-29 aircraft in the orbit at the time of the shot followed the subsequent flanks of the atomic cloud. The air filters were not changed in order to obtain a maximum sample of activity. The aircraft landed at ENIWETOK and the filter was turned over to AEC representatives for analysis and comparison with the drone samples. AFMSW-1 should utimately obtain a report of the activity of this filter from AEC.

The missions for the cloud chasers of the 308th detachment of BARBERS POINT were flown on a track approximately to 2° S 164° W as follows:

		OUT BOUND	RETURN
1st mission	15 May 1948	11,000 feet	21,000 feet
2nd mission	16 May 1948	11,000 feet	21,000 feet
auxiliary mission	16 May 1948	1,000 feet	30,000 feet
3rd mission	17 May 1948	11,000 feet	21,000 feet
auxiliary mission	17 May 1948	1,000 feet	30,000 feet
4th mission	18 May 1948	11,000 feet	21,000 feet
5th mission	19 May 1948	11,000 feet	21,000 feet
6th mission	20 May 1948	11,000 feet	21,000 feet
7th mission	21 May 1948	11,000 feet	21,000 feet

The 374th squadron at LADD FIELD was scheduled to fly missions on a track from LADD FIELD to BARBERS POINT with take-off terminal to be determined by the availability of aircraft. The scheduled missions were:

1st mission	15 May 1948	1,000 feet
2nd mission	16 May 1948	21,000 feet
3rd mission	17 May 1948	21,000 feet
4th mission	18 May 1948	1,000 feet
5th mission	19 May 1948	1,000 feet
6th mission	20 May 1948	1,000 feet

A radio silence directive apparently had been issued for all cloud chasing activities from BARBERS POINT. It is not clear who issued this directive but it was believed that this may have been injudicious. Although security was important, this flight procedure was not compatible with air-sea rescue requirements. Further, it is believed that there could be no significant branch of security if position reports were given without weather and lititude. A real threat to security would arise if in-flight weather reports were transmitted to collection centers for further dissemination for meteorological purposes.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2
APO 187, c/o Postmaster
San Francisco, Calif.

17 May 1948

OFFICE OF NAVAL RESEARCH REPRESENTATIVE, KWAJALEIN

Inclosure D to FITZWILLIAM FORWARD Report

The Office of Naval Research established an office in the operating area of Joint Task Force SEVEN to supervise and coordinate all Navy FITZWILLIAM activities in the MARSHALL ISLANDS.

The ONR representative, Captain H. B. Hutchinson, USN, stopped at HAWAII on 5 March 1948 and was directed by Major General W. E. Kepner, Deputy Commander Joint Task Force SEVEN, to set up his office at KWAJALEIN.

While at OAHU, T.H., Captain Hutchinson represented the Naval Research Laboratory and the Naval Ordnance Laboratory, in regards to their participation in FITZWILLIAM in the MARSHALL ISLANDS. Personnel present at several conferences were Colonel Ehrgott, AFMSW-1; Captain H. S. Persons, USN, Operations Officer of Task Group 7.3; Captain John Vest, USN, Commander Task Group 7.7 and Commander MARSHALLS SUB-AREA; Colonels Jackson and Henry, USAF, members of Office of the Commander, Air Forces, JTF-7; Commander H. L. Miller, USN, ONR Liaison Officer CINCPAC; and Mr. Aaron Heller, NOL Field Supervisor for southwest Pacific.

Captain Hutchinson drew twenty-eight (28) copies of ARPACAS 3-1 for distribution to the NRL---NOL stations in the Pacific. Colonels Ehrgott and Jackson briefed him on the strict security measures mandatory in the handling of those time signal codes.

The ONR office was opened at KWAJALEIN on 10 March 1948, with the following:

Lieutenant R. W. Givens, USN.
Mr. Aaron Heller, NOL, and one (1) enlisted man as clerk.

The island commander, Captain Vest provided billeting, messing and transportation facilities in addition to the office space.

The ONR representative's office was the focal point for all matters pertaining to Navy participation in the FITZWILLIAM project in the MARSHALLS, CAROLINE and MARIANAS ISLANDS. Captain Hutchinson immediately established contact with Task Group 7.3, Office FITZWILLIAM FORWARD and other participating agencies. Through the administrative efforts of the office; all Navy stations were properly installed and manned, and appropriate communications channels established so that reports were forthcoming immediately after each explosion; all data and records were collected and sent by officer courier to the respective agencies' home offices; a time-tick signal was broadcast by a radio station installed at KWAJALEIN which was monitored by various Navy installations; and time signal notification codes (ARPACAS) were distributed and collected in

accordance with security procedures. Captain Hutchinson was directed by Major General Kepner on 10 April 1948 to keep the island commander informed of his requirements and of assistance he needed from the Island Commander, KWAJALEIN.

On 16 April 1948, it was learned that Mr. Aaron Heller's "Q" clearance had been denied. Immediate action was taken by Captain Hutchinson to relieve Mr. Heller of all classified documents and all duties in connection with the project. Subsequently Mr. T. F. Johnston, NOL arrived from WASHINGTON on 26 April 1948 and Mr. Heller was sent home on 29 April 1948.

The roll-up of all personnel and equipment of Navy stations in the Pacific was expedited immediately following Z-day test, after which (on Z plus five (5) days) the office of the ONR representative was rolled up and moved to PEARL HARBOR T.H., to follow up on roll-up logistics.

In the event of another experiment similar to FITZWILLIAM, it is strongly recommended that a similar office be organized and located at the most advantageous point as was done in this instance.

HEADQUARTERS FITZWILLIAM FORWARD
c/o Commander, Task Group 7.2,
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San Francisco, Calif.

17 May 1948

NAVAL ORDNANCE LABORATORY SEISMIC AND SONIC TESTS

Inclosure E to FITZWILLIAM FORWARD Report

The Naval Ordnance Laboratory participated in the FITZWILLIAM project in the operating area of JTF-7 by conducting seismic and sonic tests for the detection of atomic explosions. There were six (6) NOL seismic stations and eight (8) NOL sonic stations in the MARSHALL ISLANDS.

The seismic tests were conducted to determine the characteristics of the earth tremor caused by an atomic explosion. The sonic tests were for the purpose of obtaining data on picking up the direction and strength of low frequency sound waves created by an atomic explosion.

Seismic stations were located on the following atolls of the MARSHALLS:

KWAJALEIN	2 seismographs	(KWAJALEIN and CARLOS ISLANDS)
MAJURO	2 seismographs	(MAJURO and DALAP ISLANDS)
BIKINI	2 seismographs	(BIKINI and ENNIRIKKU ISLANDS)
AILINGLAPALAP	2 seismographs	(AILINGLAPALAP and WOTJA ISLANDS)
MILI	2 seismographs	(ENAJET and NAARIGIRIKKU ISLANDS)
ENIWETOK	1 seismograph	(ENIWETOK ISLAND)

Sonic stations were located on the following atolls of the MARSHALLS, all stations consisting of two (2) microbarographs separated by a distance of approximately ten (10) miles:

KWAJALEIN	(KWAJALEIN and CARLOS ISLANDS)
UJAE	(UJAE and BOCK ISLANDS)
MAJURO	(MAJURO and DALAP ISLANDS)
BIKINI	(BIKINI and ENNIRIKKU ISLANDS)
AILINGLAPALAP	(AILINGLAPALAP and WOTJA ISLANDS)
MILI	(MILI and NAARIGIRIKKU ISLANDS)
ENIWETOK	(ENIWETOK ISLAND and CVE 115 USS BAIROKO)
JALUIT	(JALUIT and EBON ISLANDS)

The seismographs and microbarographs were set up adjacent to each other wherever both instruments were located, and one (1) NOL man at a site operated both. The seismic pick-up consisted of an NOL seismograph connected to a single induction type transducer. The inductor included a movable permalloy button mounted on a spring supported mass in its magnetic circuit. Earth tremors produced a variation in balance of the bridge circuit which in turn actuated an Esterline-Angus recorder.

The sonic equipment consisted of a single induction type transducer connected to a pipe network or array having five (5) separate terminations to the atmosphere. The microphone itself consisted of an inductor which included in its magnetic circuit a diaphram-mounted permalloy core. Variations in pressure applied to the microphone produced a variation in balance of the bridge circuit which in turn actuated an Esterline-Angus recorder. The individual terminations of the NOL array were spaced a small fraction of a wave length apart and were arranged so as to produce a substantial reduction of the ambient noise background. The ten (10) mile separation between the instruments of each station permitted determination of an angle of incidence of the primary pressure wave front at the successive transversals.

Mr. Aaron Heller of NOL was sent out from WHITE OAKS, MARYLAND as the field supervisor for the NOL seismic-sonic tests in this area. He was to operate out of KWAJALEIN under the supervision of Captain H. B. Hutchinson, USN, who was to be the ONR representative in this area.

On his way out Mr. Heller stopped at OAHU where he conferred at FORT SHAFTER, TH on 5 March 1948 with Colonel Herbert W. Ehrgott of AFMSW-1, Colonels Jackson and Henry of the Office of the Commander, Air Forces, JTF-7, Captain Hutchinson and Commander H. L. Miller, USN, ONR liaison officer to CINCPAC. At this conference it came up that no arrangements had been made for spare radio receivers or power units in case of breakdown of the single ones that NOL was furnishing each of the stations. Mr. Heller was not in favor of any arrangements being made for spare receivers or power units, but Colonel Henry offered to obtain about six (6) receivers and transmitters to be spotted at KWAJALEIN for emergencies. Colonel Henry made arrangements with the Signal Supply Officer of USARPAC on 8 March 1948 to have these spare receivers and power units shipped by air from OAHU to Captain Hutchinson, ONR representative, KWAJALEIN.

Also taken up at the conference was the problem of getting the NOL personnel and equipment from KWAJALEIN to the various atolls of the MARSHALLS. Task Group 7.3 (Naval) and Task Group 7.7 (ISCOM KWAJALEIN) had agreed to furnish most of the transportation and support necessary.

Another conference was held on 7 March 1948 at PEARL HARBOR attended by Colonels Ehrgott and Jackson, by Captain Hutchinson, USN, and by Captain John Vest, USN. Captain Vest had the dual assignments of CTG 7.7 and Commander MARSHALLS SUB-AREA. The transportation and support necessary for the NOL stations in the MARSHALLS were covered, and Captain Vest agreed in his capacity as Commander MARSHALLS SUB-AREA to furnish whatever was necessary for these stations in so far as his facilities and personnel were available over and above what he had previously agreed to furnish as CTG 7.7.

The NOL personnel and equipment arrived at KWAJALEIN from the Zone of the Interior by Naval Air Transport Service during the month of March 1948. Mr. Heller set up his office with Captain Hutchinson in the space furnished them by ISCOM KWAJALEIN. Captain Hutchinson issued copies of ARPACAS 3-1 (time signal notifications of pending atomic explosion) to the heads of the NOL stations.

Three (3) auxiliary mine sweepers were attached to Task Group 7.3 by CINPAC for the FITZWILLIAM project in the MARSHALLS. They were as follows:

USS GULL	(AMS 16)	MILI
USS PELICAN	(AMS 32)	AILINGLAPALAP
USS SWALLOW	(AMS 36)	BIKINI

The USS PASIG (AW 3) accompanied the SWALLOW from KWAJALEIN to BIKINI on 25 March 1948, most of the seismic-sonic equipment and supplies being transported by the PASIG including an LCVP for use by the NOL station in the BIKINI lagoon.

The USAT FS 211 transported the equipment, supplies and personnel for the NOL station at UJAE from KWAJALEIN to JUAE on 25 March 1948. Thereafter the FS 211 returned to KWAJALEIN, reloaded, and accompanied the GULL and the PELICAN on 28 March 1948 to AILINGLAPALAP where the NOL station supplies, equipment and an LCVP were unloaded and left with the PELICAN.

The FS 211 and the GULL then proceeded to JALUIT where the equipment, supplies and personnel of the NOL station were unloaded. The FS 211 and the GULL then proceeded to MAJURO where the NOL station personnel, equipment and supplies were unloaded.

From MAJURO the FS 211 and the GULL proceeded to MILI where the NOL station personnel, supplies and equipment including an LCVP were unloaded and left with the GULL.

The NOL station at ENIWETOK was manned by one (1) NOL technician who arrived from KWAJALEIN by ATC with his equipment and supplies. He erected the seismic and sonic equipment on ENIWETOK ISLAND and the sonic equipment aboard the USS BAIROKO where he taught the ship's Communications Officer to operate the microbarograph.

All NOL seismic-sonic stations were set-up and operating prior to X-day. It was found that the sites of some had to be readjusted due to excessive background noise, but these moves were made by station personnel without too much effort. The stations at UJAE and JALUIT were not left manned after they had been erected, calibrated and tested for background as the Commander MARSHALLS SUB-AREA at KWAJALEIN arranged to have the UJAE and JALUIT operators flown from KWAJALEIN by PBM after receipt of H minus twenty-four (24) hour warnings.

The Commander MARSHALLS SUB-AREA set up a schedule of twice weekly PBM trips from KWAJALEIN to MAJURO, and once a week trips to AILINGLAPALAP, MILI and BIKINI.

Security clearance troubles that beset the NOL project in this area for the duration of the tests started on 24 March 1948 when information was received from WASHINGTON, D.C. that Mr. D. J. Bordelon, the NOL station head at PALAU was being denied a Q-clearance, but was being granted a P-approval. Captain Hutchinson transferred Mr. Bordelon from PALAU to BIKINI and recovered copy Number 32 of ARPACAS 3-1 from him. At BIKINI, Mr. Bordelon operated one (1) set of seismic-sonic equipment, but did not have access to the time signal code which was held by the Commander of the USS SWALLOW. Mr. Richard L. Knodle was

transferred from BIKINI to PALAU to take Mr. Bordelon's place, and Lieutenant Walter E. Greene, USN, was issued copy Number 32 of ARPACAS 3-1.

All of the NOL sonic equipment and half of the seismographs were in commission and operating on X-day (15 April 1948) and their results varied from positive through questionable to negative. The seismographs were out of commission at KWAJALEIN and CARLOS ISLAND (KWAJALEIN ATOLL), at WOTJA ISLAND (AILINGLAPALAP ATOLL) and at ENAJET and NAARIGIRIKKU ISLANDS (MILI ATOLL). Results of tests were transmitted to NOL at WHITE OAKS, MARYLAND by officer courier.

Between X-day and Y-day (1 May 1948) the sonic station at UJAE was dismantled and its equipment taken to KWAJALEIN. This was done for four (4) reasons: first, the X-day results at UJAE were positive; second, spare parts were needed to keep other stations in commission; third, NOL personnel were spread so thinly that those operating UJAE were needed elsewhere; and fourth, UJAE lagoon was considered by Captain Hutchinson as too hazardous for small boat resupply between PBH and the islands.

The second of NOL's clearance difficulties in this area struck like a bomb on 16 April 1948 when word was received from WASHINGTON, D.C. that Mr. Heller, the NOL field supervisor in this area, had been denied a "Q" clearance. Headquarters FITZWILLIAM FORWARD instructed Lieutenant Colonel Triffy who was on TDY at KWAJALEIN to have Captain Hutchinson recover copy Number 35 of ARPACAS 3-1 and all classified materials from Mr. Heller and to keep him on insensitive duties. This was done by Captain Hutchinson.

Captain Hutchinson reported that he had requested NOL at WHITE OAKS, MD. for a replacement for Mr. Heller on the grounds of inefficiency previous to the question of Mr. Heller's clearance status arising.

As a result of the furor created over Mr. Heller's status, a new ARPACAS 3-2 was distributed and replaced ARPACAS 3-1. Mr. T. F. Johnston of NOL arrived at KWAJALEIN on 26 April 1948. Mr. Heller departed KWAJALEIN on 29 April 1948 for return to NOL at WHITE OAKS, MARYLAND.

A radio receiver at BIKINI went out the week before Y-day, but a spare was flown in from KWAJALEIN in time for the test.

The NOL stations were better prepared for Y-day than they had been for X-day, partly because of the increased effectiveness of Mr. Johnston, the new field supervisor who replaced Mr. Heller, and partly because of the experience gained by NOL personnel on X-day. The NOL seismic-sonic results on Y-day were far better than X-day's. However, a sour note crept in on Y-day in a report from BIKINI to the effect that strange foot-prints were seen in the sand and that the NOL equipment had been tampered with but not molested.

CJTF-7 dispatched the J-2, JTF-7, and a detachment of Marines from ENIWETOK aboard a destroyer to investigate the report from BIKINI. Headquarters FITZ-WILLIAM FORWARD was not given a report of their investigation, but an informal talk with the J-2, JTF-7 revealed that there was nothing to the report: that Mr. Bordelon and a Navy man had become confused in the dark after having gone

ashore to ready their gear for Y-explosion, and had wandered around considerably before locating their site; that Mr. Bordelon had volunteered the information to J-2 that the footprints he had seen were probably his own; that a barrel allegedly moved by a person or persons unknown had in fact not been moved; and that the Commander of the USS SWALLOW had not himself investigated Mr. Bordelon's allegation that some unauthorized party had been ashore.

The third clearance difficulty arose on 4 May 1948 when it was reported from WASHINGTON, D.C. that granting a Q-clearance to Mr. J. P. Leary, NOL station head at TRUK, was being questioned. General Kepner took the matter up with Captain Hutchinson at KWAJALEIN, Mr. Leary was brought to KWAJALEIN, relieved of his copy of ARPACAS 3-2, placed on insensitive duties at KWAJALEIN and replaced at TRUK by Ensign Richard Richardson on 11 May 1948. Major General Kepner made the decision that ARPACAS 3-2 would not be replaced unless further information were received from WASHINGTON, D.C. more detrimental to Mr. Leary's integrity than that on hand.

The NOL stations functioned for Z-day (15 May 1948) much as they had for Y-day, but their results were not nearly as impressive.

Roll-up of the stations started after the data from Z-explosion had been recorded, Task Group 7.3 picking up the stations by ships in the inverse order in which they had been put out. The technician with his equipment from ENIWETOK ISLAND and from the USS BAIROKO was flown to KWAJALEIN on Z plus two (2) days by the Air Transport Command.

The results of the NOL seismic-sonic tests in the MARSHALLS will have to be studied and evaluated at the NOL at WHITE OAKS, MARYLAND, but from what could be determined in the field it appeared that something had been learned of the characteristics of earth tremor and sub-audible sound frequencies resulting from an atomic explosion.

It is recommended in future tests in conjunction with atomic explosion, that:

1. That adequate spares be furnished to isolated stations, and stocked at a central location where a number of stations are in a relatively small area so that they may draw them as needed.
2. The following equipment be furnished each station:

   a. Oscilocope for aligning amplifier circuits.
   b. A slide rule.
   c. A battery charger.
   d. Extra damping oil.

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17 May 1948

NAVAL RESEARCH LABORATORY BALLOON AND GROUND LEVEL RADIOLOGICAL TESTS

Inclosure F to FITZWILLIAM FORWARD Report

The NAVAL RESEARCH LABORATORY participated in the FITZWILLIAM project in the operating area of JOINT TASK FORCE SEVEN by conducting upper atmosphere and ground level radiological tests. There were four (4) radiological stations in the MARSHALLS ISLANDS located at MAJURO, RONGERIK, and one (1) each aboard the destroyer-minesweepers, USS QUICK and USS DAVISON. Each station was equipped with balloon-borne and ground level radiological detection equipment.

The purpose of this experiment was to detect and measure the amount of radioactivity in the upper atmosphere and at ground level resulting from an atomic explosion.

The balloon-borne automatic radiological counters consisted of the standard radiosonde weather sounding equipment incorporating a counter tube. The scaling and recording units were on the ground. The balloon-borne transmitter had a range of 150 miles. The equipment was borne aloft by two (2) balloons, one (1) of which was designed to burst at approximately 35,000 feet. This afforded a rapid rate of ascent to the air layer to be monitored and a slow rate of ascent through the layer to an altitude of 50,000 feet. Modulation of the radiosonde carrier frequency by the barograph and by the counter permitted recording of the counting rates and corresponding altitudes by a twenty (20) pen Esterline-Angus recorder. Each balloon station was directed to perform eight (8) releases for each atomic explosion.

The ground level radiological equipment for each station was as follows:

1. An NRL automatic radiological counter.
2. An NRL ground air-filter unit.
* 3. An NRL tray-type counter.
4. An Esterline-Angus traffic type recorder.
5. 500 sheets of U.S. Army Chemical Corps filter paper #5.
6. 200 bottles of helium, used for inflating the balloons.

* The DMS's QUICK and DAVISON each had an AEC wrap-around counter instead of tray-type as listed in 3 above.

All the project officers were trained at the Naval Research Laboratory. Some of the officers attended the radiological safety school at NAVY'S TERMINAL ISLAND AIR STATION, SAN FRANCISCO, CALIFORNIA. Personnel were assembled at SAN DIEGO and proceeded to their respective stations aboard the DMS's USS QUICK and USS DAVISON, and the USS PICKAWAY. The two (2) crews aboard the USS PICKAWAY disembarked at KWAJALEIN and were transported by the AMS (16) GULL to MAJURO and the AMS (36) SWALLOW to RONGERIK. The other crews remained aboard the two (2) DMS's, which proceeded to ENIWETOK ATOLL until they would be directed to take up their positions about 600 miles northeast of ENIWETOK on an arc between WAKE ISLAND and MAJURO. The other stations arrived at MAJURO and RONGERIK on 3 April 1948. Each consisted of an officer (station-chief) and six (6) enlisted men. The stations aboard the DMS's were aided in their balloon launchings by members of the ships' crews. The operation of the four (4) stations will be discussed separately due to some of the details being peculiar to a particular station.

The NRL radiological team, headed by Ensign R. L. VADER, USN, arrived at MAJURO on 2 April 1948, and immediately began setting up the station. It was completely set up and operational by PX-day (8 April 1948) when a dry-run was made to check on operation of equipment and to gather background radiological data. For X-day a signal to launch the balloons was sent by Colonel Holzman, Headquarters FITZWILLIAM FORWARD, thru CTG 7.3, and ONR representative, KWAJALEIN, (who enciphered the message in a one-time-pad secret code) to the balloon team chief, at H minus two (2) hours. The launching operations were completed and results obtained were reported as being positive.

For Y-test, operations were similar to X-test, however, due to heavy rains and severe icing, the first balloon was lost and the remaining three (3) balloons reached an altitude at only 35,000 feet. No further launchings were attempted. Results were negative. The ground equipment results were reported as positive.

For Z-test, the balloon-borne results were insignificant, but this was expected by Colonel Holzman as the atomic cloud failed to rise as high as did those on X and Y days.

The NRL radiological station headed by Ensign G. D. ROBERTSON, USN, arrived at RONGERIK aboard the AMS (32) SWALLOW, on 3 April 1948. Operations were similar to the MAJURO station, except for notification signals and other communications. A one-time signal pad had been requisitioned by the ONR Representative, KWAJALEIN, but had not arrived. Pending arrival of this code pad, Colonel Holzman was to send a message over the Air Weather Circuit announcing, "MAJOR PRIBBLE WILL ARRIVE YOUR STATION AT ____ ZEBRA," which meant to launch balloons. Subsequently the one-time-signal pad was received, and for X-day the signal from Colonel Holzman was transmitted by both methods. Results of the equipment were significant.

For Y-day, the "launching signal" was sent by COLONEL HOLZMAN to the ONR Representative, KWAJALEIN, and thence to RONGERIK by use of a one-time-pad, Reported results were positive for the equipment.

For Z-day, the balloon-borne results were insignificant.

The two (2) DMS's were dispatched to their locations (600 miles east of ENIWETOK) on X minus two (2) days by CTG 7.3. The time notification to launch balloons was sent by Colonel Holsman through CTG 7.3 channels. For X-test, significant results were reported by both teams. For Y-test, results were reported as positive but moderate. The DMS DAVISON reported that seven (7) out of eight (8) runs were very successful. For Z-test, balloon-borne operations were insignificant. After Z-test, roll up of the four (4) stations was rapidly accomplished by Task Group 7.3 in reverse order to the method in the delivery of the stations' personnel and equipment.

All data was picked up by officer couriers on a weekly basis and returned to the office of the ONR representative, KWAJALEIN. Records were accumulated and included with other Naval participation station records and sent by officer courier to Chief, ONR, Washington, D.C.

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17 May 1948

SONIC BALLOON TEST, KWAJALEIN

Inclosure G to FITZWILLIAM FORWARD Report

The Watson Laboratories of Air Materiel Command arranged for one (1) of its sonic balloon teams to participate in the FITZWILLIAM project as a mobile team to operate in the Central Pacific, at KWAJALEIN, GUAM and HICKAM FIELD, HAWAII, in that order, changing location for each of the three (3) explosions.

The purpose of this exploratory test was as follows: first, to determine if an atomic explosion's compressional waves are generated in the sound channel existing between 50,000 and 70,000 feet (such waves would conceivably travel unimpeded for long distances in this channel without touching the earth's surface); second, to determine whether a sound pick-up unit suspended from a floating balloon could detect compressional waves (possibly undetected by similar sound units at the earth's surface) by virtue of the decreased background noise in the high-level sound channel.

Balloons were made of high grade plastic, were of tear-drop shape, and were twenty-five (25) feet at their largest sea-level diameter. The sonic unit was a combination microphone-transmitter which was suspended from the balloon and picked up sound waves, transmitting them to a ground directional antenna connected to a radiosonde receiver (standard SCR 658 air weather radio receiver). The transmitted sound impulses were recorded on two (2) Esterline-Angus recorders.

A dribble constructed of a five (5) gallon tin incorporating a metered jet to allow a predetermined spillage rate of high grade kerosene-ethylene-glycol mixture was attached to the balloon. This was designed to counteract the helium gas seepage thru the surface pores of the plastic balloon. This metered loss of ballast and controlled the rising rate of the balloon at 500 to 600 feet a minute.

Ground sonic equipment consisted of World War II sound ranging devices utilized to pick up sound waves from an explosion traveling along the earth's surface.

A radio receiver was used to obtain explosion time notification code signals from the ENIWETOK radio station.

The balloon launching site had to have a down-wind clearance of about 1000 feet to lay out the 100 feet risers and cables to which were attached the microphone-transmitter and dribbler units. Also the site had to be sheltered from the wind to prevent damage to the balloon while it was being

inflated. At KWAJALEIN a wind-break was constructed through the courtesy of the island commander, Captain Vest, USN. At a predetermined time, the balloon was inflated with a fixed amount of helium gas to raise it to an altitude of from 50,000 to 60,000 feet where it floated at a constant level. The balloon was cautiously launched and guided until it cleared all ground obstacles. Electrical power for the microphone-transmitter was provided through wet-cell batteries, especially constructed to prevent freezing. The balloon was tracked visually by use of theodolites. Prior to the actual test on KWAJALEIN on X-day (15 April 1948) two (2) practice runs were made to minimize chance of failure and to improve operating techniques.

The transportation requirement was for air lift to transport the team of six (6) scientists and twelve (12) thousand pounds of equipment from BELMAR, NEW JERSEY to KWAJALEIN, GUAM, HAWAII and then back to BELMAR, NEW JERSEY. The Air Materiel Command provided three (3) aircraft, a C-54, a B-29, and a B-17, and crews, under the direction of Captain Stanley C. Lewis, from the 4149th AFBU, MIDDLETOWN, PENNSYLVANIA. The C-54 was also utilized in carrying Tracerlab personnel and equipment to KWAJALEIN and GUAM. Maintenance assistance was afforded by the local base and tactical organizations.

The mobile team personnel was assembled and partially trained at Watson Laboratories. The team arrived at KWAJALEIN 31 March 1948; departed for NORTH FIELD, GUAM, on 16 April 1948; for HICKAM FIELD on 3 May 1948; and was scheduled to depart from HAWAII for its home station on Z plus one (1) day.

The balloon team and aircraft crew personnel were as follows:

BALLOON TEAM:

Dr. Albert P. Crary	"Q" clearance	Physicist
Mr. Charles S. Schneider	"Q" clearance	Meteorological Engineer
Mr. John W. Alden	"P" clearance	Radio Engineer
Mr. John A. Moulden	"P" clearance	Radio Repairman
Mr. Murry Hackman	"P" clearance	Meteorological Engineer
Mr. James Smith	"P" clearance	Meteorological Engineer

B-29 CREW

Captain Stanley C. Lewis	Pilot (Flight Commander)
1st Lieutenant Randall S. Kane	Co-Pilot
1st Lieutenant Wm. L. Adams	Navigator
M/Sergeant W. L. Halliday	Engineer
M/Sergeant R. A. Kabaste	Radio Operator
T/Sergeant R. A. Cox	Ass't Radio Operator
T/Sergeant L. D. Moon	Ass't Engineer

C-54 CREW

Captain John P. Clowry	Pilot
1st Lieutenant Richard Mesher	Co-Pilot
1st Lieutenant Chas. A. Lamana	Navigator
S/Sergeant James Brau	Engineer
S/Sergeant L. H. Campbell	Radio Operator
Sergeant George L. Fratwell	Ass't Engineer

B-17 CREW

1st Lieutenant Owen B. Dubell	Pilot
1st Lieutenant Thomas F. Carroll	Co-Pilot
1st Lieutenant John Mertzen	Navigator
Sergeant W. R. Rice	Engineer

Time notification signals were required and provided in order to afford sufficient time to make necessary launching preparations, and to position the balloons just a few minutes prior to the predetermined arrival of the explosion sound wave. Headquarters FITZWILLIAM FORWARD furnished ARPACAS 3-1 and 3-2 by officer courier. The team experienced no difficulty in obtaining the time signals.

Reports required of the team were a brief statement as to positive or negative results of the tests, and notification of team movement to it's several locations. Reports of results were made to Headquarters FITZWILLIAM FORWARD and to AFMSW-1.

Results of the KWAJALEIN test were as follows: balloon-borne equipment results were positive and ground equipment results were questionable. An accurate final analysis and evaluation report will be submitted upon Dr. Crary's return to Watson Laboratories, including an accurate determination of results.

Due to time limitation and pending a thorough evaluation of results, the following recommendations, of necessity, should be considered tentative:

1. Before departing for field locations, a survey should be made to determine the best balloon launching sites, giving due consideration to shelter from high velocity and gusty winds, and sufficient clear space to lay-out shroud lines and control cables thus affording clear passage of the instruments which are suspended about one hundred (100) feet below the balloon.

2. That an SCR 658, radiosonde receiver be included in the team equipment list. For these tests, a receiver had to be borrowed from the air weather station at each location. This presented a problem because each station had only one (1) receiver and it was needed by the station personnel for upper air sounding operations. This necessitated selecting the best possible launching site adjacent to the weather station. Also, this precluded selection of a site without a weather station.

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17 May 1948

AWS GROUND LEVEL RADIOLOGICAL TESTS IN JTF-7 AREA

Inclosure H to FITZWILLIAM FORWARD Report

The ground level radiological station at KWAJALEIN was set up between 24 March and 2 April 1948 by Major Harry C. Crim who had been sent out from the United States by the Air Weather Service on ninety (90) days temporary duty.

Captain Jesse N. Hays, Commanding the 31-8 Air Weather Detachment at KWAJALEIN assisted Major Crim in unpacking and erecting equipment (which had arrived by Air Transport Command on 1 March 1948), in administrative work and in the transmission of radio messages.

The 1535 Air Force Base Unit (ATC) furnished an air-conditioned building and the "ham" radio shack for the use of the ground level radiological station.

Task Group 7.4 remodeled and repaired the air-conditioned building. Carpenters put up built-in benches and shelves, and electricians rewired the building, installed multiple outlets at various convenient points, ran an instrument ground wire through the building, installed lights where needed, and overhauled the air conditioner and kept it in commission. Task Group 7.4 also wired the "ham" radio shack.

The ground level radiological equipment consisted of a ground filter unit, [redacted] wrap-around geiger counters and scalers, an automatic radiological counter and an ionization chamber.

The ground filter unit was a dust sampling device equipped with a blower that passed approximately 1250 cubic feet of air per minute through a filter paper designed to collect solid particles in the atmosphere.

[redacted]

The wrap-around Geiger counter (there were four (4) at KWAJALEIN) consisted of a small cylindrical brass-lined lead chamber weighing 350 pounds down the center of which ran a Geiger-Mueller tube. This tube was connected to an El-Tronic Scaler that counted the radiation penetrating the tube. Filter papers that had been exposed to the atmosphere in the ground filter unit, in the [redacted] and in aircraft air filters were placed in the wrap-around Geiger counter for measurement of their radioactivity.

The General Radio automatic radiological counter for recording station radiological background was placed on the air weather observation platform atop the ATC terminal building, and its Esterline-Angus recorder was below in the air weather office.

The Wells Survey ionization chamber for measuring and recording background air ionization and cosmic showers was placed in the "ham" radio shack and powered by island electricity. A five (5) KVA generator was furnished by Task Group 7.4 for standby power. This equipment was installed by Mr. Alexander Thomas of Tracerlab who arrived at KWAJALEIN on 27 March 1948.

At a conference at KWAJALEIN on 30 March 1948 Colonel Jackson informed Captain Hays that it was his (Hay's) responsibility to furnish Major Crim with personnel to assist him in the operation of his ground level radiological equipment. Although Captain Hays had received no such instruction through AWS channels, he agreed to do this, and on 4 April 1948 detailed two (2) enlisted men, Pfc. T. Caffarello and Pfc. Blair to the ground level radiological station. Two (2) more AWS enlisted men were detailed to the station by Captain Hays on 9 April 1948, Cpl. B. G. Campbell and Pfc. H. E. Bender. Pfc. Blair turned out to be inefficient and uninterested in the work, and was sent back to the AWS detachment by Major Crim on 18 April 1948.

Major Crim trained the AWS enlisted personnel detailed to him in the operation of the ground level radiological equipment and in reporting procedures. With them he also trained Captain Hays, 1st Lieutenant Sheppard C. Cummings, and 1st Lieutenant William R. Menzie, Master Sergeant John W. Carney and Technical Sergeant Raymond G. Roberts, all of the Air Weather Station, in operating and reporting.

Maintenance was performed by Major Crim assisted by Mr. Thomas. Later Major Crim trained Lieutenant Cummings, Corporal Caffarello, Corporal Campbell and Pfc. Bender in maintenance of the equipment.

Calibration of instruments was performed as follows:

Wrap-around Geiger counters and scalers---every twelve (12) hours.

Automatic radiological counter---every twelve (12) hours.

Ionization chamber---daily.

Reports were rendered to WXIA, AACS, WASHINGTON, D.C. every twelve hours on automatic radiological counter data and ground filter data, using message form Number 2. A report was sent to WXIA on message form Number 1 of aircraft filter data as soon as filter papers were counted.

A weekly report was sent to Tracerlab at HICKAM FIELD, T.H., consisting of ionization chamber calibrations, ionization chamber recorder chart, automatic radiological counter calibrations, automatic radiological counter data, ground filter data, aircraft filter data, [redacted] and a weekly report of operations.

A weekly report was sent to Headquarters FITZWILLIAM FORWARD covering changes of personnel and changes in operation of equipment.

The ground level radiological station was attached to the 31-8 Air Weather Detachment at KWAJALEIN for administration.

The ground filter unit with its 220 volt 20 horsepower motor presented a difficult problem from the start. Because the island electric power was overloaded, Major Crim was not permitted to hook the ground filter unit into it. The island commander furnished him a 50 KVA generator to power the unit; it started operating on 14 April 1948, but the generator broke down (field coils burned out) on 16 April 1948. Another source of supply was discovered in the form of diesels furnishing power to the ATC laundry, and so the filter unit was moved to the vicinity of the laundry, hooked into its power supply, and operated satisfactorily thereafter.

Immediately after X-day "hot" filters started coming into the station. These filters came in groups of eight (8) to twelve (12) in large envelopes. When these filters were placed in the counter tubes for evaluation, they contaminated the tube which caused a rise in tube background.

Instructions were followed for such a case and the tubes were washed with soap and water. However, this was not very efficient as it only reduced the background a slight amount, and the cleaning process required about fifteen (15) minutes per tube.

Laundry wrapping paper was then procured from the island laundry and envelopes were made in which each filter was sealed with paper tape immediately on removal from the aircraft or ground filter units. Thereafter filters were counted through these paper envelopes. Tests showed that these envelopes absorbed a neglible amount of radiation. This solution to the problem cut down on laboratory contamination, tube contamination and personnel hazard.

A large percentage of the filters collected for several days after X-day contained so much activity that the mechanical counters could not register their readings. On scanning the filters with a Tracerlab monitor instrument it was found that the activity on the filters was not evenly distributed, and so no attempt was made at this time to count the filters by reducing their size. Also the reporting code for aircraft filters limited the maximum number of counts that could be reported to WXIA to 999.

Shortly before X-day, through the efforts of Captain Hutchinson, USN, a revised code form was authorized so that an unlimited number of counts could be reported. At the same time the 43rd Weather Wing issued orders to the effect that filters too hot to count would be cut in half and the readings multiplied by two (2). One-half filter papers proved too active to count, and so some of the filter papers had to be cut down to as small as 1/128 of their original size. This was a crude solution because the variable density of radioactivity of the paper did not give an accurate figure when multiplied by say 128.

Following X-day the automatic radiological recorder increased to three and one-half times background. Following X-day on 2 May 1948 at 0600, GMT,

the automatic radiological recorder went off scale on the 20,000 counts per minute sensitivity scale which is the highest reading scale for the unit. 20,000 CPM is approximately 17 times normal background. On 4 May 1948 at 0300, GMT, the top of the box was scrubbed with soap, water and citric acid. This gave no indication of bringing the unit back on scale. On 7 May 1948 the recorder came back on the 20,000 CPM scale. As a solution to this problem a less sensitive scale could be incorporated in the instrument so that at stations such as this where high readings might be recorded, the unit will stay on scale.

Roll-up accomplished about 30 May 1948 consisted of repacking all instruments and equipment and turning them over to the Detachment Commander of the 31-8 AWS Detachment for shipment to FAIRFIELD-SUISUN. All records, duplicate calibrations, duplicate data reports, correspondence, reports, and filter papers were sent by officer courier to AFMSW-1.

The following recommendations are made:

1. Before shipping a ground filter unit to a station, a power survey should be made to determine whether the station power system can continuously supply 20 HP 220 Volt 60 cycle AC power. If such power is not available, a power unit of suitable size should be shipped along with the ground filter unit.

2. A man with a good electronic background should be included in each station complement to perform electronic repairs on the complicated circuits.

3. The wrap-around counter counting circuit should be redesigned to not overload the 50 mmf condensers, or a larger supply of 50 mmf condensers should be included in the spare-parts kit as these condensers are very susceptible to failure.

4. The rubber gasket on the AMC filter screen should be placed on the inside of the screen sandwich.

5. The automatic radiological counter should: have a large scale incorporated in the instrument to read higher backgrounds if installation is contemplated at a station such as this which receives a considerable amount of radiation; should be calibrated daily instead of every twelve (12) hours; a curve should be furnished the operator giving scale readings in terms of radiation dosage or intensities (Roentgen Units) so that an idea of health hazard may be determined.

6. A dosimeter should be included with the laboratory instruments to measure radiation dosage incident to handling filter papers for operator protection.

7. Envelopes should be used for all filter papers to eliminate instrument contamination, laboratory contamination, and personnel hazard.

HEADQUARTERS FITZWILLIAM FORWARD
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APO 187, c/o Postmaster
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17 May 1948

AIRBORNE AIR FILTERS, GAS SAMPLING AND
NRL AUTOMATIC RADIOLOGICAL COUNTER TESTS

Inclosure I to FITZWILLIAM FORWARD Report

The Air Weather Service directed its 514th Long Range Reconnaissance Squadron (Weather), North Field, GUAM, to participate in the SANDSTONE tests. A detachment of the squadron arrived at KWAJALEIN on 10 March 1948, and was designated as TASK UNIT 7.4.4 of TASK GROUP 7.4, under Commander, AIR FORCES, JOINT TASK FORCE SEVEN.

At the same time, plans had been made by Headquarters, Air Weather Service, to use the eight (8) B-29's of Task Unit 7.4.4 in its radiological detection experiments.

Since it was understood that subject detachment could perform the weather reconnaissance mission assigned by Commander, AIR FORCES, JTF-7, and yet carry airborne radiological detection equipment, plans were made to install gas sampling kits in seven (7) B-29's and air-filters in all eight (8) aircraft.

The purpose of the air-filters was to pass a volume of air (approximately 1500 cubic feet per minute) through a piece of filter paper approximately 8½ by 18 inches in size, thus collecting radioactive fission particles resulting from an atomic explosion. These filter papers were then given to the ground radiological station at KWAJALEIN for counting with a wrap-around Geiger counter. All significantly "hot" filters were turned over to the Tracerlab field laboratory for analysis and evaluation.

The purpose of the gas sampling test was to collect samples of radioactive air at various altitudes above the surface of the earth resulting from an atomic explosion. The collecting was accomplished by pumping air into oxygen cylinders to a pressure of 400 pounds per square inch. The full cylinders were expedited by Air Transport Command to reach Tracerlab, BOSTON, MASSACHUSETTS, within five (5) days, for analysis and evaluation.

Air filtering kits arrived at KWAJALEIN on 3 April 1948 and were installed within the next two (2) days, requiring approximately sixteen (16) man-hours per aircraft. Lower rear turrets were removed from the aircraft and the air filtering units were installed in that position in accordance with the blue-prints and instructions for installation. No difficulty was encountered in the installations, and the engineering section said that the air filtering units were the most complete and easily installed kits with which they had ever worked. The installation instructions were detailed and easily interpreted. The pilots were quite concerned about the possibility of hitting the filtering unit if they made a tail-low landing, but to date no one on KWAJALEIN has damaged one. There has been no apparent change in the flying characteristics or the airspeed of the B-29's due to this installation.

First Lieutenant Harold W. Grace was appointed FITZWILLIAM project officer for the unit, with First Lieutenant John Morris being appointed assistant. The weather technicians were selected as the logical men to handle filters because of their position in the aircraft.

The gas sampling bottle kits arrived at KWAJALEIN on 11 April 1948 and were installed in accordance with instructions from the Air Materiel Command. In this connection, photographs of similar installations were used as a guide, simplifying and reducing the number of man hours on this operation. In installing the unit it was necessary to drill a 3/4" hole through the right side of the fuselage for the air intake; six 10/32" holes were drilled for the air intake support bracket. It was also necessary to drill a one-inch hole through the pressure bulkhead in order to run the compressed air lines into the pressurized compartment. The compressor units, which were located in the aft bomb bay, were hooked into the aircraft's electrical system. Switches, pressure gauges and controls were located in the aft pressurized section. The instructions were followed without deviation and no difficulty was encountered with the installation, the total man hours per aircraft being forty (40).

The gas samples were taken in 2000 cubic inch oxygen bottles and were compressed to 400 lbs/sq. in. When the first gas samples were taken, some difficulty was experienced with leaky seals on the gas sample bottles; this was eliminated by using gasket seal compound. Later, all the gas sample bottles were pressure-tested under water at 400 lbs/sq. inch.

The weather technicians were instructed in the procedures for inserting and removing filter paper and in the operation of the gas sampling installation. On-the-ground training in the aircraft was carried out so that each weather technician would be entirely familiar with the operation of the filtering and gas sampling units. The mechanics of both installations were quite simple and all of the weather technicians were quick to learn the proper procedures.

Prior to flight, unit briefings were held, at which time the weather technicians were informed of the procedures to be used on that particular flight, such as: when to insert and remove the filter papers, number of filter papers to take on the flight, proper procedure for handling and safeguarding the exposed filter papers, how to fill out data sheets for the filter papers and gas sample bottles, when to fill the bottles, and disposal of the bottles and filter papers upon landing. The coordinates of filter paper changes were given to the weather technicians by the navigator, and the flight engineer was kept advised as to when the next filter paper change would occur, allowing him to depressurize in advance so that the filter could be changed at the correct time. Upon landing, weather technicians took the filter papers to the Tracerlab laboratory for analysis. Results were not made known to this unit. The gas sampling bottles were shipped on high priority via air to Headquarters, Air Weather Service, Washington, D.C., ATTN: Captain Joubin. When they were shipped, Lieutenant Colonel King, Commanding Officer of the 31st Weather Squadron at HICKAM FIELD, was notified. He was responsible for seeing that the samples were not delayed at HICKAM FIELD. Notification was also made to Chief, Air Weather Service, and Commanding Officer, 308th Weather Reconnaissance Group, FAIRFIELD-SUISUN. Orders were received specifying that samples would reach their destination within five (5) days of the time they were taken.

Operations were conducted in accordance with flight operations orders issued by Headquarters FITZWILLIAM FORWARD. The areas to be searched were recommended by the Staff Meteorologist, JTF-7, and were based on the projected trajectory of the cloud at specific levels and times. This information was received via TOP SECRET radio. Unit operations planned the next day's mission on the basis of this information, and appropriate flight plans were computed. Crews were briefed to fly the missions in such a manner as to adequately cover the search areas at proper altitudes and to reach the areas at 12-hour intervals from H-hour.

On the first few radiological flights where radioactivity was encountered, weather technicians were not equipped with gloves and upon handling the filter papers their hands became contaminated. Having had too little indoctrination in the safeguards established for the protection of the personnel concerned, many of the men were frightened. The SOP for air and ground radiological safety was immediately rewritten and the weather technicians were instructed to use rubber gloves when handling filter paper and to avoid putting their hands on the gummed flaps of the Manila envelopes (covering for exposed papers) or to their mouths. The ground crews required to work on the planes returning from radiological flights in which radioactivity had been encountered were worried about what effects working on contaminated airplanes might have on their bodies. After the first test, a meeting of all personnel was held and General Kepner and Colonel Cooney dispelled all worries on the matter by speaking on the precautions being taken to ascertain that no one was in any danger. The general attitude of all personnel at the end of the lecture was that they had been worrying unduly and that just because pointer needles or the rad-safe instruments went to the peg did not mean that they had received an injurious dose of radioactivity.

On 1 May, Mr. Wilkins, a civilian technician of NRL installed two NRL automatic radiological counters in each of the two aircraft assigned to fly the H plus twelve (12) hours cloud tracking missions. Installation of these units was very simple. The unit was merely placed in the radar compartment and was plugged into the 24-volt heater outlet. It was necessary to calibrate each unit for the particular aircraft in which it was to be used since the normal background varied greatly.

Radar operators were checked out in the operation of the units. When an aircraft with the NRL counters installed returned from a mission, the units were immediately removed and installed and re-calibrated in the next aircraft to be used for cloud tracking. The units were used on six (6) missions immediately following Y-day -- apparently very successfully. No malfunctions developed. The recording tapes used on these missions were removed and the coordinates of any radioactivity that was encountered were entered on them by using times as recorded by the radar operator and then checking the navigator's log for the coordinates for those particular times.

Prior to X-day, filter papers were changed every three (3) hours and/or course change. These filter papers were used to give a normal background count. Unused filter paper was inserted a few minutes before H-hour on X-day. On all flights from H-hour to H plus 36 hours, filters were changed every hour. This shorter time interval was used to reduce the count/minute to

facilitate the determination of the areas of high concentration. From H-plus 36 to H-plus 72 hours, filter papers were changed every two (2) hours; at H-plus 72 hours and thereafter, filter papers were changed every three (3) hours.

Gas samples were collected for background count at H minus 4 hours on X-day. Immediately after H-hour, samples were collected in the immediate area of the test and at 12 hour intervals thereafter, in each forecast area. In each case, four (4) bottles were filled. At H plus 36 hours, gas sampling was discontinued after thirty-two (32) bottles were filled.

Filter papers were changed on the three-hour basis until H-hour on Y-day. Just prior to H hour of Y-day, filters were changed in the cloud-tracking aircraft and remained exposed for six (6) hours. These filter papers were removed by AEC personnel upon landing at ENIWETOK at H plus six (6) hours. Other reconnaissance aircraft in the area changed filter papers every half-hour. From H hour to H plus 36 hours, filter papers in aircraft below 12,000 feet were changed every half-hour; above 12,000 feet, every hour. From H plus 36 hours to H plus 72 hours, filters were changed in all aircraft every hour; at H plus 72 hours filter papers were changed every three (3) hours.

Background gas samples were to have been taken at H minus 48 hours but due to a 24 hour postponement of Y-day, samples were taken at H minus 72 hours. Gas samples were taken immediately after H hour in the area of the test; at 12 hour intervals thereafter, until H plus 36 hours, in each forecast area. Due to mechanical difficulty the aircraft flying H plus 36 hour cloud tracking mission aborted and samples in the west area were taken at H plus 48 hours instead of H plus 36 hours. At H plus 12 hours, at the suggestion of the Radsafe Officer, only two (2) bottles were filled in the west area because contaminated air was being pumped into the aft-pressurized compartment of the aircraft due to a leaky connection. Again, in each case, with the exception noted above, four (4) bottles were filled and sampling discontinued at H plus 48 hours with thirty (30) bottles filled for Y-day.

Background air samples were taken at H minus 48 hours in preparation for Z-day. Immediately following H hour the cloud tracking aircraft took samples in close proximity to the cloud. Thereafter, air samples were taken at 12 hour intervals until H plus 36 hours. Thirty-two (32) bottles were filled in connection with this test, making a total of ninety-four (94) bottles for the project. Filter papers were used on all flights prior to, on, and after Z-day. Prior to Z-day papers were changed every three (3) hours and/or every course change. On Z-day, new filter papers were inserted just prior to H-hour and were left in place until the cloud tracking aircraft landed at ENIWETOK six (6) hours after the explosion, where they were removed by AEC personnel. Filter paper in other reconnaissance aircraft in the area at H-hour was changed every thirty (30) minutes. From H-hour to H-hour plus 36 hours, filter papers were changed every half-hour in the aircraft flying at altitudes below 12,000 feet; above that altitude filter papers were changed every hour. From H-hour plus 36 to H-plus 72, filter papers were changed at hourly intervals on both Vulture Seven (flights west of ENIWETOK) and Vulture Eight (flights east of ENIWETOK). A total of 300 filter papers were used in connection with Z-day operations, for a total of 920 filter papers for the project.

The air sampling installation was removed and turned over to the Commanding Officer of 31-8 Air Wea. Detach. for return to the Air Materiel Command at WRIGHT FIELD, DAYTON, OHIO. The air filtering units were left in the aircraft.

It is recommended that further research be made and that the filter unit be designed to include the following requirements:

1. That it hold one (1) sheet of filter paper instead of two (2).

2. That it be reduced in vertical dimensions so that it will be mounted flush to the fuselage, so as to offer less drag and be less conspicuous, affording more security to the air filtering project.

3. More accessible so the operator can change filter paper from within the pressurized compartment.

4. A heating element or anti-icing equipment be incorporated to remove ice while in flight and icing conditions are encountered.

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17 May 1948

OPTICAL DETECTOR TESTS

Inclosure J to FITZWILLIAM FORWARD Report

Although the optical perturbation equipments operated on GUAM and ENIWETOK by Signal Corps personnel were subject to JTF-7 operational procedures, verbal orders of Commander, Air Forces, JTF-7, directed that Headquarters FITZWILLIAM FORWARD lend all possible assistance to these tests as their results were of direct interest to the long range detection program.

[redacted]

The equipment installed and operated at ENIWETOK consisted of:

1. Photo electric recorder utilizing an optical system consisting of a three (3) inch diameter lens of twelve (12) inch focal length.

2. Duplex 35mm motion picture cameras synchronized to give complete coverage, and utilizing lenses of F 1.5 and focal lengths of sixteen (16) inches.

3. Four (4) by five (5) inch still camera with lens of F 1.0 and twelve (12) inch focal length.

4. [redacted]

The equipment used on GUAM consisted of items No. 1 and No. 2 only, as accurate timing was not possible at that distance.

Team "A" headed by Dr. Craig M. Crenshaw of the Signal Corps laboratories and assisted by Staff Sergeant William McBreen and T/4 G. A. Swartz

conducted the tests at ENIWETOK ISLAND.

Team "B" headed by Mr. D. J. Southard and assisted by Sergeant William Blades and T/5 W. E. Koester conducted the test at GUAM.

In addition to the flash of the explosion, time signals for activations of equipment were received on a receiver furnished by Headquarters FITZWILLIAM FORWARD.

Since this experiment was not under supervision of Headquarters FITZ-WILLIAM FORWARD all processing of records and films and the submission of records and reports were arranged directly between Dr. Crenshaw and JTF-7.

Dr. Crenshaw and his team arrived at ENIWETOK on 29 March 1948. Lieutenant Colonel Triffy found a site for them at the old Navy brig, and they were set up for operation by 2 April 1948.

During the X-day explosion Dr. Crenshaw made test runs to determine the amount of background light to be expected. No actual test could be run on this day as the [redacted]

On Y-day test a full scale run was made at ENIWETOK but no results are expected as a [redacted]

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17 May 1948

COAST AND GEODETIC SURVEY SEISMIC TESTS, ENIWETOK

Inclosure K to FITZWILLIAM FORWARD Report

The purpose of this experiment was to determine the nature and intensities of the components of the seismic wave resulting from an atomic explosion which travels through the earth between the point of the explosion and the recording instruments.

The U.S. Coast and Geodetic Survey made available the services of Mr. William K. Cloud, Geophysicist, who was on duty with the Seismological Field Survey Office in San Francisco, to conduct this experiment. The Air Forces furnished two (2) enlisted technicians, M/Sgt. Thomas J. Donan, and S/Sgt. Alexander Popp, to operate the radio equipment and assist Mr. Cloud in setting up and operating the test equipment. Mr. Cloud brought with him a directive, in letter form, from U.S. Coast and Geodetic Survey Headquarters in Washington, subject: Instructions No. 5-G&S-48 dated 27 February 1948.

The equipment employed consisted of three (3) strong motion accelerographs removed from sites along the West Coast of the United States and brought to the operational area by air transportation. These instruments are designed to record strong motion seismic waves in three (3) planes by means of light beams recording on sensitized paper. Supplementary equipment consisted of radio transievers operating on 27 and 27.1 mcs for communications and remote starting of instruments, chronometers for recording absolute time on the records, and a radio receiver for time signals to permit rating the chronometers.

It was not intended to take measurements of X explosion so sites were selected on islands of ENIWETOK ATOLL to insure best results on explosion Y, and permit setting up the instruments for Z explosion if results from Y-test were not satisfactory. The sites selected were:

Station No. 1 North End RUNIT ISLAND.

Station No. 2 South End RUNIT ISLAND.

Station No. 3 Center of ANIYAANII ISLAND.

Station No. 4 North End PARRY ISLAND.

Station No. 5 South End PARRY ISLAND.

Stations Nos. 1, 2 and 3 were to be instrumented during Y-test, and the equipment from stations Nos. 1 and 2 on RUNIT ISLAND was to be moved to sites

Nos. 4 and 5 on PARRY ISLAND for test Z should the results of test Y prove unsatisfactory. Although it was not intended to take part in test X, the installations had been completed and instruments set up, and so a trial run was made during this test even though the station locations were not at desirable distances from the explosion. This trial run was very valuable in that the experience gained enabled Mr. Cloud to be better prepared for the Y-test.

Timing signals for this experiment consisted of cable and radio signals to start equipment and to record a minus one (1) second tick on record tape. Minus one (1) minute and minus one (1) second impulses were available from the photo tower on RUNIT for station No. 1 and from the photo tower and ANIYAANII for station No. 3 for Y-test. All stations on X-test were actuated by radio signals on the 27 mcs band from PARRY ISLAND, as relays had not yet been connected to RUNIT and ANIYAANII photo towers.

The processing of the record tapes required special arrangements due to lack of local photo processing facilities and due to JTF-7 security regulations. Since no facilities for processing the record paper rolls (6" by 200") were available in the vicinity of ENIWETOK, arrangements were made to use the Naval dark room at KWAJALEIN. In order to meet the security requirements it was necessary for an officer of FITZWILLIAM FORWARD to accompany Mr. Cloud to KWAJALEIN, be present while he developed his record paper, take possession of the record after Mr. Cloud had inspected it, and to prepare a certificate for the files of Headquarters FITZWILLIAM FORWARD showing:

a. Date, time and place of developing.

b. Who developed the film.

c. Who was present during the developing.

d. Who saw developed film.

e. That no copy of film was made.

An officer at FITZWILLIAM FORWARD would then bring film record to Headquarters FITZWILLIAM FORWARD for packaging and dispatch by officer courier to AFMSW-1.

All records, and notes in addition to record tapes were to be turned over to Headquarters FITZWILLIAM FORWARD at conclusion of the test for dispatch to AFMSW-1.

Mr. Cloud and his two Air Force enlisted assistants together with all their equipment and supplies arrived at ENIWETOK ISLAND by air on 14 March 1948.

Colonel Henry of this headquarters contacted Mr. Cloud on 18 March 1948, two (2) days after the arrival of the USS MT MC KINLEY at ENIWETOK. Mr. Cloud's requirements and problems were discussed and no difficulties were indicated with the exception of timing signals. The question of minus one (1) minute and minus one (1) second time signals was discussed with Dr. Clark of Task Group 7.1 who took this question up at the next staff meeting of TG 7.1. No one present at this meeting had any recollection of having promised these signals

when planning was going on in WASHINGTON prior to departure for the operating area. On 22 March 1948 Mr. Cloud and Colonel Henry at a conference on the AV-5 (USS ALBERMARLE) with Drs. Froman, Graves and Clark, and Colonel Sands, obtained the following decision:

a. Mr. Cloud could have minus one (1) minute and minus (1) second signals from the timing cable, for his station No. 1 on North RUNIT, probably for station No. 3 on ANIYAANII, but definitely not for station No. 2 on South RUNIT.

b. Mr. Cloud and two (2) technicians could remain on PARRY ISLAND during the explosions.

c. Transmission of time signals on 27 or 27.1 mcs was permissible provided additional random transmissions were used to cover the actual signals.

d. Mr. Cloud could visit stations within the last 36 hours prior to explosions to wind his chronometers and ready his equipment.

e. AEC would give accurate prediction of time of explosions and would provide voice time broadcast. This broadcast would provide Mr. Cloud with time warnings to permit activation of his equipment via his radio channel.

On 31 March 1948 Mr. Cloud and Mr. Robert Davis of Task Unit 7.4.3 (Photo) completed final arrangements to provide minus one (1) minute and minus one (1) second time signals from the North RUNIT photo tower and from the ANIYAANII photo tower.

Arrangements for evacuation of Mr. Cloud and his crew consisted of emergency evacuation only, as all personnel of this team were permitted to remain on PARRY ISLAND during the actual explosions. Mr. Cloud and his two (2) enlisted assistants were included in the emergency evacuation plan of the Island Commander, PARRY ISLAND.

During this preparation period, arrangements were made by this office for boats, men, and transportation to facilitate the installation and testing of this complicated set-up of instruments. Mr. Cloud reported on 4 April 1948 that his installations were all ready for operation and that if possible he would like to make test runs on X-day. This was discussed with Colonel Holsman and decision was made to permit him to take part in this test even though station locations were not suitable for good records from this explosion. Due to the great amount of time and work involved, Mr. Cloud did not take part in PX-day practice, except to carry out his part of the emergency evacuation plan.

After the stations' installations were completed work consisted entirely of testing and calibrating, and keeping batteries charged to insure all being in readiness for X-test. During this time details were worked out for getting Mr. Cloud and one (1) assistant into the stations within the last 24 hours to wind chronometers, and make last minute preparations and adjustments. Two (2) plans were considered to accomplish this, namely:

a. To proceed by boat to RUNIT ISLAND on afternoon of minus two (2) days to make all preparations at stations No. 1 and No. 2 and spend

the night at RUNIT. A boat to pick them up at daylight (about 0700 local time) on minus 1 day at RUNIT ISLAND, transport them to ANIYAANII, stand by while they made last minute preparations at station No. 3 and then return them to PARRY ISLAND.

b. An alternate plan was to fly Mr. Cloud and one (1) assistant in an L-5 aircraft to RUNIT ISLAND on the afternoon of minus two (2) days. They would ready stations No. 1 and No. 2 as above and be picked up at daylight on minus one (1) day and flown to ANIYAANII, the L-5 aircraft to stand by and return them to PARRY upon completion of readying station No. 3.

Plan "A" had the advantage of permitting them to take a Jeep along to facilitate transportation on RUNIT ISLAND. The disadvantage of using boats was that if a 24 hour postponement were arranged late on minus one (1) day, it would then become necessary to visit all three (3) stations on the morning of the new minus one (1) day. This would result in a late return on minus one (1) day.

Plan "B" had the advantages of keeping tabs on the operations as the L-5 plane carried radio, and all stations could be readied and return to PARRY could be accomplished at a much earlier time if a 24 hour postponement should make it necessary to ready all stations on minus one (1) day.

Plan "B" was utilized on the X-test. Mr. Cloud reported by telephone to this office at 0955 on X minus one (1) day that his stations had all been readied and that he was in position on PARRY ISLAND.

On X-day all three (3) stations were activated by radio signals from Mr. Cloud's station on PARRY ISLAND.

On X-day after the explosion Mr. Cloud was flown in by L-5 to pick up his records.

Lieutenant Colonel Triffy and Mr. Cloud took Mr. Cloud's records to KWAJALEIN on 16 April 1948 for processing. Upon processing and inspection it was found that only one (1) record was obtained, that from the equipment at station No. 3 on ANIYAANII ISLAND. The reason for no records on stations No. 1 and No. 2 on RUNIT ISLAND was that the instruments at these stations were activated when the automatic time clock turned the radio sets on. Apparently a surge in the receiver (rather than the proper signal) operated the relays, thus permitting the record to have run out (7 minutes run) before the atomic bomb was actually fired. The same trouble had been experienced with this relay system during the practice tests. The record obtained at station No. 3 was clear and readible but of no particular value due to excessive distance from the explosion. These records were returned from KWAJALEIN to ENIWETOK by Lieutenant Colonel Triffy, were packaged and sent to AFMSW-1 by "Q" cleared officer courier on 20 April 1948.

Preparations for Y-day consisted of checking, testing and calibrating all equipments. The cable timing signals for stations Nos. 1 and 3 were particularly tested, and Mr. Cloud appeared to be well satisfied that everything was in readiness.

On Y minus two (2) days an L-5 aircraft took Mr. Cloud and one (1) assistant to RUNIT ISLAND for last minute check and winding of chronometers.

On Y minus one (1) day two (2) L-5 aircraft were dispatched to pick up Mr. Cloud and his assistant at RUNIT ISLAND at 0700 hours local time and take them to ANIYAANII ISLAND to check station No. 3. Mr. Cloud reported in at 0855 hours local time on Y minus one (1) day that they were back at PARRY ISLAND and that all stations were in readiness.

About noon of Y minus one (1) day (April 28, 1948) it was announced by JTF-7 that there would be a twenty-four (24) hour postponement. Mr. Cloud went by L-5 to all stations to cut off his clock settings. He departed at 1430 hours local time and returned to PARRY ISLAND at 1530 hours local time. This date became new Y minus two (2) days.

On the new Y minus one (1) day (30 April 1948) Mr. Cloud and one (1) assistant left PARRY ISLAND at 0700 hours local time by two (2) L-5 aircraft to place stations in readiness. At 0955 hours local time this date, Mr. Cloud reported all stations were ready and that he was at his proper post at PARRY ISLAND.

On Y-day (1 May 1948) arrangements were made for a truck and boat to take Mr. Cloud on Y plus one (1) day to RUNIT ISLAND to collect records and remove equipment from stations No. 1 and No. 2. On return trip to PARRY ISLAND a stop was made at ANIYAANII ISLAND to pick up record from station No.3 there.

Y plus two (2) days (3 May 1948) Lieutenant Colonel Triffy and Mr. Cloud departed for KWAJALEIN to process records of Y-day tests. The records from all three (3) stations were excellent and would furnish the information desired from these tests. Mr. Cloud stated he was ready to return to his home station as his directive from C&GS permitted him to return if Y-day results were good. C&GS in Washington was so informed. A message was also sent to AFMSW-1 informing that office of the results and inquiring whether they had any desires as to Mr. Cloud's remaining for Zebra test.

Captain J. S. Russel, USN, CTG 7.1, called shortly after Y-day and said he was desirous of having Mr. Cloud discuss with a Dr. Mark of Task Group 7.1 the feasibility of installing one of Mr. Cloud's instruments on Zero Island (RUNIT) for the Z-test. Dr. Mark explained that the reason for wanting records of earth shock on Zero Island was to determine whether there had been sufficient motion or displacement of their instrumentation building to materially effect their recordings. It was first thought that authority would have to be obtained by JTF-7 from the Coast & Geodetic Survey. However, it was later determined that Mr. Cloud had authority to remain and run this test, his only concern being that AEC must be responsible for any damage to his test equipment and should assist in his roll up at the conclusion of the test. A reply from AFMSW-1 to our inquiry whether Mr. Cloud should remain was received asking that Mr. Cloud remain and stating that this had been cleared with Headquarters C&GS. As a result of the above it was decided that one (1) set of instruments should be installed in the Gamma B building on RUNIT ISLAND at a distance of approximately 3000 feet from the explosion.

Mr. Cloud contacted Dr. King and Mr. Shonka of TG 7.1 and made arrangements to work in Gamma B hut on RUNIT. His installation there was completed 11 May 1948. Time did not permit the installation of a station on PARRY ISLAND. His last trip by L-5 aircraft to ready stations was made on Z minus one (1) day.

Following Z-day Mr. Cloud hand-processed his records in an improvised portable dark room. Good records were obtained from both the Gamma B station on RUNIT and station No. 3 on ANIYAANII. Colonel Henry took these records to TG 7.1 on 19 May 1948, where they were logged in and classified as military SECRET. Lieutenant Colonel Velente and MR. HERB MILLER did the classifying. These records were then packed for return to AFMSW-1 with other FITZWILLIAM FORWARD records and papers.

M/Sgt. Donan departed by air for his home station on 17 May 1948. All of Mr. Cloud's equipment, except storage batteries which were surveyed, was crated and turned over to the Port Director, ENIWETOK (Maj. Ship), on 18 May 1948 for shipment on the USS HAROCO to California. Mr. Cloud and S/Sgt. Popp departed ENIWETOK by air for their home stations on 19 May 1948.

[redacted]

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AFOAT-1
DATE 8 Dec 49

Report
of
Operation FITZWILLIAM

Vol I Tab III D Copy No. 35

Project FIRSTRATE
(Narrative & Annex)

AWS Participation in FITZWILLIAM

HQ, AWS

UNITED STATES AIR FORCE

[redacted]

[redacted]

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BOOK I

NARRATIVE

I. INTRODUCTION.

By letter 3 December 1947 from Chief, Special Weapons Group, USAF, and Commanding General, ATC, the AWS was given operational responsibility for collecting the necessary geophysical observations in connection with LRDAE. As applied to FITZWILLIAM, this directive was regarded as applying solely to the collection of evidence of radioactivity in the atmosphere.

Air Weather Service participation in Project FITZWILLIAM was assigned the code name of FIRSTRATE. Under FIRSTRATE, AWS collected radiological samples and took measurements of ambient radioactivity at ground level; recorded and transmitted to Headquarters USAF essential data connected therewith; supplied meteorological data and assisted other participating agencies by providing certain logistical support and basic equipment and personnel.

The basic problem was to collect evidence of the radioactivity released into the atmosphere by the atomic explosions. Direct evidence was collected in the form of radioactive particles filtered from the air mass contaminated by the explosion. Indirect evidence was gathered by recording ambient radioactivity on automatic recording counters at ground level. The AWS plan under which this was accomplished is given in Annex "A".

The ground net stations were located in accordance with metecrological studies centered on SANDSTONE locations and times, with some consideration given to possible ultimate requirements of [redacted] The majority of the ground stations were at locations having AWS detachments.

Capture of explosion products by airborne filters was to be accomplished by three (3) separate flying operations:

a. Normal reconnaissance flights of AWS, VLR, Weather Reconnaissance squadrons based at Guam, Fairfield-Suisun, Fairbanks, and Bermuda.

b. Special weather reconnaissance flights by 8 weather reconnaissance B-29's operating from Kwajalein under the direction of Commander, JTF-7.

c. Special flights as necessary for the specific purpose of tracking and intercepting the radioactive cloud, to operate on call from Shemya and Hawaii, as directed by the Weather Officer, JTF-7, in his dual capacity as staff meteorology is of AFMSW-1.

II. THE PLANNING PHASE.

A. Possible Detection Methods.

The conference of 17 November 1947 at the Pentagon
mined that there were at least seven (7) possible avenues of
k on the problem of long range detection of atomic explosions.
methods are:

1. seismic - to detect explosions by earth tremors.

2. sonic - to detect sound waves emanating from explosions.

3. electromagnetic - to detect electromagnetic disturbances produced by the explosion.

4. atmospheric conductivity - to determine the effect of an atomic explosion on the conductivity of the atmosphere.

[redacted]

6. ionospheric - detection by observing dimples in the ionosphere.

7. nuclear - detection by radiological contamination of the atmosphere.

he latter method, radiological contamination, that initially
ed the Air Weather Service in Project FITZWILLIAM.

B. Assignment to Air Weather Service.

The task of detecting atomic explosions by means of
ng radiological contamination of the atmosphere was given to
Weather Service because it is primarily an operational agency
l to operate on a twenty-four hour world-wide basis, and be-
; has personnel with the essential technical backgrounds.

The first authority for Air Weather Service participation in Project FITZWILLIAM was given verbally from the Chief of Staff, U. S. Air Force, to Brigadier General Donald N. Yates, Chief, Air Weather Service. Much of the initial discussion of the detection program was kept in verbal form for security reasons. The first written evidence of Air Weather Service participation came from the Chief of Staff, U. S. Air Force, (see Appendix I, letter dated 13 November 1947) advising that the Special Weapons Group was the monitoring agency and proposing other military organizations as participating agencies. Following the conference of 17 November 1947, a letter dated 3 December 1947 (see Appendix II) was sent to the Chief, Air Weather Service, directing Air Weather Service participation.

On 27 October 1947, General Yates selected Major James M. Fahey to supervise the activities of the Air Weather Service in Project FITZWILLIAM.

The appointment of Major Fahey to the capacity of supervisor was temporary, pending the arrival of Major Gerard M. Leies, who was being recalled to active duty after having completed schooling in nuclear physics at the University of California. On 15 December 1947, Major Stephen W. Pournaras, Air Weather Service, was selected to assist Major Fahey, who was scheduled to attend a service school beginning in January 1948. It was contemplated that Major Pournaras would be well enough acquainted with the problem to

assume the responsibility of the project until the arrival of Major Leies on 15 January 1948. By the time Major Leies arrived, the work had grown to such proportion that it became a two-man job with Major Pournaras and Major Leies working together. Major Pournaras remained in the capacity of supervisor.

C. The Operational Plan.

1. The Problem:

Major Fahey's first instructions were to draw up a plan for Air Weather Service participation in Project FITZWILLIAM. He was directed, for security purposes, to keep the plan in verbal form, however, the extent of the project necessitated that a written plan be drafted. From his experience at the conference with the other agencies, Major Fahey knew what methods and procedures were generally outlined for the Air Weather Service.

Air masses which were in proximity to the SANDSTONE explosions were to be filtered for evidence of radioactive particles. It was believed that if a sizeable volume of air passed through a filter element of sufficient density, any solid particles, including fission products, would be retained in the filter element. The element was then to be examined by sensitive radiological measuring devices to determine the magnitude of radioactivity. If the filter elements proved to contain a higher degree of radioactivity than might normally be expected, they were to be subject to further analysis in laboratories to ascertain what types of particles were present.

Evidence of fission products would be conclusive that an atomic explosion had taken place somewhere along the trajectory of the air mass which had been filtered.

In addition, certain sensitive radioactivity detection instruments were to be strategically located so that contaminated air masses passing in proximity to the instruments would be detected.

The equipment to be utilized in this technique was designed for both ground stations and reconnaissance aircraft. The locations of the ground stations and the vectors of the reconnaissance tracks were chosen to present a network over the trajectories of possibly contaminated air masses. A letter, dated 11 December 1947, was sent by Air Weather Service to Air Materiel Command specifying the requirements for the necessary equipment and requesting that Air Materiel Command develop and provide same. The requirements had been previously discussed by Major Fahey and Major M. A. Cristodoro, Jr., of Air Materiel Command. The Naval Research Laboratory and the U.S. Army Signal Corps were also to provide several types of equipment. Provisions were made to give all of this equipment high priority for shipment via Military Air Transport Service as it was completed. It was anticipated that equipment would be finished for one station at a time and each station was assigned a priority to receive its equipment. This procedure would not be strictly followed and will be discussed later in this report.

AFMSW-1 withheld approval of the first AWS plan pending changes to effect concurrence with "Operations Plan - FITZWILLIAM", dated 20 March 1948. Major Pournaras and Major Leies examined both plans and determined that there was a conflict in two instances: (1) on the handling of filter papers by aerial reconnaissance units, and (2) on the addition in the Air Weather Service plan of Barber's Point as an air sampling location. Air Weather Service requested that authority be granted to follow the Air Weather Service plan since changes would cause confusion in the field. A reply (7 April 1948) by AFMSW-1 directed that the addition of Barber's Point was approved and that pending modification of the procedure for handling filter papers, the Air Weather Service plan was approved.

The final plan "Air Weather Service Participation in Project FITZWILLIAM" may be found in Annex A.

2. The Ground Net:

The network for ground installations for Project FITZWILLIAM was determined from climatological studies of air mass trajectories prepared by the Director of Military Climatology, Air Weather Service. These stations were selected specifically for the SANDSTONE explosions so that the network would be readily adaptable to the [redacted] net during the post-SANDSTONE period. A revision was later made for the operational phase of [redacted] Some installations were made at U. S. Weather Bureau observation posts; however, the majority were made at Air Weather Service stations.

3. Aerial Reconnaissance:

a. Aerial operations were to be conducted by the 373d, 374th, 375th, and 514th Reconnaissance Squadrons, WLR, Weather, flying their normal reconnaissance tracks.

b. Eight (8) aircraft of the 514th Reconnaissance Squadron were placed at the disposal of the Task Force Commander, JTF-7, for Operation SANDSTONE. As a secondary mission these aircraft also assisted i in FIRSTRATE operations in the vicinity of the Marshall Islands.

c. Flights of the 374th and 375th Reconnaissance Squadrons were ordered on special "cloud-chasing" assignments by Commander, Air Forces Joint Task Force Seven, upon recommendation of the Task Force Weather Officer.

4. Personnel Assignments:

The personnel to be employed in the operation of the detection net were to receive training with demonstration and instruction at Bolling Air Force Base. Lt. H. J. Gustafson and Lt. Jack R. Smith were assigned to the Naval Research Laboratory at Washington, D. C., to study and become familiar with Naval Research Laboratory equipment. WOJG Robert I. Dunlop and Technical Sergeant Wilson H. Craig were sent to Evans Signal Laboratory, Belmar, New Jersey, to study equipment that was being developed by the U. S. Army Signal Corps.

5. Procedures for Obtaining Data:

a. Definitions:

Background: The residual count obtained on radiological counting equipment when no radioactive sample is brought near. This residual count (background) is due to cosmic rays, to radioactive materials in the earth, and to a slight contamination in the materials of which the instruments are made. The background is somewhat variable with geographical location but is fairly constant at a given place.

Half-life: The time required for a radioisotope to lose 50 percent of its activity.

Decay Curve: A decay curve is the plot of the activity or intensity of a radioisotope as the ordinate and time as the abecissa. It has long been known that radioactive material decreases in activity with time. Each radioisotope has a characteristic rate of decrease and consequently a characteristic half-life. Thus, by observing the decay curve of a radioactive substance we can determine its half-life. This is a widely used method of identifying a radioactive material.

b. Air Filtering.

In order to detect the presence of radioactive contamination in the atmosphere, the air was filtered both at ground level and at higher altitudes (by means of an air filter unit installed in a B-29 type aircraft). Exposed filter papers were then analyzed by

means of Geiger counters (Beta counters). When the counters indicated an activity sufficiently greater than normal background count (the count obtained by measuring an unexposed filter) to warrant further investigation, the filter paper was then forwarded to a radiochemical laboratory where the following analysis was carried out:

(1) A series of counting measurements was made on the filter paper in order to determine the gross decay curve.

(2) The filter paper was radio-chemically analyzed to isolate the radioactivity due to the various elements present.

The results of the above analysis served to indicate whether or not fission products were present in the filter paper.

d. Automatic Recording Counters.

Automatic recording Geiger counters sensitive to gamma radiation were designed and set up to record automatically the counting rate experienced. Theoretically, any radioactive "cloud"

passing over these counters would emanate gamma rays which would be recorded on these counters. This type of detection equipment was particularly designed for ground installation; however, a modification of the equipment was tested as airborne equipment. The latter type was designed to detect, by means of gamma radiation, the presence of a radioactive cloud through which the plane passed.

e. Ionization Chambers.

These instruments, like the automatic recording counters described above, were designed to detect, by means of beta and gamma rays, the presence of a radioactive cloud passing over the equipment at or near ground level.

f. Air Sampling.

Several of the B-29 type aircraft were equipped with air compressors which, at flight altitude, compressed air drawn from outside the aircraft into airborne type oxygen supply bottles. These bottles, containing approximately 2000 cubic inches at 400 lbs per square inch pressure, were to be rushed, via ATC, to a chemical laboratory (Tracerlab, Inc., Boston), where they were to be analyzed for fission products. It was later found that these air samples failed to reveal, when alayzed, any detectable amounts of fission products. The air sampling process was subsequently supplanted by Project BEANS; a project which attempted to extract certain noble gases in liquid form from the atmosphere. The samples of the noble gases were rushed to a chemical laboratory where an attempt was made to detect radioactive isotopes.

III. PRE-SANDSTONE OPERATIONS.

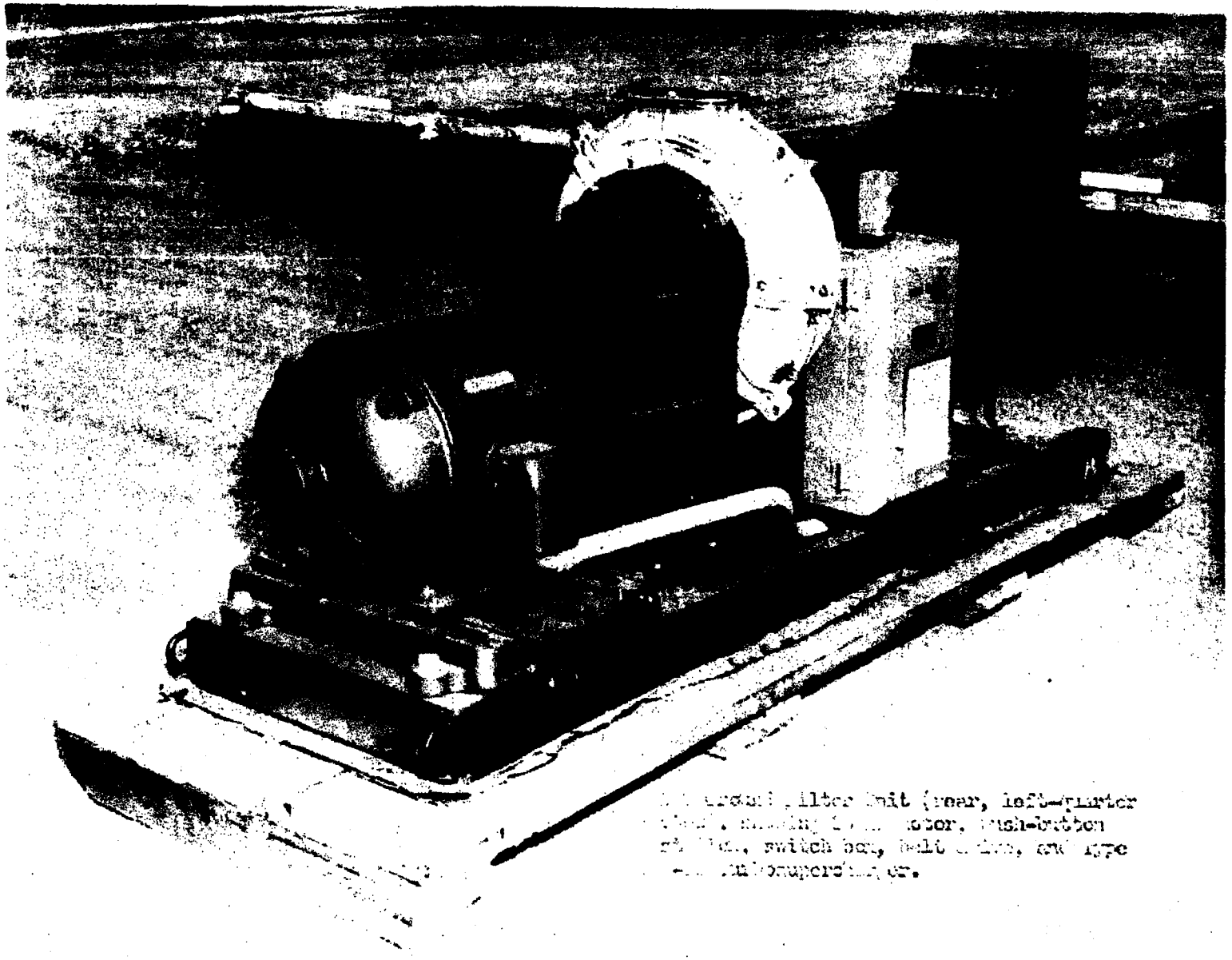
A. Equipment.

As has been previously mentioned, the requirements for equipment and materiel pertinent to Project FITZWILLIAM were determined by the joint conference of 17 November 1947.

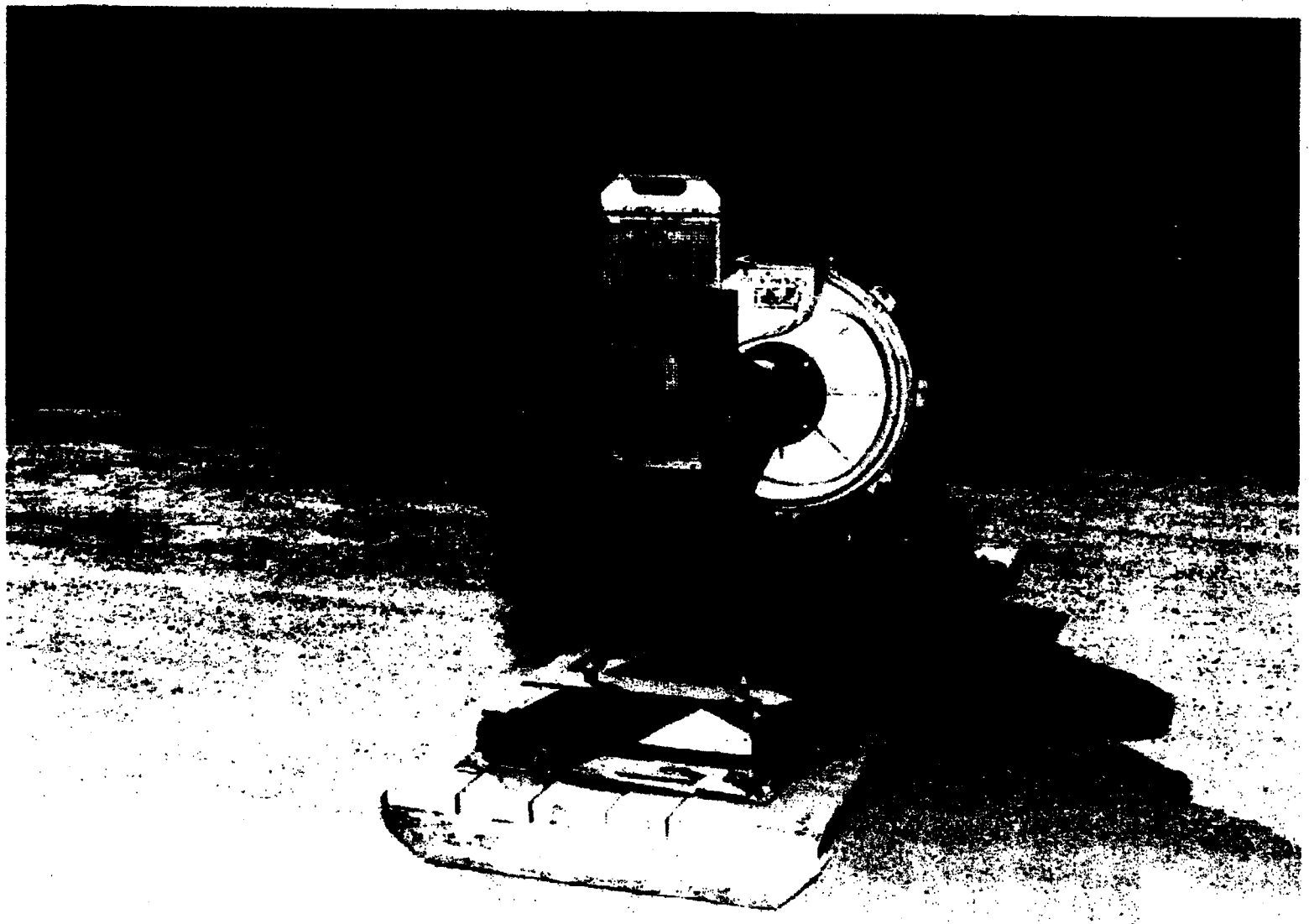
1. The AMC filter unit is composed of a 20 hp 220 volt three phase motor and a turbo-supercharger from a B-29 type aircraft. The air input of the supercharger is drawn through an 8" X 18" filter paper (Chemical Warfare #5) at the approximate rate of 1400 cubic feet per minute.

After exposure, the filter paper is inserted in a brass tube which is slipped over a long, thin walled, self-quenching Geiger tube. The tube, housed by two inches of lead to reduce the background count, is coupled with a Model LS-64 counter. This counter, manufactured by the El-tronics Company, Inc., of Philadelphia, Pennsylvania, consists of a built-in, high voltage supply for the G-M tube, a scaling circuit, and a mechanical register.

Several operational and installation difficulties were experienced with this piece of equipment. One problem encountered in operation during the training program was with the double belt coupling system between the motor and the blower. The temperature of the belt became excessive as a result of slippage and subsequently



[illegible] filter unit (rear, left-quarter [illegible], switch box, [illegible] type [illegible]).

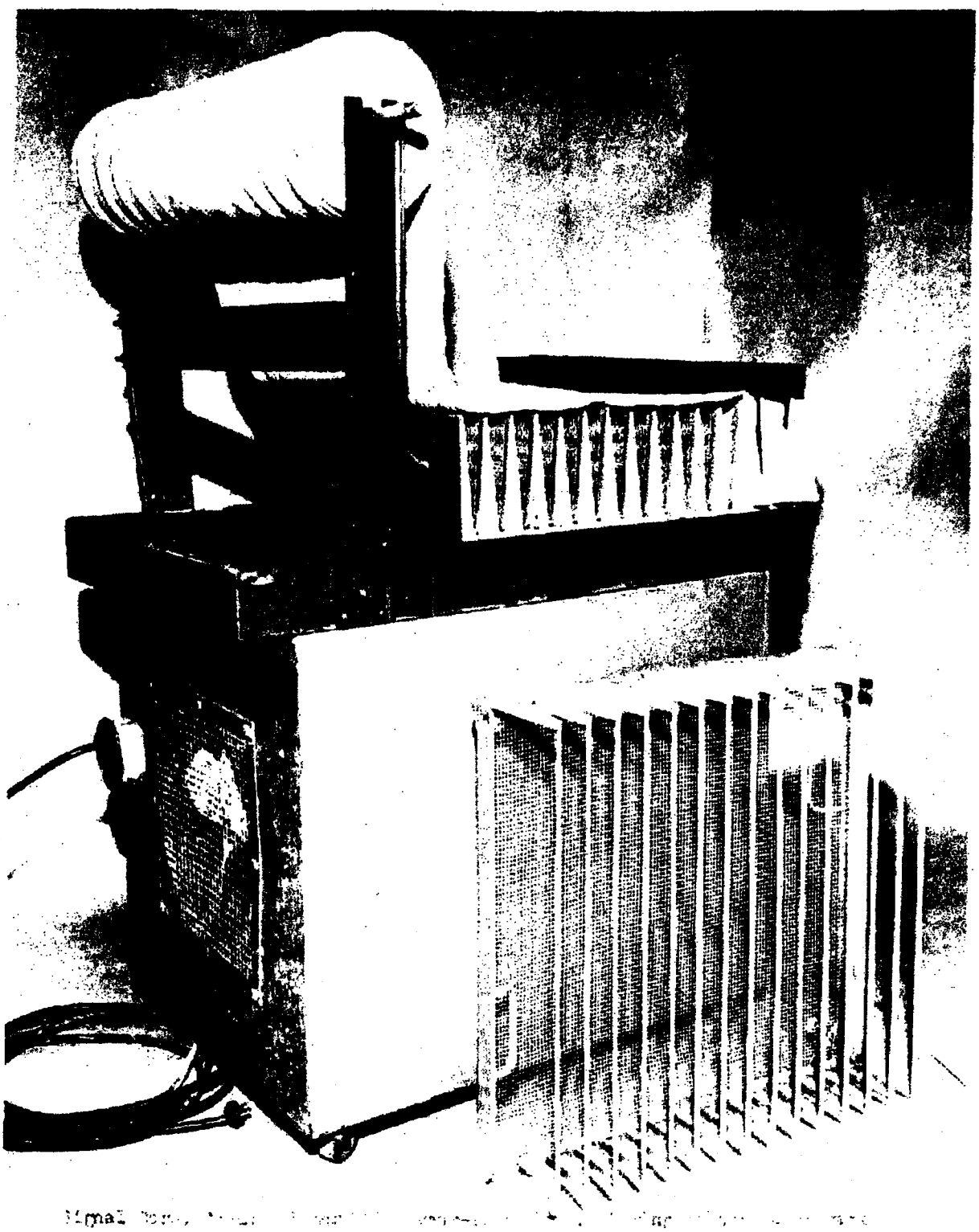


[illegible] filter paper holder partially withdrawn.

burned out the belt. This obstacle was overcome by a modification kit which was designed by the Navy to meet the emergency. The modification kit was later produced and assembled for all units by Air Materiel Command.

At a number of installations the significant difficulty was in obtaining an adequate power supply. The normal operating requirement for the 20 hp 220 volt motor is approximately 68 amperes with an initial starting current of approximately 100 amperes. This initial load taxed the normal power supply at most installations and caused a breakdown in the power system. Each station operator had to meet this problem in his own way since it did not arise until field installations were being made.

2. The U. S. Army Signal Corps supplied a dust sampling unit designed around the Air Materiel Model PL-29 and utilized a 24" X 24" 10-ply filter paper. This unit was manufactured by the Kruse Engineering Company of Newark, New Jersey. Air is drawn through the filter paper which is mounted in a removable rack in front of the air duct. The blower consists of a 12 inch propeller type fan and is powered by a 1/12 hp AC motor. This unit samples much less air per unit time than does the AMC blower. After exposure, the filter paper is removed from the rack, wound on a mandrel and slid over a long Geiger counter beta tube. The Geiger tube is manufactured



by the Able Scientific Class Apparatus Company of Chicago, Illinois. The tube is housed in a 12" X 12" X 30" wooden box which provides no shielding against background radiation. This unit also utilizes an IS-64 El-tronics scaler for counting and is identical in operation to the scaler on the AMC unit. The absence of a lead shield raises the background count and makes the counting of samples of low activity less accurate. In addition, the 10-ply filter paper used in the Signal Corps unit is sufficiently thick to absorb the majority of the activity of soft beta radiation of practically all of the fission products.

3. Two (2) types of continuous recording units were used in the FIRSTRATE program. One of these units was designed by the Physical Optics Division of the Naval Research Laboratory at Washington, D. C., and the other by the Wells Survey Company of Fort Worth, Texas.

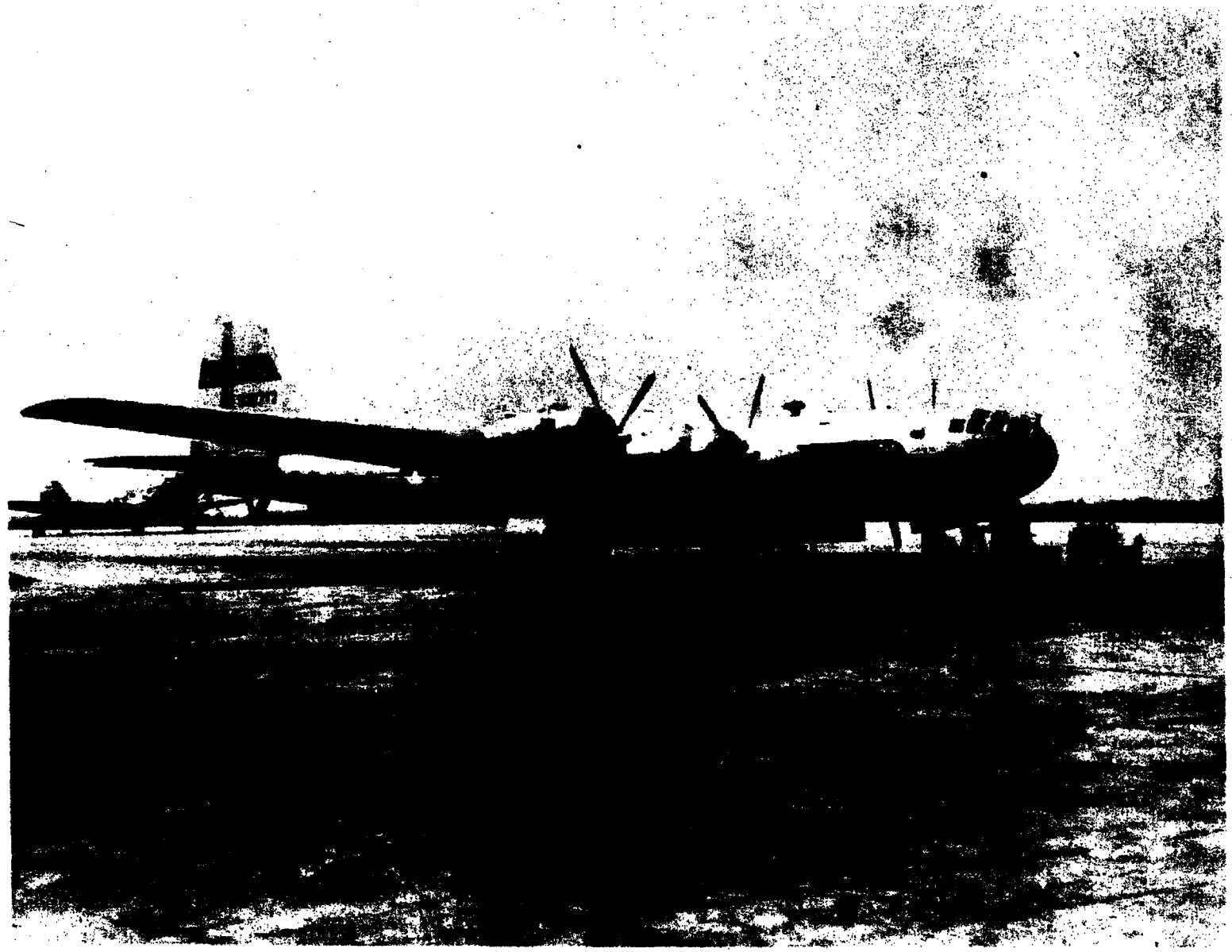
The NRL counter is powered by 110 volts 60 cycle AC and is composed of seven (7) Geiger tubes containing a special halogen-noble gas and a nickel-iron cathode. The tubes, constructed by the Amperex Company and filled with gas by Naval Research Laboratory, are nested together; six on the periphery and one in the center, all electrically connected in parallel. The output of the tubes is fed into a General Radio type 1500 Counting Rate Meter through a discriminator circuit which cuts out the large pulses due to cosmic

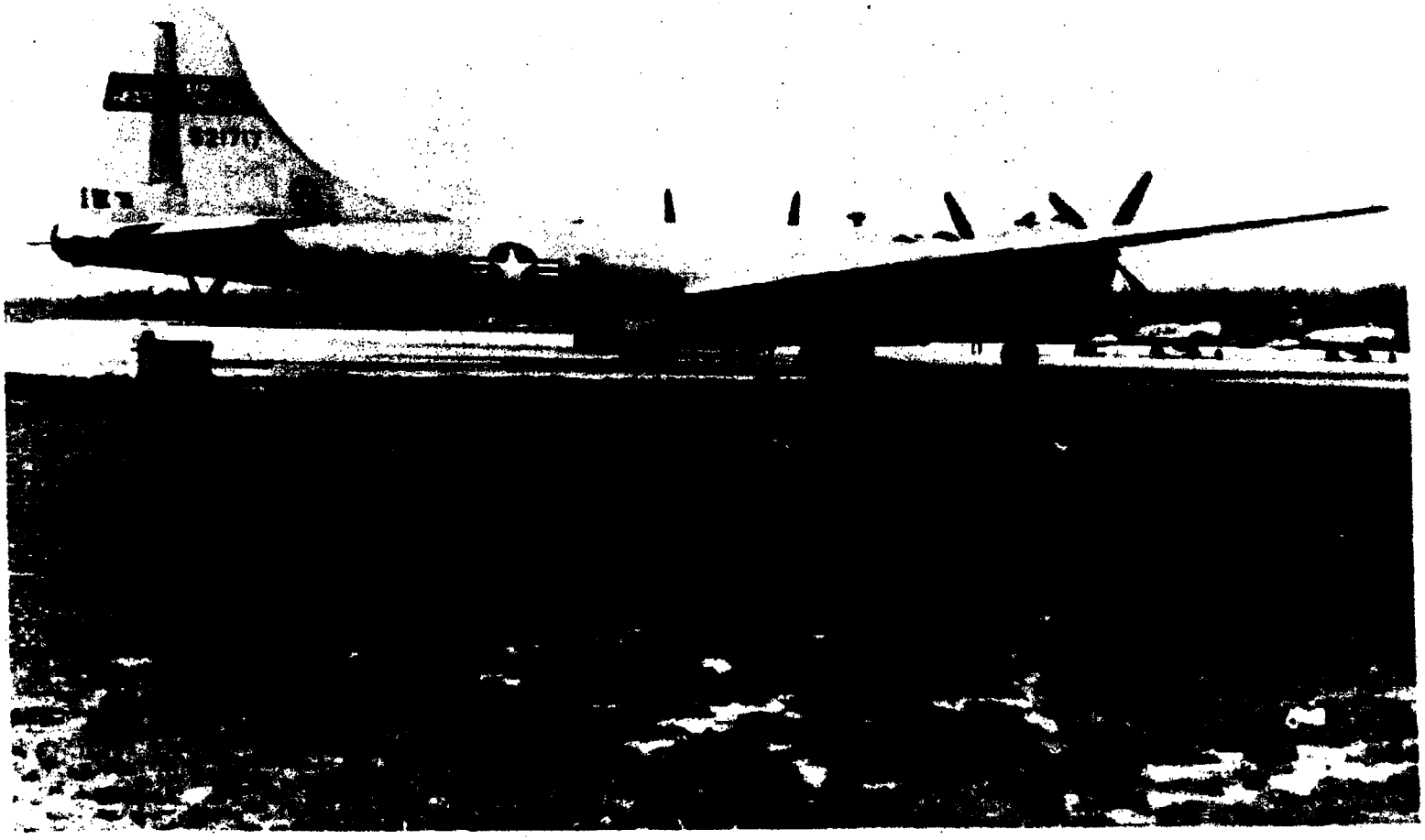
rays while allowing smaller pulses from gamma rays to pass. The meter integrates the counts per minute electrically and feeds its output into an Esterline-Angus Recorder which records counts per minute against time.

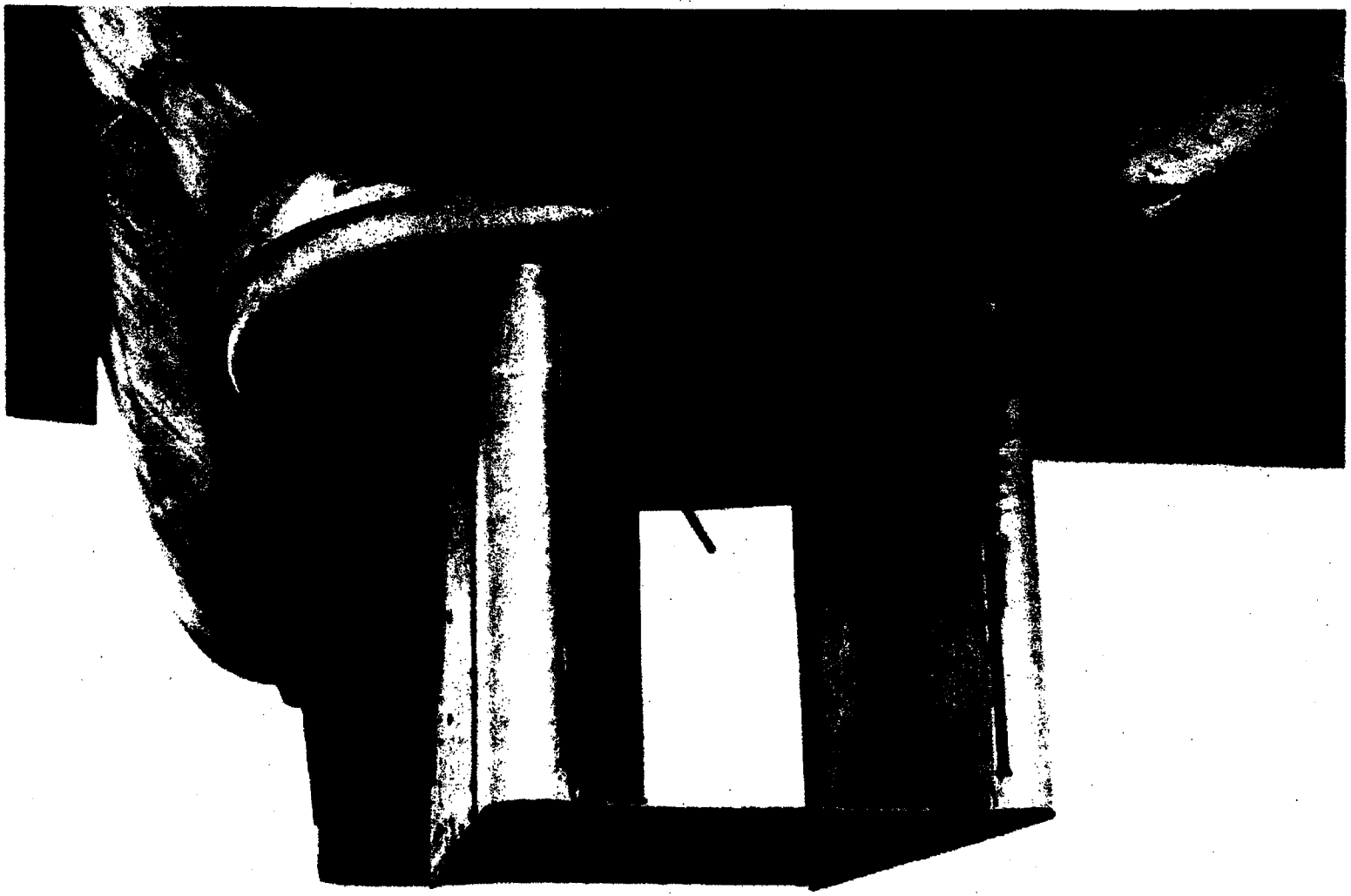
The second type of automatic detection equipment, the Wells Survey background counter, consists of an ionization chamber approximately four feet long and one foot in diameter, containing argon gas under high pressure. Radiation, either beta or gamma, causes ionization within the chamber which is detected by a vibrating reed electrometer which, through a suitable circuit, actuates a Speed-o-max Recorder.

This unit is equal to the NRL unit in sensitivity. The ionization chamber is more stable and less subject to sudden changes than the NRL counters; however, the complexity, weight, and cost of the unit seem to disqualify it for use in its present form.

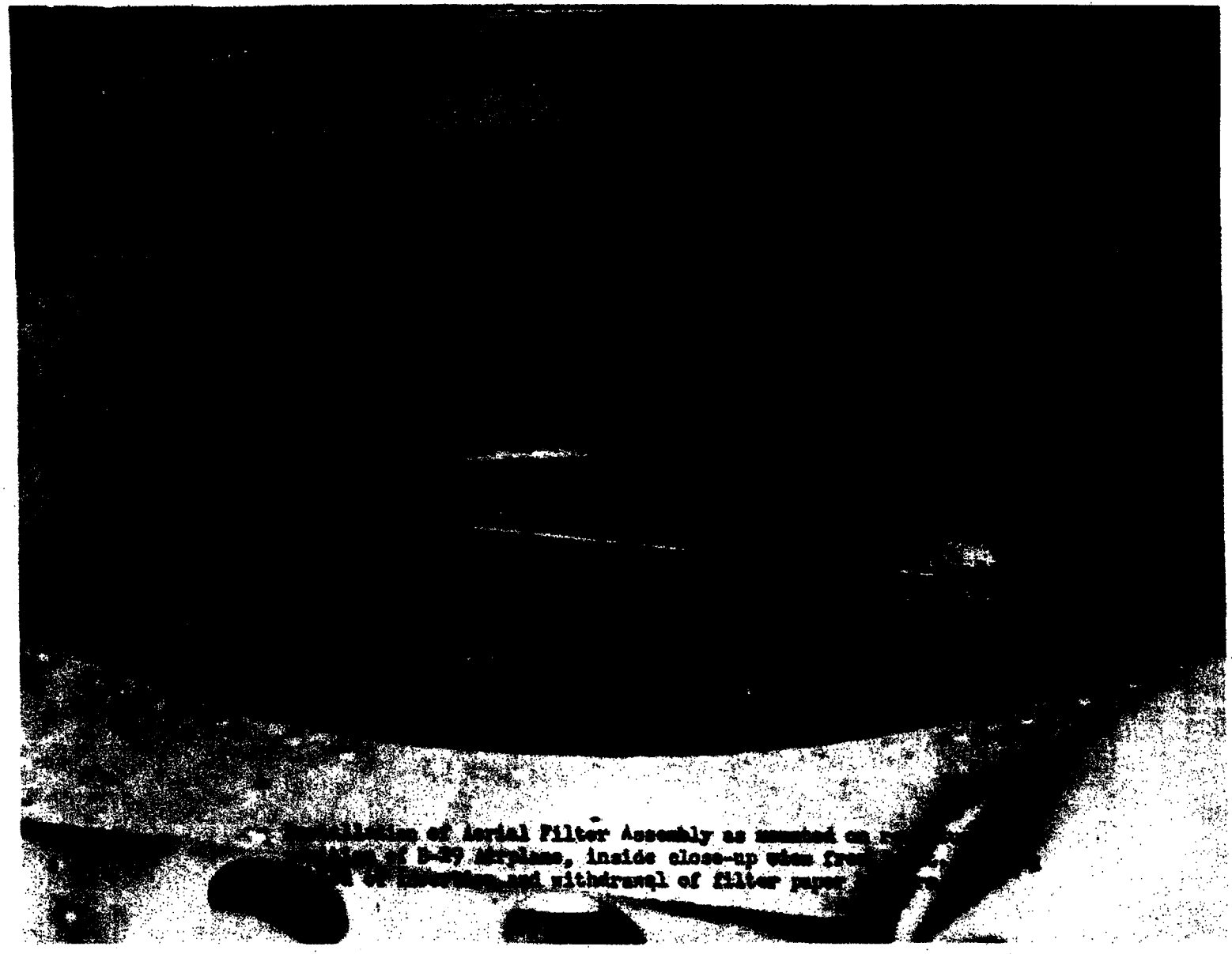
4. The airborne filter equipment was all designed and manufactured by Air Materiel Command in the sheetmetal shops at Warner-Robins Air Force Base, Macon, Georgia. It was necessary to design these units for both the "stripped" and the "combat type" B-29 aircraft. Each unit was assembled in kit form for installation at squadron maintenance level. The filter unit protruded below the aircraft such that the force of the airstream, aided by a venturi effect, caused

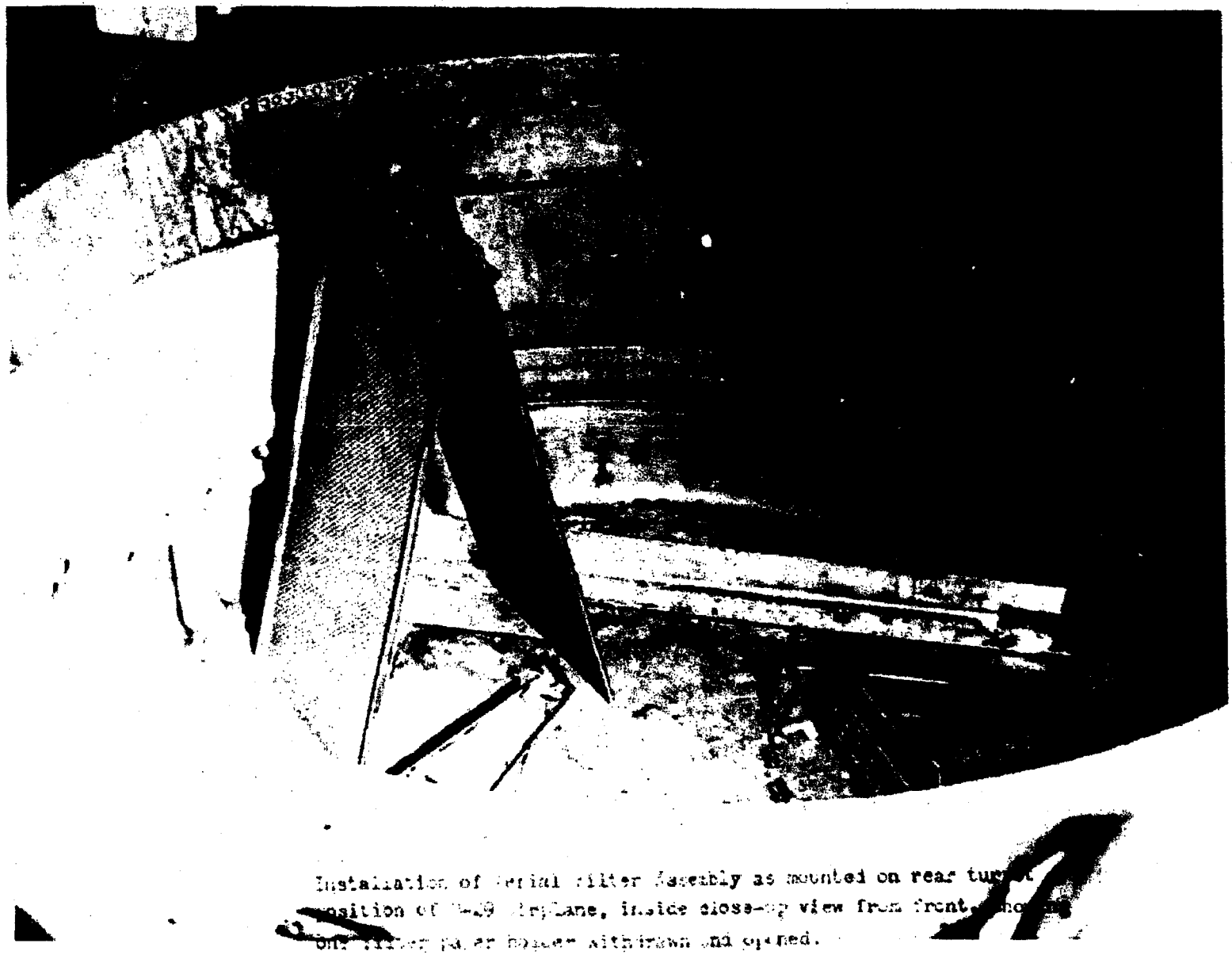






Installation of Aerial Filter Assembly as mounted on rear turret position of B-29 Airplane, close-up view from front





Installation of aerial filter assembly as mounted on rear turret position of B-29 airplane, inside close-up view from front, showing one filter paper holder withdrawn and opened.

Only one (1) installation of this piece of equipment was made. This was in a B-29 of the 308th Reconnaissance Group on 6 May 1948.

B. Personnel and Training.

1. It was the intention of the Air Weather Service to have the first field equipment from the Naval Research Laboratory, the U. S. Signal Corps, and Air Materiel Command delivered to Bolling Air Force Base for purposes of demonstration, technical study, and for establishment of a training program. Two (2) NRL automatic counters were sent to Bolling Air Force Base by truck and accompanied by Lt. H. J. Gustafson, who had been stationed at Naval Research Laboratory to study the equipment. Two (2) other pieces of equipment, an AMC blower and an AMC aerial filter also arrived. United States Air Force officials believed that the nature of the equipment would require a more formal program of instruction than had been anticipated by the Air Weather Service at Bolling Air Force Base and called on Tracerlab, Inc., the personnel of which organization are technicians with a background in the fields of electronics and physics. This change in plans; however, dictated that each piece of equipment arriving at Bolling be loaded on an airplane and forwarded to either Fairfield-Suisun Air Force Base, California or to the Boston office of Tracerlab, Inc. Tracerlab, Inc., a civilian agency which had been contracted by the Special Weapons Group, United States Air Force through Watson Laboratories, was to

supervise the maintenance of equipment in the field and the training of operating personnel for the radiological contamination investigation of Project FITZWILLIAM.

2. Fairfield-Suisun Air Force Base was chosen as the location for the training program since it was geographically convenient to the field stations and since it was an Air Transport Command base. Some of the equipment which was developed for the project was sent first to Boston to allow the Tracerlab personnel to study it from the standpoint of maintenance and operation.

Tracerlab, Inc., was presented with a list of equipments, proposed operating locations, and a general outline of the proposed operations. Along with United States Air Force technicians, the technical personnel of Tracerlab, Inc., evolved an outline for establishing and operating monitoring stations to yield the maximum significant data over the period of the SANDSTONE tests.

The equipment to be used by the field operators in Project FIRSTRATE was examined and analyzed by Tracerlab's electronics personnel. After examination, instruction and maintenance booklets were written; suitable spare parts were ordered; and a portable maintenance kit was designed. The instruction and maintenance booklets and the maintenance kit are combined in the Tracerlab report on "Training Phase for Monitoring Personnel", dated May 1948. (See Vol. III, Tab C).

On 28 February 1948, nine (9) administrative and technical representatives of Tracerlab, Inc., arrived at Fairfield-Suisun Air Force Base from Boston. While at Fairfield-Suisun Air Force Base they were supplied and accommodated with quarters and messing facilities by the 308th Reconnaissance Group(Weather).

3. School convened on 1 March 1948 with approximately sixty-five (65) students in attendance. The wide variance in grade, training, and experience, coupled with the lack of time and the limited available instructional personnel and equipment presented a situation which required maximum effort of all concerned.

4. The program, primarily of a practical nature, was designed to familiarize each operator with the operation, maintenance, and calibration of equipment. Over half of the allotted school time was spent in practical laboratory work. Mornings were spent in lectures and discussions on fundamental theory of scalers, Geiger tubes, and reporting procedures. A brief outline of the course is as follows:

Registration and Assignment to Sections	1 hr
Introduction to Course	1 hr 30 min
Introduction to the Technical Aspects of the Program for Phase 2	1 hr 15 min
Responsibilities of Station Operators	1 hr
Background Counting Station Which Uses the GR Count Rate Meter	1 hr 30 min
The Particles Involved in Radioactive Decay and the Distribution of Fission Products from an Atomic Bomb	1 hr 10 min

Introduction to all Equipment to be Used on Project	1 hr 30 min
Operation of Electronic Scaling Units	2 hr 15 min
Trouble Shooting in Circuits of Project Electronics Equipment	1 hr 15 min
Theory, Operation, Construction of Geiger Tubes	2 hrs
Probable Air Trajectories	1 hr
Detailed Procedures for Use in Dust Sampling	1 hr 30 min
Practice in Reporting Data	1 hr 30 min
Statistics	45 min
Mufflers	15 min
Assignment of Operators to Individual Stations and Meeting with Tracerlab Field Engineers Assigned to Particular Areas	2 hrs
Special Lecture to Operators Assigned to Termini of B-29 Air Filter Runs	1 hr
Final Quiz	2 hrs 30 min

5. By 8 March 1948, the assignments of personnel to Air Weather Service stations had been made. Selections for these assignments were made on the results of the preliminary examination and the individual's aptitude on specific pieces of equipment.

On 10 March the first phase of the training course was completed, and for the next five (5) days, all personnel who were to be assigned to Air Weather Service stations received a concentrated training on that equipment which was peculiar to each field assignment. This was phase 2 of the training program.

Those students who completed the school were assembled and issued the completely packaged portable maintenance kit which had been made up by Tracerlab, Inc., in Boston. They also received one copy of the pamphlet "Responsibilities of Personnel Assigned to Project FIRSTRATE Field Stations." This was the interim Standing Operating Procedure, which was later rewritten by Air Weather Service and reissued in directive form by AFMSW-1. This later directive was known as "Annex F" to "Operational Plan - FITZWILLIAM".

By 15 March all students, equipped with filter paper, instruction books, and proper repair kits, departed Fairfield for their assigned stations. In the opinion of the Tracerlab technicians "all officers with assignments to Project FIRSTRATE left the school completely instructed in the job to be done."

Graduates were assigned as follows:

Major Harry C. Crim, Jr., USAF	Kwajalein Atoll
Major S. A. Mitchell, USAF	Bolling AFB
Major M. T. Moree, Cml C	March AFB
Captain H. T. Bingham, USAF	Adak Island

Captain B. C. Brill, CAV	Wake Island
Captain Glenn E. Davis, USAF	Hickam AFB
Captain Thomas A. Hope, Cml C	Shemya
Captain Richard Lambie, USAF	Kindley AFB
Captain K. L. Leiby	Ladd AFB
Captain John D. Servis, Cml C	Annette Island
Captain Francis P. Smith	Iwo Jima
Captain Oscar J. Tibbetts, USAF	Haneda AFB
1st Lt David M. Falk, USAF	Fairfield-Suisun AF
1st Lt Robert E. Frazier, USAF	Elmendorf AFB
1st Lt Gordon L. Jacks	Nome, Alaska
1st Lt J. E. Kuchenbecker, USAF	Spokane AFB
1st Lt J. D. McGowan, FA	Chitose
1st Lt B. B. Small, INF	Barter Island
1st Lt Jack R. Smith, USAF	Albrook AFB
1st Lt Albert H. Stout, USAF	Fairfield-Suisun AF
1st Lt Benjamin H. Walsh, USAF	Kimpo AFB, Korea
1st Lt C. V. Wilson, USAF	Guam (North AFB)
WOJG Robert I. Dunlop, USAF	THornbrough AFB
WOJG Ben H. Houston, USAF	Clark AFB
T/Sgt Wilson H. Craig, Jr., USAF	Guadalcanal
S/Sgt E. A. Anderson, USAF	Hickam AFB
Sgt Jack R. Peacock, USAF	Haneda AFB
Cpl William R. Freeze, USAF	Okinawa

C. Installation of the FIRSTRATE Net.

1. Shipment of Equipment:

The fact that Project FITZWILLIAM was being carried on in conjunction with Operation SANDSTONE considerably affected the procurement, movement, and installation of many pieces of FIRSTRATE equipment. Nearly all supplies being used in connection with Operation SANDSTONE and Project FITZWILLIAM were bein routed to the Pacific area on a high priority. Traffic became so heavy that shipping channels and supply depots were deluged with supplies for all participating agencies. As a result of this, some FIRSTRATE equipment was either misrouted or misplaced.

Priority, for shipment of each piece of equipment to its specified location upon its completion, was established by Air Force Headquarters (AFMSW-1). The disposition of each unit was determined by the strategic value of the operating sites as related to the SANDSTONE operation and the interim net for Project [redacted] All shipping was to have been done via "air lift" on a high priority basis.

The Air Weather Service was notified of dates of shipments and carefully monitored the movements to insure that each piece of equipment arrived at its appointed destination in time for installation before the test dates. Upon learning that some equipment had failed to reach location within a reasonable time, Project FIRSTRATE supervisors made investigations by long-distance telephone

calls, telegraph, and cablegram to locate the "lost" instruments and supplies. As each piece was located, Air Weather Service airplanes were directed to recover and ferry the equipment to its assigned point of operation.

Delays enroute did occur due to the tremendous overload on military and commercial freighting facilities.

2. Locations of FIRSTRATE Stations:

Listed below are the stations where FIRSTRATE equipment was installed for Project FITZWILLIAM.

<u>7th Weather Group, Fort Richardson, Alaska</u>

Adak (Davis AFB)

Barter Island

* Elmendorf Field

Thornbrough AFB

* Ladd Field

Nome

* Shemya AFB

<u>43d Weather Wing, Tokyo, Japan</u>

Chitose

Kimpo (Korea)

Okinawa (Kadena AFB)

* Yokota

Clark Field (Manila)

* Guam (North AFB)

Iwo Jima (Central AFB)

59th Weather Wing, Tinker Field, Oklahoma

* Fairfield - Suisun AFB

March AFB

Spokane AFB

Bolling AFB

8th Weather Group, Westover AFB, Massachusetts

Albrook AFB

* Kindley AFB

31st Weather Squadron, Hickam AFB, Oahu, T. H.

Guadalcanal

* Hickam Field

Kwajalein

United States Weather Bureau

Annette Island

Wake Island

* Stations marked with an asterisk were prepared to receive filter papers from airborne filter units.

3. Tracerlab maintenance personnel operated from central locations established at:

[redacted]

Headquarters, 7th Weather Group, Anchorage, Alaska

Headquarters, 30th Weather Squadron, North Field, Guam

Headquarters, 308th Reconnaissance Group (Weather), Fairfield-Suisun AFB, California

Headquarters, 31st Weather Squadron, Hickam AFB, Oahu, T. H.

Tracerlab, Inc., Boston, Massachusetts

The purpose of these centers was to provide technical assistance, for the maintenance of the equipment. Movement of the Tracerlab engineers assigned to each of these organizations was accomplished by Air Transport Command aircraft; by local weather squadron aircraft; by use of one (1) C-54 aircraft of the 514th Reconnaissance Squadron; and by use of one (1) C-54 aircraft of Air Materiel Command assigned for use by Tracerlab.

Field stations were geographically grouped by the Tracerlab engineers to facilitate maintenance supervision. Listed below are the Tracerlab engineers; their bases for operations, and the stations in each area.

Mr. Jay T. Thomas
308th Reconnaissance Group (Wea)
Fairfield-Suisun AFB, California

Fairfield-Suisun AFB

Bolling AFB

March AFB

Spokane AFB

Kindley AFB, Bermuda

Albrook AFB, Canal Zone

Mr. George E. Howser
30th Weather Squadron
Harmon AFB, Guam

North AFB, Guam

Kadena AFB, Okinawa

Central AFB, Iwo Jima

Clark AFB, Manila, P.I.

Mr. Roger A. Coulombe
7th Weather Group
Anchorage, Alaska

Thornbrough AFB (Ft Randall)	Ladd AFB, Fairbanks
Davis AFB, Adak, Alaska	Annette Island, Alaska
Barter Island, Alaska	Shemya, Alaska
Nome, Alaska	Elmendorf AFB, Alaska

Henderson AFB, Guadalcanal	Hickam AFB, Oahu
Kwajalein Atoll	Wake Island

Tracerlab, Inc., also established air filter teams (for radiochemical analysis) at Hickam Field; North Field, Guam; and Kwajalein.

The Boston office of Tracerlab, Inc., was the terminal point for analysis of the oxygen supply bottles used in the "gas sampling" techniques and for analysis of samples taken in Project BEANS.

4. Special Operating Locations:

a. Barber's Point, Oahu: The 374th Reconnaissance Squadron, VLR, Weather, operated four (4) B-29 type aircraft from Barber's Point upon receipt of the order to execute Plan DOUBLEDAY.

b. Kwajalein: Eight (8) aircraft (B-29) of the 514th Reconnaissance Squadron, VLR, Weather, were committed to the Task Force for specific high priority flights.

c. Shemya, Alaska: The 375th Reconnaissance Squadron, VLR, Weather, was prepared to operate aircraft out of Shemya for Plan DOUBLEDAY but were required to participate in special cloud chasing flights.

d. The 514th Reconnaissance Squadron, VLR, Weather, was required to have aircraft available to operate out of Yokota. Regular reconnaissance flights were made from:

Guam by the 514th Reconnaissance Squadron

Ladd Field by the 375th Reconnaissance Squadron

Fairfield-Suisun AFB by the 308th Reconnaissance Group and 374th Reconnaissance Squadron

Kindley Field (Bermuda) by the 373d Reconnaissance Squadron

AMC airborne filter units had been shipped as follows:

Priority #1	14 kits (Combat type B-29)	514th Reconnaissance Squadron, North Field, Guam
Priority #2	14 kits (stripped type B-29)	375th Reconnaissance Squadron, Ladd Field, Alaska

Priority #3	14 kits (stripped type B-29)	374th Reconnaissance Squadron, Fairfield-Suisun AFB, California
Priority #4	4 kits (combat type B-29)	308th Reconnaissance Group, Fairfield-Suisun AFB, California
Priority #5	14 kits (stripped type B-29)	373d Reconnaissance Squadron, Kindley Field

D. Field Administration Problems.

In the early stages of operation, misunderstandings frequently occurred because all personnel were not fully advised of their duties and responsibilities with relation to other agencies. This was due to several causes. One important reason is that a letter from the Chief of Staff, U. S. Air Force, dated 22 March 1948, to the Commanding Generals of all major commands directing cooperation with the project had not been disseminated to the lower echelons. Many base commanders were not aware of the part they were to play in Project FIRSTRATE. Another reason for the misunderstanding was that many persons, for security purposes, were not completely briefed on the project.

A possible cause for a few cases where cooperation was poor may be that staff officers of some organizations were reluctant to give support to Project FIRSTRATE. This may have been because they did not feel justified in using their materials and personnel on a job about which they knew nothing, ot it may have been due to jealousy or envy at not being a confidant in the project.

E. Coordination with other Agencies.

1. Briefings by Major S. W. Pournaras:

On 2 March 1948 Major S. W. Pournaras accompanied Colonel H. W. Ehrgott of AFMSW-1 to Fort Shafter, Honolulu, to brief Lt. General J. E. Hull, USA, Commander, Joint Task Force Seven, and Major General William E. Kepner, USAF, Commander, Air Forces, Joint Task Force Seven. Clarification of Plan DOUBLEDAY was necessary since "Air Weather Service Participation in Project FITZWILLIAM" specified that Plan DOUBLEDAY would be executed at the direction of the Commander, Air Forces, JTF-7. General Kepner had not been advised of this matter and it was necessary that he be briefed before further action was taken. Both General Hull and General Kepner were briefed on Project FIRSTRATE in its entirety.

General R. A. Wooten, Commanding General of the Pacific Air Command, was conferred with on Pacific Air Command support of Project FITZWILLIAM. At this conference General Wooten suggested that Plan DOUBLEDAY aircraft operate out of Barber's Point rather than Hickam Field. His suggestion was followed since facilities at Barber's Point were more complete than those at Hickam.

While on this trip Colonel Ehrgott and Major Pournaras also took the opportunity to brief Colonel Nelson P. Jackson, who was to be Chief, FITZWILLIAM Forward.

Lt. Colonel Norman E. King, representing Colonel William O. Senter, Commanding Officer of the 43d Weather Wing, was briefed on the requirements of his organization in Project FIRSTRATE.

Upon completion of the meetings and conferences, Colonel Ehrgott and Major Pournaras returned to the continent and arrived in Washington on 10 March 1948.

Enroute to Fort Shafter, Major Pournaras stopped at Fairfield-Suisun Air Force Base where the Tracerlab school for FIRSTRATE field operators was beginning. While there he gave a lecture to the students on probable weather trajectories in the Pacific and on the reasons underlying the location of stations for the FIRSTRATE net.

2. Support of Upper Level Sonic Observations:

Air Weather Service gave support to Dr. J. A. Peoples of the Atmospheric and Electronics Group of Air Materiel Command at Holiman Air Force Base, Alamogordo, New Mexico, who was conducting a sonic investigation at Maxwell Field, Alabama. This was one of three units that Dr. Peoples was operating during the SANDSTONE tests. This technique proposed to detect large sources of noise by means of sonic equipment borne aloft by a free balloon. On 25 April, Dr. Peoples called upon Air Weather Service for assistance. He asked that he be provided with certain meteorological data (average winds for every 10,000 ft. up to 50,000 ft. for April and May). He also requested use of the SCR 658 (radio detection finder) at Maxwell Field and facilities for communications.

3. Cooperation with Naval Research Laboratory:

In December 1947, the Air Weather Service received a request from the Navy to make available one (1) B-29 type aircraft and crew to the Naval Research Laboratory, Washington, D. C., for the purpose of testing airborne detection equipment. This equipment was designed and constructed by the Naval Research Laboratory to obtain direct readings of abnormal radioactivity in the atmosphere.

Air Weather Service complied with the request and directed that the 308th Reconnaissance Group (Weather) provide the subject airplane and crew to report at Andrews Air Force Base, Washington, D. C., on 5 January 1948.

After the airplane arrived at Andrews, there was considerable difficulty in accomplishing the test operations. The early part of 1948 was marked by very cold weather and heavy snow. Hangar facilities were not available and the severe weather aggravated a leakage in the fuel system. Limited maintenance prevented immediate attention to this problem and the plane was grounded for nearly a month.

Early in February, a flight was made from Andrews Air Force Base to a base in Arizona to permit operation over the Caribbean.

On 24 February the aircraft and crew were back in Washington and were joined by Lt. L. H. Braude, USAF, who was assigned as an observer for the Naval Research Laboratory equipment. Lt. Braude's itinerary was as follows:

24 Feb - 29 Feb	Andrews AFB
1 Mar - 9 Mar	Howard AFB, C.Z.
10 Mar - 19 Mar	Andrews AFB
20 Mar - 1 Apr	Fairfield-Suisun AFB and Barber's Point, T.H.
2 Apr - 7 Apr	American Samoa
8 Apr - 22 Apr	Barber's Point, T.H.
23 Apr - 4 May	Andrews AFB and Hawaii
5 May - 11 May	Hawaii, Kwajalein, and Eniwetok
11 May - 26 May	Hawaii, Fairfield-Suisun AFB, Andrews AFB

A period of testing was conducted to determine the operational and maintenance efficiency of the equipment; to establish radiation background data; and to correlate the data with geographic location, altitude, and weather phenomena. Four (4) Naval Research Laboratory units were operated in the Air Weather Service aircraft that had been loaned to Naval Research Laboratory.

From 28 February 1948 to 1 April 1948, calibration flights were made at altitudes between 5,000 feet MSL and 40,000 feet MSL in the area of Washington, D. C., and Lima, Peru. Transient flights were also made from Washington, D. C., to Barber's Point, T.H., via Fairfield-Suisun Air Force Base, California, at 20,000 feet. Between 1 April 1948 and 8 April 1948, constant altitude flights at 20,000 feet MSL were made along the 160°W meridian from Barber's Point to American Samoa.

For the XRAY (first) explosion seven (7) flights were made in the B-29 aircraft in conjunction with JTF-7 ordered flights from Barber's Point, T.H.

After the XRAY test, the Naval Research Laboratory supplied additional units of equipment; four (4) of which were used by the 514th Reconnaissance Squadron, VLR, Weather, for operation from Kwajalein; four (4) other units were sent to the 308th Reconnaissance Group (Weather) at Fairfield-Suisun Air Force Base, California; and four (4) units were kept at Barber's Point to be used by the 308th Reconnaissance Group detachment, which was at the disposal of JTF-7.

For the YOKE (second) explosion, the equipment was operated out of Kwajalein. Equipment was also operated on two flights out of Fairfield-Suisun.

During the ZEBRA (third) test, three (3) flights were made out of Kwajalein and four (4) flights were made out of Barber's Point. Five (5) flights were made out of Fairfield-Suisun Air Force Base. One (1) of these latter flights was made in conjunction with an experimental flight conducted by Dr. Waite and Dr. Gish of the Carnegie Institution.

One administrative problem occurred in the AWS/NRL project when the Navy requested that the B-29 belonging to the 308th

Reconnaissance Group (Weather) be transferred to the 514th Reconnaissance Squadron VLR, Weather. Naval Research Laboratory technicians had stripped the B-29 of the 308th Reconnaissance Group in preparation for the tests and did not wish to reinstall the equipment in another aircraft. Headquarters, Air Weather Service did not approve this request since there was an acute shortage of airplanes at Barber's Point and the work involved in transferring an aircraft from one organization to another would, at that time, have been greater than the effort required to transfer the equipment from one plane to another. Naval Research Laboratory finally agreed to transfer the equipment to a B-29 type aircraft of the 514th Reconnaissance Squadron at Kwajalein.

4. Atmospheric conductivity investigation was carried out by Dr. O. H. Gish and Dr. G. R. Waite, who had been affiliated with the Carnegie Institution of Washington and were contracted as individuals by the Air Force to act in the capacity of consultants. The Air Force project proposed to measure the conductivity or ionization of the atmosphere, thus measuring indirectly the amount of ionization producing material present in the atmosphere.

The ionization equipment was installed in an Air Weather Service B-29 type aircraft of the 308th Reconnaissance Group (Weather). This airplane, operating out of Kwajalein, Fairfield-Suisun Air Force Base, and Barber's Point, T. H., was vectored into the path of the radioactive clouds for detection purposes.

It was believed that the ionization equipment might be more sensitive to gamma radiation than the conventional Geiger counter equipment. Assisting in the comparison of the two types of equipment was a function of the Air Weather Service during the SANDSTONE operation.

5. Ionospherographic Investigation:

Air Weather Service personnel on Eniwetok Atoll were associated with the operation of one (1) ionospherograph to determine the magnitude of dimples produced in the ionosphere by an atomic explosion. The ionospherograph, an instrument of the type produced by the Communications Measurements Laboratory, scans from one (1) to twenty-five (25) megacycles and transmits 50 to 100 microsecond pulses with a peak power of 10 kilowatts. The pulse repetition rate is 60 to 120 cycles per second. Records are made on 35 millimeter and 16 millimeter motion picture film.

6. AWS/NOL Magnetometer Investigations:

A preliminary type investigation was conducted jointly by Air Weather Service and the Naval Ordnance Laboratory to determine the feasibility of future study of electromagnetic effects of an atomic explosion due to dynamo action in the ionosphere resulting from the sonic or hydrodynamic waves.

The equipment, designed by Naval Ordnance Laboratory for aerial magnetic survey work, was modified for high sensitivity

magnetic measurements in the vicinity of the blast. The instrument is essentially a second harmonic detector arranged for recording on an Esterline-Angus recorder. The sensitivity is of the order of 10^{-5} gausses.

Three of these installations were made at Kwajalein and Eniwetok Atoll. Air Weather Service personnel were associated with the operation of two (2) magnetometer installations and the third was totally operated by Naval Ordnance Laboratory personnel.

IV. TEST OPERATIONS.

It was desired that all stations be operative by 1 April to allow operators sufficient time to become fully acquainted with operating and reporting procedures in the field and to gather necessary background data prior to the time that critical data resulting from the SANDSTONE explosions were expected. The following list indicates the dates on which each station was operational and capable of preparing data for transmission:

23 March	Elmendorf AFB
27 March	Shemya AFB
28 March	March AFB
28 March	Nome
[redacted]	
1 April	Barter Island
1 April	Guadalcanal
1 April	Hickam AFB
1 April	Iwo Jima
1 April	Kimpo (Korea)
1 April	Kindley
1 April	Kwajalein
1 April	Okinawa
2 April	Guam (North AFB)
4 April	Adak
4 April	Bolling AFB
4 April	Spokane AFB
5 April	Fairfield-Suisun AFB
5 April	Ladd AFB
8 April	Thornbrough AFB
10 April	Albrook AFB
10 April	Annette Island
13 April	Chitose
15 April	Wake Island
20 April	Clark AFB

The operators of these stations were fully aware of the imminent explosions but were not cognizant of the dates on which they were to be accomplished. Dates were not revealed since it was believed that such information might cause apprehension on the part of the operators and thus affect the data reported.

The three (3) SANDSTONE explosions, scheduled for April and May, were referred to by the code names: XRAY, YOKE, and ZEBRA. Comprehensive accounts of the preparation and execution of each explosion may be found in the "Report of Joint Task Force Seven", Operation SANDSTONE Narrative.

A. Explosion XRAY.

Plan DOUBLEDAY was first executed on 13 April 1948. Upon receipt of the message to execute Plan DOUBLEDAY, the 308th Reconnaissance Group (Weather) dispatched aircraft to Barber's Point, Oahu, T. H., and the 375th Reconnaissance Squadron, VLR, Weather, dispatched aircraft to Shemya, Alaska, for this purpose of special "cloud-chasing" missions at the direction of the Commander, Air Forces, Joint Task Force Seven. Eight aircraft of the 514th Reconnaissance Squadron, VLR, Weather, which had been committed to the Task Force for operations out of Kwajalein, were already engaged in filtering air in addition to making weather observations. During this time, other aircraft of the 514th, 373d, 374th, and 375th Reconnaissance Squadrons were engaged in normal weather reconnaissance missions. (see Annex C).

Explosion XRAY was accomplished on 15 April 1948. As the explosion cloud expanded and ascended, the Air Weather Service aircraft assigned to JTF-7 flew in the vicinity exposing filter papers at regular intervals. With time, the cloud became elongated and finally split; the lower portion being carried westward by the trade winds while the upper portion moved eastward with the westerly winds aloft.

On the basis of the path already made, it was possible to forecast the future movements of the cloud so that operational aircraft could be concentrated over a specific area rather than sent on random search missions. Subsequent data revealed that the Air Weather Service meteorologists on duty with JTF-7 had forecast the path of the cloud with remarkable accuracy. For detailed information on these and subsequent DOUBLEDAY flights(see Annex B and C).

The operational value of the airborne detection equipment was borne out by the aircraft flying on the missions out of Barber's Point.

On the basis of the forecast path of the cloud and the excellence of the reports received from operating units, it was evident at Headquarters, Air Weather Service, that better coverage could be given on the cloud, as it neared the west coast of North and Central America, by modifying the routine weather reconnaissance tracks out of Fairfield-Suisun Air Force Base, California. These tracks out of

Fairfield-Suisun proved again the operational value of the aerial reconnaissance detection program.

Data from ground level equipment verified the data on a delayed basis due to the fact that the cloud was carried more swiftly at higher levels than at ground level. Thus, evidence of the cloud was gathered by ground units from the trailing portion of the cloud and from continuous "fall-out" of radioactivity along the path.

As the major portion of the cloud (the upper portion) progressed eastward it was picked up by the reconnaissance planes of the 373d Reconnaissance Squadron, VLR, Weather which was operating out of Kindley Air Force Base, Bermuda. Results obtained from these flights were better than had been anticipated and it appeared likely that further coverage on the cloud's progress could be given by transferring aircraft, crews, and equipment to Lagens Air Force Base, Azores and possibly beyond. All these special mission flights were classified Secret, and the reconnaissance units were instructed not to send position reports. It was, therefore, necessary to secure air space reservations for the flights and to obtain permits (through the State Department) to operate over foreign countries. This was accomplished verbally with the least possible delay and with the wholehearted cooperation of the State Department, Civil Aeronautics Administration, and Headquarters, United States Air Force. Flights

were subsequently made from Lagens Air Force Base over the Atlantic Ocean and later over North Africa from Wheelus Field, Tripoli. Tracking of the cloud beyond the range of reconnaissance airplanes from Tripoli could not be accomplished because adequate bases for operation were not available.

Up to this time meterologists of AFMSW-1 had predicted the path of the cloud with extreme accuracy and it now appeared that the path could be further forecast as the cloud completed a circuit about the earth. Based upon the reliability of the previous forecasts, aircraft of the 514th Reconnaissance Squadron, VLR, Weather, operating out of Guam, were dispatched to locate the cloud as it emerged from over Asia.

For the second explosion, Plan DOUBLEDAY was again executed with modification. When it became apparent that the cloud from the YOKE burst would not travel toward Alaska it was decided to send the aircraft of the 375th Reconnaissance Squadron, VLR, Weather, which had been held at Ladd Air Force Base for movement to Shemya, to Barber's

Point at the command to execute Plan DOUBLEDAY. Additional aircraft of the 308th Reconnaissance Group (Weather) were to move from Fairfield-Suisun Air Force Base to Barber's Point to fly on additional tracks southward to the Equator. The reason for these changes was that scientific personnel of AFMSW-1 had requested a more extensive north to south cross-section of the YOKE cloud.

The transfer of the additional airplanes from Fairfield-Suisun Air Force Base to Barber's Point left a hole in the aerial net on the west coast of North America. To provide the desired reconnaissance it was necessary to move aircraft of the 373d Reconnaissance Squadron from Kindley Air Force Base, Bermuda, to Fairfield-Suisun Air Force Base, California. In addition to the scheduled work load on aerial reconnaissance units at Barber's Point and Guam it must be remembered that flights were also being conducted to detect the XRAY cloud near the Philippines. Here it may be observed that reconnaissance units were already operating at maximum effort and that had sufficient aircraft and crews been available the shifting of aircraft and crews could have been avoided and the work requirements for Project FIRSTRATE could have been accomplished more smoothly and effectively.

Explosion YOKE was accomplished on 30 April 1948 and from the very first the data obtained by the eight (8) B-29 type

aircraft committed to the Commander, Joint Task Force Seven was highly favorable. Ground stations began transmitting favorable reports and the cloud was tracked as it began moving eastward toward the Americas.

As the cloud progressed the aircraft at Barber's Point were again vectored into its path to continue tracking across the Pacific Ocean. Results from these missions were plotted on charts and the trajectory of the cloud was roughly delineated. The trajectory of the YOKE cloud again indicated the desirability of reconnaissance by planes based at Kindley Air Force Base; however, these aircraft (373d Reconnaissance Squadron) were not released by the 308th Reconnaissance Group (Weather) in time to execute some of the early scheduled missions out of Bermuda. The planes of the 373d Reconnaissance Squadron were subsequently transferred to the home base at Kindley Air Force Base where operations were continued over the Atlantic Ocean.

Results of the tracking continued to be favorable and plans were again made for operations out of Lagens Air Force Base, Azores and Wheelus Field, Tripoli. For the movement of aircraft, crews and equipment to these areas refer to Annex B and C.

The YOKE cloud traveled somewhat the same path as did the cloud from the first explosion and the problem of obtaining air space reservations and permits to operate over water and foreign territories again existed. Execution of reconnaissance flights beyond

Tripoli did not appear to be feasible or necessary and was not attempted.

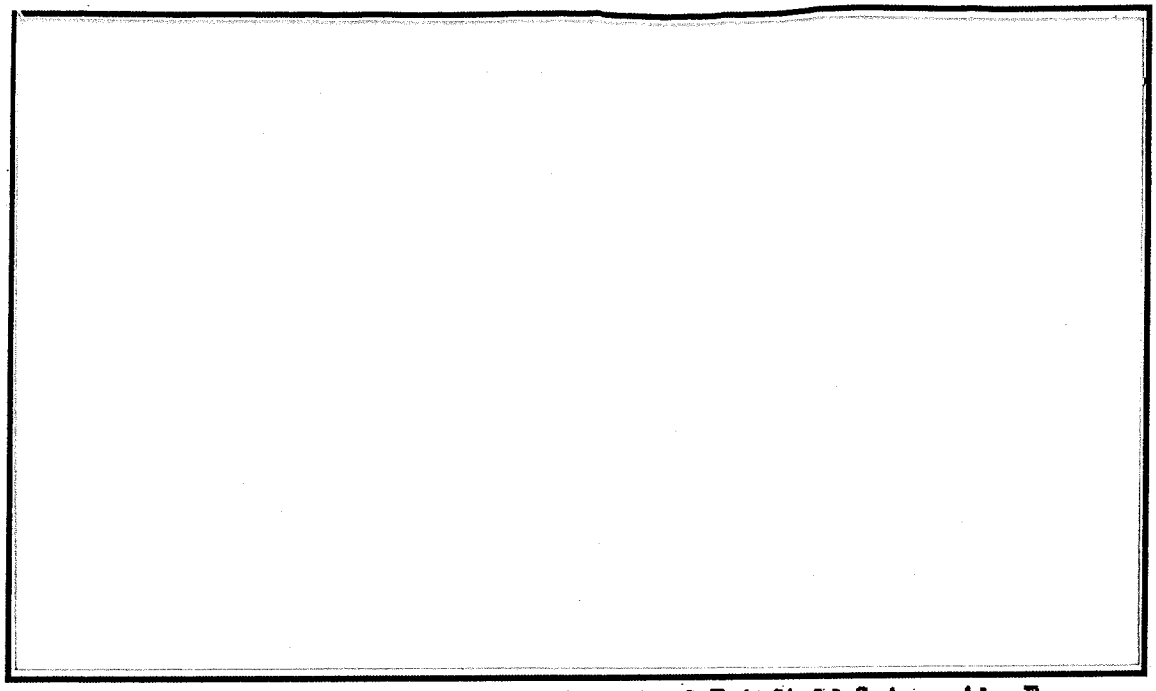
[redacted]

C. Explosion ZEBRA

Plan DOUBLEDAY was executed for the ZEBRA explosion in the same manner as for the YOKE burst.

ZEBRA was accomplished on 15 May 1948. Data was reported almost immediately since the ground and aerial network had been strengthened as a result of experience gained on XRAY and YOKE. For the purposes of Project FIRSTRATE, however, the third explosion gave a poor showing and was relatively ineffective when compared with XRAY and YOKE.

It was anticipated that the ZEBRA cloud would move toward California. Upon this premise, reconnaissance tracks out of Fairfield-Suisun Air Force Base were again modified and the ground filter unit at March Air Force Base was moved to Sonora Pass, California, (approximate elevation: 10,000 feet) to attempt detection at higher levels with the ground equipment. No significant data was obtained from the equipment while located in Sonora Pass.



The search flights out of Fairfield-Suisun Air Force Base failed to detect the ZEBRA burst as such. Continued effort to detect the concentration of the ZEBRA cloud was made by flights out of Bermuda and the Azores. Data from these latter missions also failed to produce positive evidence of the cloud and it is not now known whether the ZEBRA cloud as such ever reached the west coast of North America.

By 6 June 1948, operations (Project FITZWILLIAM) related to Operation SANDSTONE explosions ceased and the FIRSTRATE project was ready for transition into the interim net operation under

D. Air Sampling Procedures.

The practice of collecting air samples for analysis by Tracerlab, Inc., at Boston was carried on through the XRAY and YOKE observation periods, but was discontinued before the third explosion. Data from this process proved to be highly unsatisfactory.

The first bottles that arrived at Boston were found to contain little or no pressure as a result of leakage. This problem was solved by having the junction of the filter valve and the bottle itself secured by a non-porous cement and by advising concerned personnel to exercise extreme care in the filling and shipping of the bottles.

The problem of transporting the air sample bottles from the field to the analysis laboratory required considerable effort since it was desired that a minimum delay exist between the collection of the sample and the analysis of same. Bottles from Kwajalein and Barber's Point were collected at Hickam Field for further transportation by Air Transport Command aircraft to National Airport, Washington, D. C. Priority for the shipments had to be obtained to insure immediate movement. Upon arrival at National Airport, all shipments were received personally by Major G. M. Leies of Air Weather

Service, who was previously notified by cablegram of the time of arrival of each shipment. Major Leies then put the bottles on an Air Weather Service C-47 type aircraft for immediate transfer to Boston.

V. THE ROLL-UP.

A. Disposition of Air Weather Service Aircraft.

1. Aircraft and crews of the 514th Reconnaissance Squadron, VLR, Weather, were returned to their home station at North Air Force Base, Guam, upon completion of "temporary duty" with JTF-7 at Kwajalein.

2. Aircraft and crews of the 308th Reconnaissance Group (Weather) and the 374th and 375th Reconnaissance Squadrons, VLR, Weather, which were subject to the "special cloud chasing" missions were released from further participation by the Commander, Air Forces, JTF-7, upon receipt of the message "Plan DOUBLEDAY abandoned."

3. Aircraft and crews of the 308th Reconnaissance Group (Weather), the 374th and 375th Reconnaissance Squadrons, VLR, Weather, which did not participate in Plan DOUBLEDAY and aircraft and crews of the 373d Reconnaissance Squadron, VLR, Weather, resumed operation over their normal assigned weather reconnaissance tracks from their respective bases.

4. On 26 May the B-29 used to provide airlift for the NRL Radiological Counters and technicians was returned to the ZI for removal of the specialized Naval Research Laboratory equipment

at Andrews Air Force Base. The plane and crew then returned to the home station with the 374th Reconnaissance Squadron, VLR, Weather, at Fairfield-Suisun Air Force Base, California.

5. The B-29 type aircraft which was specifically modified and assigned to Air Materiel Command for measurement of atmospheric conductivity was returned to the ZI. The aircraft and its specially selected crew remained assigned to Air Materiel Command for the duration of the 1948 summer thunderstorm season (for further investigation of ionic distribution above thunderstorms) under the direction of Dr. Waite and Dr. Gish.

B. Tracerlab in the Roll-up.

1. Upon termination of Project FITZWILLIAM and the expiration of Tracerlab contracts (1 July 1948) providing for field laboratories and field maintenance, new contracts were drawn to provide for two (2) laboratories; one at Hickam Field, T. H., and one at Tracerlab, Inc., Boston, Massachusetts.

For the roll-up, Dr. W. C. Peacock of Tracerlab was directed to utilize the C-54 aircraft assigned to him by Air Materiel Command. Dr. Peacock was to pick up an officer courier at Guam to be responsible for the security of classified materials.

Equipment and personnel at Guam were loaded on the C-54 and transshipped to Kwajalein. At Kwajalein the process was repeated and the C-54 was then moved to Hickam Field.

At Guam and Kwajalein, all expendable items which were deemed contaminated were destroyed. All non-expendables which were deemed sufficiently contaminated to be of no further use were also destroyed.

At Hickam, all filter papers and residues of the Guam, Kwajalein and Hickam laboratories which were of sufficient import to require further analysis were analyzed. Some equipment from both Guam and Kwajalein was left at Hickam to facilitate work on the remaining papers. All other equipment and certain personnel were returned to the ZI. Hickam was to be kept in operation until the establishment of a laboratory at Berkeley, California.

It was arranged that storage space would be provided in the bomb sight vault at McClellan Air Force Base for filter papers. Instructions were issued to all stations to forward all exposed filter papers on hand to the 2101st Air Weather Group for storage in the vault. These papers were to be available for examination by certified personnel of the Air Force and Tracerlab, Inc.

2. Field maintenance personnel, provided for under the new Tracerlab contracts, were to be assigned to the 43d Weather Wing, the 7th Weather Group, 8th Weather Group, and the 308th Reconnaissance Group (Weather).

C. The Ground Net.

1. The ground station network, which had originally been planned with the post-FITZWILLIAM requirements in mind, needed few modifications for transition to the [redacted] net.

a. The equipment at Wake Island (United States Weather Bureau) and Guadalcanal was withdrawn.

b. All Wells Survey Ionization Units were withdrawn and sent to the Wells Survey Company at Tulsa, Oklahoma.

c. Three (3) of the four (4) AMC Wrap Around Counters at Kwajalein were withdrawn.

d. The equipment at the Midway Island installation (operated by Naval Research Laboratory) was sent to Hickam Field for installation.

A list of the FIRSTRATE interim [redacted] net stations and the equipment used may be found in Appendix V and Annex D.

2. The maintenance log books of each station were forwarded to Headquarters, Air Weather Service, in Washington and then sent to Tracerlab, Inc., in Boston for study. Esterline-Angus recorder tapes, data sheets, and calibration sheets dated prior to 7 June 1948 were handled as Top Secret material and forwarded by courier to Headquarters, Air Weather Service and then to AFMSW-1. Data sheets and calibration sheets after 7 June were handled as Secret.

VI. CONCLUSIONS AND RECOMMENDATIONS.

In general, it may be stated that the operation of Project FIRSTRATE was conducted very satisfactorily. It should be remembered, however, that numerous problems did arise during the operation, most of which may be attributed to a lack of proper planning before the project actually became operational. This was due mostly to insufficient time and personnel necessary for planning and to the complexities of such a unique project. Some of the problems encountered are brought to light below and a brief discussion of the facts bearing on each one is given. In addition, recommendations on each item are forwarded for consideration. It is felt that recommendations may assist in the more successful accomplishment of a similar project should this be necessary at a future date.

A. Security.

The extremely high classification of this project made it impossible for the Air Weather Service to forward pertinent portions of the overall plan to operating personnel. Consequently, these people were totally unaware of the purpose of the project. In the initial planning stages of the project, the Air Weather Service recommended that the classification of the project be lowered because of the large number of personnel that would be involved. Under the classification of Top Secret, it was impossible for the Air Weather Service to brief its people properly and the exigency of time would

not permit the accomplishment of clearances for access to Top Secret information for all personnel involved at station level. This was a decided hindrance to operations and became more evident as the operation progressed.

RECOMMENDATION: It is recommended that if a large number of people will be involved in the project, as was the case in Project FIRSTRATE, the classification should be as low as possible consistent with the security principles of the National Military Establishment.

B. Availability of Equipment.

During the early planning phases of Project FIRSTRATE it was understood that all equipment would be available by 1 February 1948. It was imperative that all the equipment be available to the Air Weather Service by that date to allow sufficient time for the training of operators and technicians for this specialized equipment and for the shipment of the equipment to stations in a world-wide net. However, it was not until the latter part of February that the equipment became available for shipment to field locations. This left little more than a month and a half from the target date for the training of personnel and installation of the net; hardly sufficient to do a good job.

RECOMMENDATION: Whenever new equipment is developed for replacement of that now in the field or in case of a similar project at a future date, it is recommended that at least three (3) and preferably four (4) months be allotted for training of personnel and for the shipment and installation of the equipment.

C. Issuance of Necessary Directives.

Project FIRSTRATE has clearly demonstrated once again that unless higher headquarters issues all necessary directives to all units concerned - both operational and support units - the project will suffer. For example, during Project FIRSTRATE, no directives were issued to Base Commanders on the support which would be required by Air Weather Service for its part in the ground and aerial phases of Project FITZWILLIAM. Station weather officers were given the responsibility of installing the equipment without proper support from higher headquarters, that is, Base Commanders were unaware of the priority of the project and were somewhat reluctant to suspend other work in favor of the project as was necessary under the circumstances. The AMC Ground Filter required considerable construction which was left to the initiative and aggressiveness of the FIRSTRATE personnel to see that the unit was installed properly. If the necessary directives had been issued, it would have been a very simple matter for the FIRSTRATE personnel to approach the Base Commanders to get what

service they needed with minimum of difficulty and delay. This would apply also to spare parts and maintenance for Air Weather Service reconnaissance aircraft. The lack of necessary directives providing supply and maintenance for aircraft became apparent immediately following XRAY burst when Air Weather Service aircraft, having been extended beyond their capabilities, were being grounded for lack of parts and maintenance. This problem was solved immediately by the issuance of necessary support directives from Headquarters, United States Air Force and Air Materiel Command.

RECOMMENDATION: It is recommended that higher headquarters issue, through channels, as far in advance as possible, pertinent directives to all commands, bases, and agencies that will be involved either directly or indirectly in any similar operation. In addition, priority of the project should be established in relationship to other projects within the National Military Establishment.

D. Issuance of Operating Instructions.

Considerable trouble was encountered by field operating personnel because no single headquarters had been assigned the responsibility for the issuance of operating instructions, both technical and administrative, during Project FIRSTRATE. Field personnel were receiving instructions not only from Headquarters, Air Weather Service, but from Tracerlab personnel scattered throughout the world, and by FITZWILLIAM Forward personnel. Some of these instructions were so conflicting that it was ultimately difficult to determine what instructions each station was following.

RECOMMENDATION: It is recommended that for future operations, one and only one unit be given the responsibility for operational control of all field operations. This will insure standardization and simplification of procedures and eliminate some of the confusion that existed during Project FITZWILLIAM.

E. Supervision of Tracerlab, Inc.

During Project FITZWILLIAM, Tracerlab, Inc., employees did an admirable and very efficient job. They acted, however, more or less according to their own best judgments and no military agency exercised close supervision over their activities. The Air Weather Service was directed to supervise their activities, but this directive was not received until the middle of the operation. This lack of supervision again led to considerable confusion as to who was responsible for informing Tracerlab personnel of their responsibilities.

RECOMMENDATION: It is recommended that only one agency be responsible for supervising administratively and technically the activities of any civilian contractor that may be called upon to assist in future projects of this nature.

F. Procurement of Personnel.

The fact that the Air Weather Service was not allotted additional troop spaces for Project FIRSTRATE necessitated that

personnel from within the organization be utilized at the expense of the primary mission of the Air Weather Service as a whole. The dearth of personnel was somewhat alleviated by the temporary duty assignment of approximately twenty-five (25) officers from other branches of the service to the Air Weather Service for a period of 120 days. Upon completion of the temporary duty assignments the officers returned to their parent organizations.

RECOMMENDATIONS: It is recommended that for future operations, sufficient time be allotted for the procurement of troop spaces and personnel for permanent assignment to the operating agency.

G. Training of Personnel.

Proper training of personnel ahead of time is an important phase of any operation and sufficient time should be allotted for this purpose.

1. The training program conducted by Tracerlab, Inc., for FIRSTRATE operators was adequate considering the limitations imposed by time, personnel, and equipment and the graduates of the school did an excellent job on the FITZWILLIAM project. The departure of these trained operators from the field stations left the operation of the net to men who had only a modicum of training and experience prior to their assuming the responsibilities of the interim net.

RECOMMENDATION: It is recommended that men trained for

this work in the future be permanently assigned to the operating agency since their value is largely contingent upon the length of time in the program.

2. On-the-job training is considered inadequate in the light of the present operation of the net. Some stations were able to train officers and enlisted men to operate the equipment and to perform day to day maintenance. In general, however, this type of training is unsatisfactory.

RECOMMENDATION: It is recommended that operators and maintenance men on projects of this type receive organized laboratory training in the specific job to be done.

3. The FIRSTRATE school conducted by Tracerlab was largely administered by civilian personnel who were not acquainted with military procedures and common requirements of the service. This led to some misunderstanding on the part of both the civilian and the military personnel.

RECOMMENDATION: It is recommended that the administration of future training schools be completely military; and if possible, the instructors themselves should be military personnel rather than civilian. Instructors should have a general knowledge of the field of nucleonics and a thorough knowledge of electronics.

4. Students in the Tracerlab school were, in general, better acquainted with the problems of radiological defense than with the subject of electronics. The difficulties encountered in the filed were largely problems of maintenance and operation of electronics equipment rather than problems dealing with nuclear radiation.

RECOMMENDATION: It is recommended that personnel chosen for training in future projects employing electronic counting and recording equipment be selected primarily on the basis of previous electronic experience and secondarily on the basis of radiological experience.

H. Experience has shown that the location of key maintenance personnel at strategic points within each operating area is desirable until each station can have its own competent maintenance personnel. As long as equipment which was primarily designed for laboratory use is being operated in the field the problem of maintenance will continue to be an important one. Current Air Weather Service plans call for manning each station with personnel trained as operator - technicians.

RECOMMENDATION: It is recommended that maintenance supervisors, either civilian or military, be utilized in the field until such time as sufficient operator - technicians are trained to meet the requirements of the project.

I. Analysis of Filter Papers [redacted]

Present operating procedures prescribe that the chemical analysis of "hot" filter papers [redacted] be accomplished at a central laboratory such as Hickam Field. Inasmuch as the present net extends [redacted] to Bermuda and from Alaska to Panama, it requires from seven (7) to ten (10) days for a "hot" filter paper to reach the central laboratory.

RECOMMENDATION: It is recommended that radiochemical laboratories be established at aerial reconnaissance terminals to analyze "hot" filter papers and thus eliminate the present delay being experienced in the shipment of these "hot" filters.

J Reporting Procedures and Instructions.

Considerable confusion existed in the field over the matter of reporting data to higher echelons. Too many changes were made in the original reporting plan by TWX from Headquarters, Air Weather Service.

Operations and maintenance logs at present cannot be forwarded more than once each month under the existing Top Secret classification since present courier facilities limit the transportation of this material.

RECOMMENDATION: It is recommended for future operations of this nature that changes in reporting procedures be kept to an absolute minimum and that changes be made only after careful consideration by

all agencies concerned. It is further recommended that reports, such as maintenance logs, be classified at a level that will permit transmission through normal channels, thus eliminating the need for special couriers.

K. Air Surveillance.

For Project FITZWILLIAM, Air Weather Service aircraft flew approximately 95 percent of the required flights during the XRAY, YOKE, and ZEBRA tests. For an account of the support given by the Air Weather Service reconnaissance units, see Appendix VI.

Further requirements for an aerial survey net based on the results of FIRSTRATE operations will have to be first established by Headquarters, United States Air Force before the Air Weather Service can determine its own requirements in connection with Project [redacted].

Summarizing the operational reports of each aerial reconnaissance unit, the following comments were predominant:

1. The irregularity of operations presented an obstacle to aircraft and crew movements in connection with the project and made difficult the staging of crews and aircraft to cover the requirements made on aerial reconnaissance.

2. Base maintenance was not adequate to maintain a sufficient number of aircraft to cover all tracking assignments.

3. Flight altitude and depressurising procedures (necessary for filter changing) caused fatigue and physical discomfort to the crew members.

4. Operational flights to and from bases other than the regular B-29 staging bases and Project FIRSTRATE stations precipitated both maintenance difficulties and communication problems in the transmission of classified material.

5. Arctic operations present problems because of lack of hangar accomodations for B-29 aircraft maintenance.

6. Continual aerial surveillance is practicable if supported by sufficient aircraft, crews, and ground echelons. Flights other than the present normal reconnaissance flights can be made only if additional man-power, equipment, and maintenance facilities are provided. Some special flights may be possible providing that the operating bases are carefully selected to insure adequate facilities.

RECOMMENDATION: It is recommended that the air filter unit be redesigned and located so as to eliminate depressurization whenever change of filter paper is made. Actual design and location of this unit should be a coordinated project between the Air Weather Service and Air Materiel Command, only after the technical requirements for such a unit have been established by Headquarters, United States Air Force.

It is further recommended that future special tracks flown should not be classified. Under a classified flight plan position reports cannot be made and the crew is in constant danger of being lost in the event of forced landing.

For future operations of this nature, it is further recommended that sufficient aircraft, crews, and equipment be provided to allow maximum special operations and avoid conflict with normal reconnaissance operation. If this is not possible then arrangements for maintenance should be made on a high priority basis.

L. FIRSTRATE Equipment.

Generally speaking, the equipment used in Project FIRSTRATE was satisfactory from the point of operational utility. The equipment was found to be capable of functioning as a part of a research and detection net; however, from the point of service and ease of maintenance the instruments were not entirely adequate for field operations. Many of the problems of maintenance and operation would not have arisen had sufficient time been allotted for field testing to determine which components were likely to give trouble.

Most of the equipment was primarily designed for laboratory use and was not constructed to withstand the rigors of continued

operation in climates ranging from the extreme cold found in Alaska to the hot, humid areas of the South Pacific.

Power supply was a problem of primary importance at nearly all installations, particularly at those stations where electric power had to be generated locally. The line voltages at many locations were subject to sudden surges and the line frequency was variable over a wide range. In many instances, small portable generators and gasoline engines were used to provide a source of power for FIRSTRATE installations alone.

RECOMMENDATION: It is recommended for future projects of this nature that the equipment be tested under the various climatic conditions, to ascertain the limitations imposed on operations and maintenance by the climatic conditions peculiar to the contemplated locale of installation. It is further recommended that the equipment be tested for such length of time as will permit the detection of components which are most likely to fail during periods of sustained operations.

1. AMC Wrap Around Counter.

The Radiation Counter Laboratory Mark I, Model 5, Geiger-Mueller tube was, for most operations, quite satisfactory, and frequently functioned throughout the entire test period without replacement.

At many stations the RC-11/U coaxial cable (used to connect the G-M tube with the El-tronics Scaler) was too short to allow installation without sharp bends in the cable at each end.

Most of the maintenance required by the AMC Wrap Around Counter was performed on the LS-64 El-tronics Scaler. The 50 mmfd 500 volt mica condensors, used as coupling condensors in the individual scalers, failed in approximately 30 percent of all scalers in service. The second largest number of failures in the El-tronics scaler was in the register coils of the Production Instrument Company Wizard, Type EC-84-MK Mechanical Register. The high temperature and humidity prevailing at a number of locations caused the coils to open in 15 percent of all instruments in use.

Other failures resulted from the defective 7-pin sockets and defective vacuum tubes.

RECOMMENDATION: It is recommended that the register coils for future use be impregnated to prevent deterioration from heat and moisture.

2. AMC Ground Filter Unit.

The primary difficulty in the operation of the AMC blower was due to the great power demand of the 20 hp motor, especially under starting conditions. At most installations the available power supply was inadequate.

The average life of the type B-22 Supercharger used as a blower is about 1,000 hours. Many failures resulted from the excessive momentum caused by the belt drive which creates a destructive stress on the roller bearing in the Supercharger.

RECOMMENDATION: It is recommended that a new ground filter unit be developed incorporating the following features:

(1) A motor which requires less power for operation but which will filter the same amount of air.

(2) Use of a geared or direct drive between motor and blower unit.

(3) Commercially designed air blower and motor instead of B-22 Supercharger.

3. Signal Corps Dust Sampling Unit with Counter.

The G-M tube used in the Signal Corps Counter is extremely thin-walled and approximately 50 percent of all tubes delivered to stations were received in a broken condition despite careful packing for shipment. No spare tubes of this type were readily available and the broken tubes had to be replaced by Radiation Counter Laboratory Mark I, Model t G-M tubes. The replacement necessitated some minor modifications in the mounting, base, and connections.

In addition, it is felt that this unit did not filter sufficient air to be of much value to the operating net.

RECOMMENDATION: It is recommended that all Signal Corps Dust Sampling Units and Counters be replaced by AMC Ground Filter Units and Wrap Around Counters.

4. Wells Survey Ionization Chamber.

Very little maintenance was required on the electronic circuits of this unit, although several tube replacements were made. The primary difficulty lay in the failure of the vibrating reed to go into oscillation. In cases where tapping or striking the chamber did not produce oscillation, the chambers were replaced and the malfunctioning components were returned to the manufacturer. This piece of equipment proved desirable inasmuch as it was less susceptible to moisture than other automatic counters. Its greater complexity and weight, however, disqualify equipment for field use in its present form.

RECOMMENDATION: If this equipment proved valuable to the detection net, it is recommended that it be redesigned as a lighter weight and smaller unit for field operations.

5. NRL Automatic Counter.

Both components (the nest of G-M tubes and discriminator circuit, and the GR Count Rate Meter) are contained in

marine type weather proof housings with rubber-sealed access doors. Silical-gal cartridges are provided to absorb residual moisture after the unit has been sealed. Even with these precautionary measures the instrument did absorb considerable moisture when calibration was performed in very humid areas.

The G-M tubes are located at the top of the unit under a steel plate which is secured by a large number of bolts. In order to inspect the tubes and the wiring circuits it is necessary to remove all bolts and the plate: a laborious and time-consuming job.

Variations in the counting rate reported by the Naval Research Laboratory counters greatly exceeded any variations which could be attributed to statistical or natural causes. It was suspected that these variations were due to the discriminator circuit, entirely. When this change was made by the field station, the variations ceased.

RECOMMENDATION: It is recommended that the calibration knobs and screws of the NRL Automatic Counter be located externally on the equipment to permit quick calibration. It is further recommended that the plate providing access to the G-M tubes and wiring circuits be replaced with a plate or door which is easily removed to permit inspection and tube replacement with a minimum delay and expenditure of time.

A P P E N D I X

I

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON

AFOPL/Col Carlisle/72455
13 November 1947 TS#66

SUBJECT: Long Range Detection of Atomic Explosions

TO: Commanding General, Air Transport Command,
Gravelly Point, Washington 25, D. C.
ATTENTION: Chief of Air Weather Service

1. The Commanding General, United States Air Force has been charged with the responsibility for detecting atomic explosions anywhere in the world.

2. In carrying out this responsibility, the Commanding General, United States Air Force has been directed:

a. To utilize to the maximum existing personnel and facilities of the Air Force, Army, and Navy;

b. To establish appropriate arrangements with other interested agencies;

c. To effect and maintain liaison with all participating organizations.

3. It is proposed that the Special Weapons Group (General Kepner) Office of the Deputy Chief of Staff for Materiel, will be the monitoring office to discharge the over-all responsibility and direction enumerated in Paragraphs 1 and 2 (see attached chart).

4. a. It is proposed that the monitoring office will delegate the responsibility for the geophysical research necessary to implement the various phases of this project to the Air Materiel Command. That command will coordinate the design and tests of equipment by the

Army Signal Corps, the Office of Naval Research, appropriate civilian agencies, and other interested agencies.

b. It is also proposed that operational agencies of the Air Weather Service, Department of Navy, and other appropriate organizations will gather technical information within their capabilities for forwarding to a filter center

[redacted]

d. The monitoring office will then make a formal report through the Chief of Staff, U. S. Air Force, to the Secretary of the United States Air Force, who will then make distribution to the appropriate agencies.

5. There will be a meeting of the representatives of the recipient offices of this communication for the purpose of discussing the proposals contained herein on 17 November in the office of Chief, Special Weapons Group, Room 3D1065, Pentagon at 1030 hours.

FOR THE SECRETARY OF THE AIR FORCE:

/S/
W. E. KEPNER
Major General, USAF
Chief, Special Weapons Group
Office, Deputy Chief of Staff,
Materiel

1 Incl:
Chart

[redacted]

A P P E N D I X

II

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS, UNITED STATES AIR FORCE
WASHINGTON

TS #67

3 December 1947

SUBJECT: Long Range Detection of Atomic Explosions

TO: Commanding General, Air Transport Command,
Washington 25, D. C.

1. Reference letter, this Headquarters, dated 13 November 1947, subject as above, the proposal contained in paragraph 4 b has been approved.

2. The operational responsibility for collecting the necessary geophysical observations is assigned to the Chief, Air Weather Service, who will initiate immediately an operational program for obtaining these data.

3. The responsibility for geophysical research and the development of adequate equipment has been assigned to the Air Materiel Command.

4. The Chief, Air Weather Service, is authorized direct communication with the Department of the Army, the Department of the Navy, and appropriate civilian institutions and agencies concerning matters influencing the implementation of the operational plan for the collection of geophysical observational data.

5. Attention is directed to AAF Letters 46-22, 46-22A, 46-22B, 46-24, and 46-24A. This project is classified TOP SECRET. Prior to the activation of the operational plan, the Chief, Air Weather Service, will submit to this headquarters a recommendation for downgrading of those phases of the operations which do not require such classification.

BY COMMAND OF THE CHIEF OF STAFF:

/S/
W. E. KEPNER
Major General, USAF
Chief, Special Weapons Group

A P P E N D I X

III

HEADQUARTERS
AIR TRANSPORT COMMAND
WASHINGTON 25, D. C.

2 January 1948

SUBJECT: Long Range Detection of Atomic Explosions

TO: Chief of Staff
United States Air Force
Washington 25, D. C.

1. In accordance with the directive contained in letter from Headquarters, United States Air Force, dated 3 December 1947, subject as above, the Air Weather Service is taking necessary action to implement the operational program for obtaining the necessary geophysical observations.

2. It is understood that the Signal Corps, Department of the Army, and Office of Naval Research, Department of the Navy, are presently engaged in research on the problem of long range detection of explosions using sonic equipment.

3. The Air Weather Service considers sonic observations as part of geophysical observations and therefore assumes the responsibility for these observations during the operational phase of the long range detection program.

4. It is requested that the Air Weather Service be given authority to place observers with the agencies conducting sonic research during operation "Sandstone" in order that desired experience necessary for the efficient operation of sonic equipment may be gained.

FOR THE COMMANDING GENERAL:

WILLARD W. WEST
Lt Colonel, Air Corps
Actg Asst Adj Gen

B/L ATC 2 Jan 48, subject: "Long Range Detection of Atomic Explosions"

1st Ind

Headquarters, United States Air Force, Washington 25, D. C.
7 January 1948

TO: Commanding General, Air Transport Command, Washington 25, D. C.
ATTN: Chief, Air Weather Service

1. The assumption (paragraph 3, basic communication) that the Air Weather Service will be responsible for collecting sonic observations during the operational phase of the Long Range Detection Program, is hereby confirmed.

2. Arrangements for the placing of Air Weather Service observers with the agencies conducting the sonic research during the research phase have been initiated by the Chief, Special Weapons Group, U. S. Air Force. Direct communication between the Special Weapons Group (Colonel B. G. Holsman, Extension 74450) and your office in this connection is authorized.

BY COMMAND OF THE CHIEF OF STAFF:

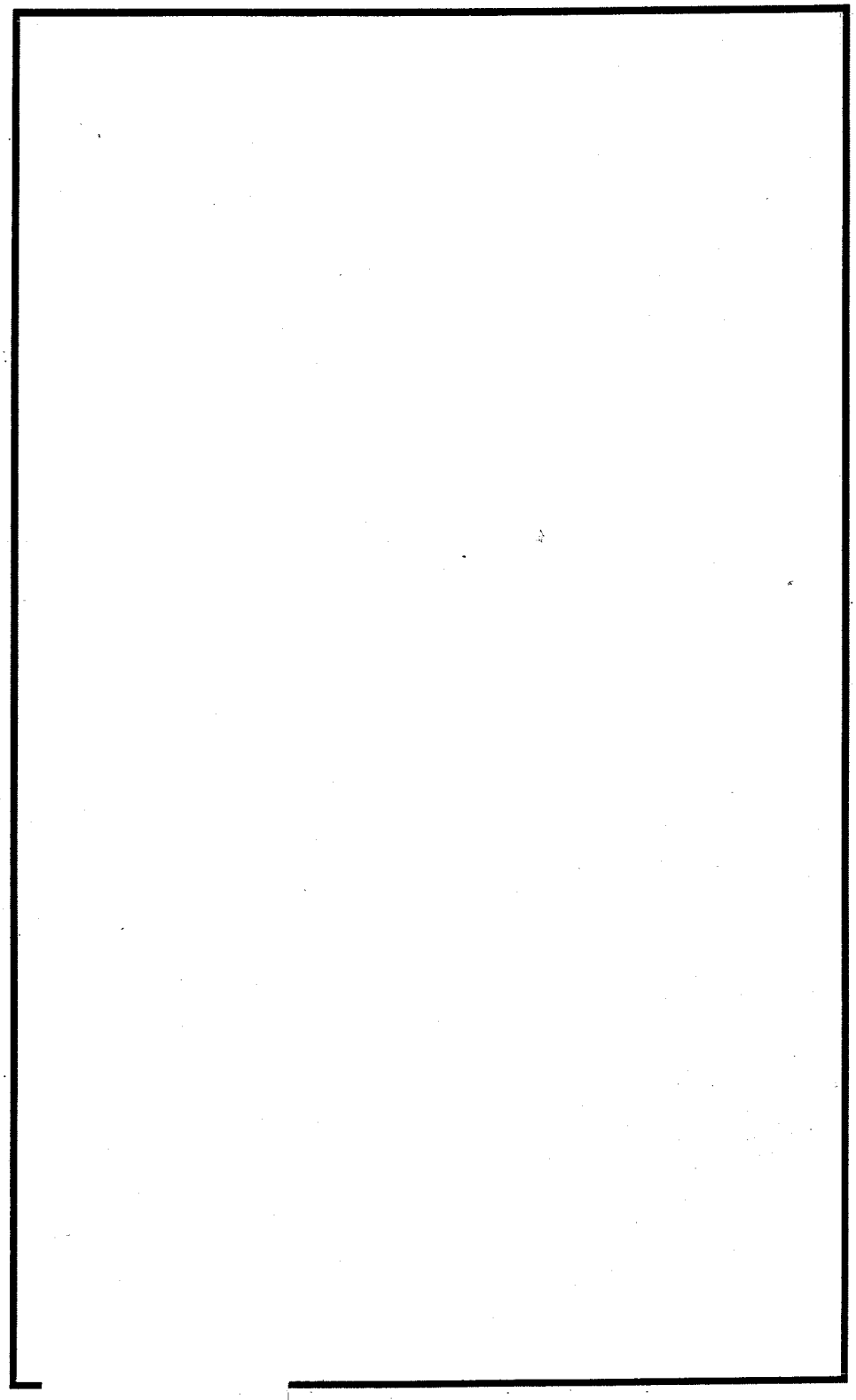
W. E. KEPNER
Major General USAF
Chief, Special Weapons Group
Office, Deputy Chief of Staff,
Materiel

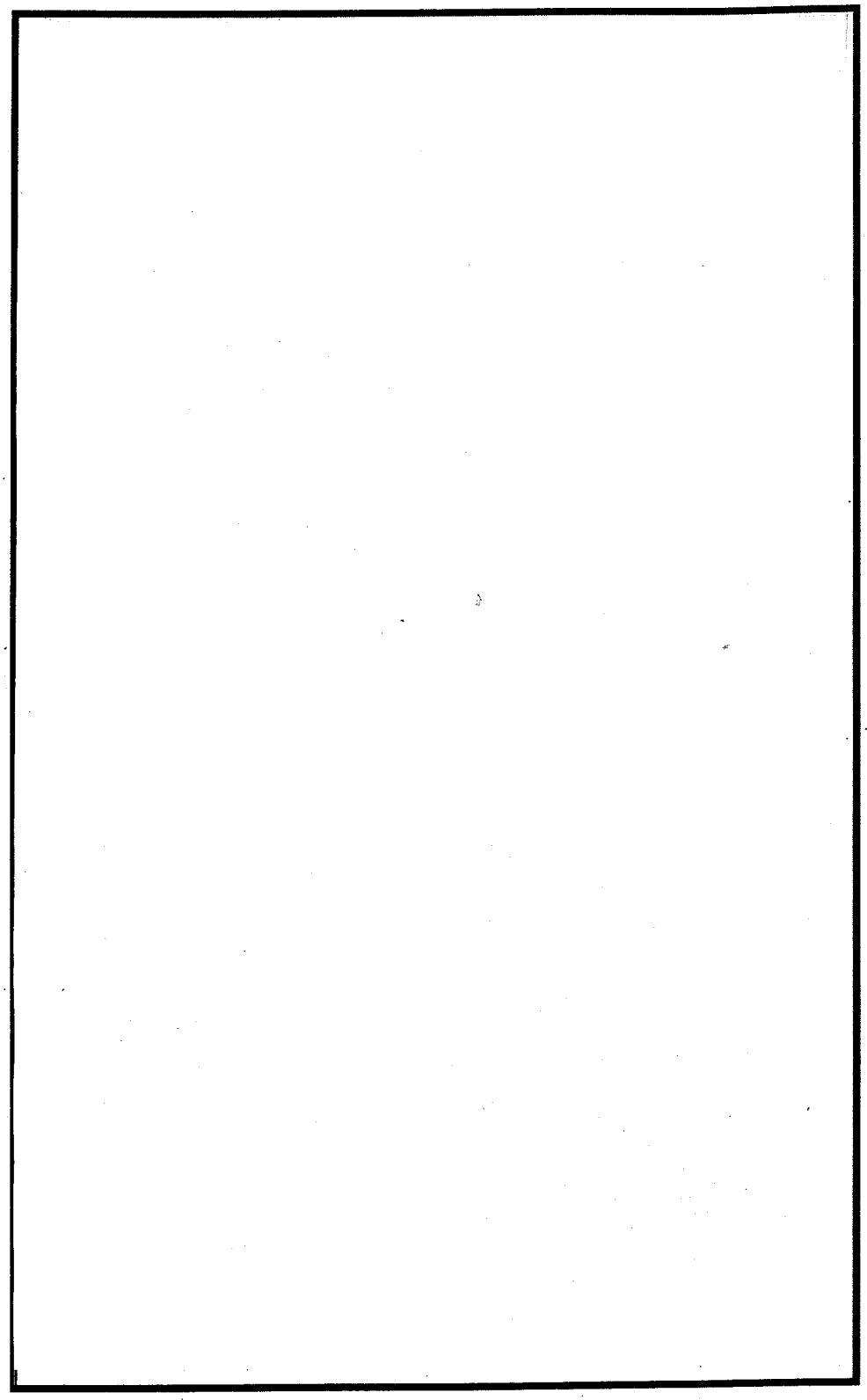
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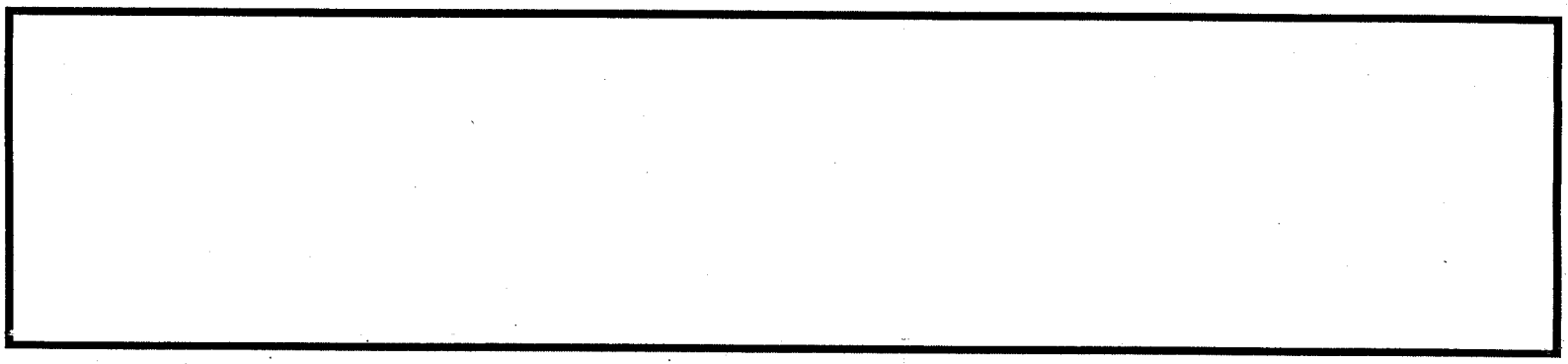
IV

AWS FIRSTRATE NET FOR PROJECT FITZWILLIAM

Station and Location	Operating Organization	Index	Radiological Recording Counter	Ground Filter Unit	Wrap Around Counter	Ionization Chamber Unit
Albrook AFB, C.Z. 08-59N, 79-34W	AWS 8th Wea Gp	5-923		AMC	1-AMC	
Annette Island 55-10N, 131-25W	USWB	5-048	NRL	AMC	AMC	
Barter Island 70-08N, 143-40W	AWS 7th Wea Wg	3-656	NRL			
Bolling AFB 38-51N, 77-01W	AWS 59th Wea Wg	5-405	NRL	AMC SC	AMC	
Clark AFB, Luzon 15-11N, 120-35E	AWS 43d Wea Wg	7-212	NRL	SC		
Davis AFB, Adak 51-53N, 176-39W	AWS 7th Wea Gp	5-992	NRL	SC		AMC







KEY:

AWS - Air Weather Service
AMC - Air Materiel Command
NRL - Naval Research Laboratory
SC - Signal Corps (U. S. Army)
USWB - United States Weather Bureau

A P P E N D I X

V

AIR WEATHER SERVICE INTERIM NET

STATION	INDEX	GROUND FILTER UNIT	WRAP AROUND COUNTER	AUTOMATIC RADIOLOGICAL COUNTER	AIRBORNE FILTER UNITS.
Adak (Davis AFB)	5-992	SC		NRL	
Albrook AFB	5-923	AMC	1-AMC		
Annette Island	5-048	AMC	1-AMC	NRL	
Barter Island	5-656			NRL	
Bolling AFB	5-405	SC		NRL	
Clark AFB	7-212	SC		NRL	
Elmendorf AFB	5-433		2-AMC		
Fairbanks (Ladd)	5-603		2-AMC		6-AMC
Fairfield-Suisun	5-493	AMC	2-AMC		23-AMC
Guam, North AFB	4-892	AMC	2-AMC	NRL	13-AMC
Hickam AFB	4-998	AMC	1-AMC	NRL	
Iwo Jima	3-661	SC		NRL	
Kimpo (Korea)	3-394			NRL	
Kindley AFB	5-926		2-AMC	NRL	12-AMC
Kwajalein	4-986	AMC	1-AMC	NRL	
Lagens AFB	1-343		2-AMC		
March AFB	5-297	SC			
Nome AFB	5-987			NRL	
Okinawa (Kadena)	3-647			NRL	
Shemya	5-549		2-AMC		
Spokane AFB	5-785	AMC	1-AMC		
Thornbrough AFB	5-308	AMC	1-AMC	NRL	

A P P E N D I X

VI

AIR WEATHER SERVICE RECONNAISSANCE MISSIONS
SUMMARY OF EFFORT EXPENDED BY AWS RECONNAISSANCE UNITS
Combined Projects: "DOUBLEDAY", "SANDSTONE", "FIRSTRATE", and "FITZWILLIAM"

UNIT	A ACTUAL OPERATIONS		B SUPPORT MISSIONS			
	Number of Missions	Hours of Flying Time	Number of Missions	Hours of Flying Time	Total Missions	Total Hours
308th Ren Gp	22	230:00	30	278:00	52	508:00
373d Ren Sq	94	1002:35	49	372:05	143	1374:40
374th Ren Sq	76	1008:00	27	322:00	103	1330:00
375th Ren Sq	60	825:15	65	470:00	125	1295:15
Flt A	(37)	(532:15)	(61)	(398:00)	(98)	(930:15)
Flt B	(23)	(293:00)	(4)	(72:00)	(27)	(365:00)
514th Ren Sq	194	1878:40	9	101:30	203	1980:10
TOTAL	446	4944:30*	180	1543:35*	626	6488:05*

* 00:00 Indicates hours and minutes

A P P E N D I X

VII

PERSONNEL ASSIGNED TO PROJECT FIRSTRATE

Headquarters, Air Weather Service

Major James M. Fahey	USAF
Major Stephen W. Pournaras	USAF
Major Gerard M. Leies	USAF
Major Robert B. Hughes	USAF
Captain Arthur Yorra	USAF
1t. H. J. Gustafson	USAF
Miss Margaret E. Harbin	

Observers with US Army Signal Corps

Captain Edgar W. Putnam	USAF
Lt. J. A. Eakin	USAF

Observer with NRL

Lt. L. H. Braude	USAF

Tracerlab Engineers

Mr. Roger A. Coulombe
Mr. Cyril H. Brown
Mr. J. T. Thomas
Mr. W. H. Faulkner, Jr.
Mr. D. W. Atchley
Mr. George E. Howser
Mr. Rowland L. Miller

Field Operators

Major H. C. Crim, Jr.	USAF
Major S. A. Mitchell	USAF
Major M. T. Moree	Chem. C.
Captain H. T. Bingham	USAF
Captain B. C. Brill	Cav.
Captain Glenn E. Davis	USAF
Captain Thomas A. Hope	Chem. C.
Captain Richard Lambie	USAF
Captain K. L. Leiby	
Captain J. D. Servis	Chem. C.
Captain Francis P. Smith	
Captain Oscar J. Tibbetts	USAF
1st Lt. David M. Falk	USAF
1st Lt. R. E. Frazier	USAF
1st Lt. Gordon L. Jacks	
1st Lt. J. E. Kuchenbecker	USAF
1st Lt. J. D. McGowan	FA
1st Lt. B. B. Small	Inf.
1st Lt. Jack R. Smith	USAF
1st Lt. Albert H. Stout	USAF
1st Lt. B. H. Walsh	USAF
1st Lt. C. V. Wilson	USAF
WOJG Robert I. Dunlop	USAF
WOJG B. H. Houston	USAF
T/Sgt. W. H. Craig, Jr.	USAF
S/Sgt. E. A. Anderson	USAF
Sgt. Jack R. Peacock	USAF
Cpl W. R. Freese	USAF
Pfc John J. Dawson	USAF

A P P E N D I X

VIII

A P P E N D I X

IX

AGENCIES CONTRIBUTING TO PROJECT FIRSTRATE

1. AIR WEATHER SERVICE - Operated ground monitoring stations and aerial reconnaissance flights to gather data for radiological contamination investigations.

2. AIR MATERIEL COMMAND - Supplied equipment for monitoring stations and reconnaissance aircraft.

3. NAVAL RESEARCH LABORATORY - Supplied equipment for determining background count.

4. U. S. ARMY SIGNAL CORPS - Supplied equipment for monitoring stations.

5. TRACERLAB, INC. - Trained operating personnel; operated radio-chemical analysis laboratories; supplied personnel for technical assistance in maintenance of equipment.

6. AIR TRANSPORT COMMAND - Provided transportation of equipment, supplies, and personnel.

7. AIRWAYS AND AIR COMMUNICATIONS SERVICE - Provided means for transmitting data to filter center.

REFERENCES

1. Report of Joint Task Force Seven
   "Operation SANDSTONE - Narrative"

2. Report on Training Phase for Monitoring Personnel,
   Tracerlab, Boston, May 1948.

3. Report on Monitoring Field Phase,
   Tracerlab, Boston, July 1948.

4. Operations - Plan - Project FITZWILLIAM
   AFMSW-1, 20 March 1948

5. Correspondence Files, January 1948 to August 1948,
   Air Weather Service, Directorate of Special Projects

6. Report of Project FITZWILLIAM,
   AACS, Washington, 28 July 1948

A N N E X

A

AIR WEATHER SERVICE PARTICIPATION IN OPERATION FITZWILLIAM

A. Methods for Radiological Contamination Detection.

1. Aerial. The aerial weather reconnaissance program, utilizing normal tracks except for special cloud chasing, will conduct the aerial detection program. The methods to be employed will be:

a. Air filtering for minute radioactive particles.

b. Collection of air samples.

c. Radiation measurements by means of automatic recording counters installed in an aircraft operating out of Barber's Point.

2. Ground. Strategically selected weather stations of the Air Weather Service will be equipped for the detection and analysis of radiological contamination. The following methods will be employed:

a. Air filtering for radioactive particles.

b. Radiological analysis of aerial and ground air filters by means of Geiger tubes.

c. [redacted]

d. Radiation measurements by means of ionization chambers and automatic recording counters.

B. Units to be Employed.

1. Aerial.

a. 308th Recon Gp (Weather) (Fairfield-Suisun AFB, Calif.)

b. 514th Recon Sq, VLR, Weather (Guam)

c. 373d Recon Sq, VLR, Weather (Bermuda)

d. 374th Recon Sq, VLR, Weather (Fairfield-Suisun AFB, Calif.)

e. 375th Recon Sq, VLR, Weather (Fairbanks, Alaska)

2. Ground.

a. Continental Weather Wing (Tinker Field, Okla.)

b. 43d Weather Wing (Tokyo, japan)

c. 7th Weather Group (Anchorage, Alaska)

d. 8th Weather Group (Westover Field, Mass.)

e. U. S. Weather Bureau

C. Operations: - Aerial Cloud Chasing.

1. Special Operating Locations.

a. Barber's Point. The 308th Recon Group (Weather) will be prepared to operate sufficient aircraft (B-29) from Barber's Point to perform not more than seven (7) days sustained operations as directed by Commander Air Forces, Joint Task Force Seven. (The limit of seven (7) days is dictated by the peculiar characteristics of the B-29, maintenance difficulties and the number of aircraft available.)

b. Kwajalein. Eight (8) aircraft (B-29) of the 514th Recon Sq, VLR, Weather, will be committed to the Task Force for operations from Kwajalein. These aircraft in addition to participating in Operation SANDSTONE will be so equipped as to take part in Operation FITZWILLIAM.

c. Shemya, Alaska. The 375th Recon Sq, VLR, Weather will be prepared to operate sufficient aircraft (B-29) from Shemya to perform not more than five (5) days sustained operations as directed by Commander Air Forces, Joint Task Force Seven.

d. Yakota, Japan. Should aerial cloud chasing be necessary at Yakota, aircraft of the 514th Recon Squadron mentioned in C1b above, will be utilized.

2. Positioning:

a. The aircraft will depart home stations as indicated in C1 above to operating locations to comply with the following message from Commander Air Forces, Joint Task Force Seven:

"Execute plan Doubleday on _____(date for arrival at designated operating location) for _____days sustained operations."

b. The Flight Commander will notify Project Officer FITZ-WILLIAM Hq Joint Task Force Seven, U.S.S. Mt. McKinley, FPO San Francisco of arrival at operating locations.

c. The aircraft will return to home bases from operating locations upon receipt of the following message from Commander Air Forces, Joint Task Force Seven:

"Plan Doubleday completed on _____(date of release from operating location. Additional Doubleday operations scheduled for _____."

d. The aircraft will remain on alert for repetitive operations of this nature until relieved from the project by the following message from Commander Air Forces, Joint Task Force Seven:

"Plan Doubleday abandoned."

3. Detection Flights.

a. Each operating location will be restricted to a maximum of one detection flight daily.

b. Except for a staging flight into home base, all flights will originate and end at operating location.

c. Aircraft will engage in no flights other than detectiin, required engineering tests, and emergency flights while at operating location.

d. A minimum of one crew will be available for immediate call during period at operating location.

e. Flights will take routine weather observations on all overwater flights, tracks being listed as Special.

f. Detection flights, both air filtering and air sampling, will be directed by the Commander Air Forces, Joint Task Force Seven. The 514th Reconnaissance Squadron Flight Commander, Kwajalein, will provide one (1) operations officer as reconnaissance adviser to Project Officer FITZWILLIAM, JTF 7, for this project.

(1) Flight requests will be directed to the Transient B-29 Flight Commander, Project FIRSTRATE, c/o Base Operations, at each operating location. Notification of standdown, if applicable, will be given daily. A minimum of twelve (12) hours preparation will be given flight crews whenever possible.

(2) Flight requests will specify course by points of latitude, longitude, altitude, and take-off time and date. With reference to air samples the request will specify when, where and how often the samples are to be taken.

(3) The flight commander will notify of compliance or inability to comply with request as soon as practicable prior to flight.

g. Coordination between operating location and unit concerning maintenance and quarters is the responsibility of the unit commander.

4. Operational Procedures.

a. Filter units. Operational instructions are contained in Attachment 1.

b. Air samples. Reconnaissance aircraft (B-29) operating from Oahu and Kwajalein, as indicated in C1a and C1b above, will collect samples of air at flight altitude.

5. Disposition of Filter Papers and Air Samples.

a. Upon completion of the flight, the exposed filter papers will be delivered to the local Weather Station according to instructions contained in Attachment 1.

b. The air samples will be flown back to Tracerlab, Cambridge, Mass., by arrangement with ATC.

6. Radiological Analysis.

a. Filter Papers. The filter papers will be radiologically analyzed at the local Weather Station by means of a wrap-around counter according to instructions prepared by Tracerlab technicians. These instructions will be given to the operating personnel who will be trained at the Tracerlab School, Fairfield-Suisun, AFB.

b. Air Samples. Tracerlab will radio-chemically analyze the air samples at Cambridge, Mass.

7. Recording and Transmission of Data.

Pertinent data will be recorded in a manner to be determined by Tracerlab technicians. The data will be encoded by Air Weather Service personnel and passed to AACS for encipherment and transmission to the Filter Center. Detailed instructions and arrangements regarding the encipherment and transmission are contained in Communications Annex to Operation FITZWILLIAM.

D. Operations: - Aerial Weather Reconnaissance.

Each aircraft conducting a normal weather reconnaissance flight or special flight other than the above will operate filter equipment in a manner similar to that for special cloud chasing aircraft and as indicated in Attachment 1.

E. Operations: - Ground Detection.

1. Operating Locations.

Attachment 2 lists stations to be utilized and their operating agency.

2. Equipment.

a. AMC Ground Air Filter Unit plus Wrap Around Counters.

b. SC Ground Air Filter and Counter Combinations.

c. Automatic Recording Counters.

d. Ionisation Chambers.

e. [redacted]

3. Operational Procedures.

Operational Procedures have been formulated by Tracerlab technicians and the pertinent instructions have been given to the operating personnel that attended the Tracerlab School at Fairfield-Suisun AFB.

4. Maintenance.

Maintenance techniques have been taught the operating personnel that attended the Tracerlab School at Fairfield-Suisun AFB. In addition, one Tracerlab technician will be sent to each of the following locations.

a. Tokyo, Japan. (Hq, 43d Weather Wing)

b. Anchorage, Alaska. (7th Weather Group, Elmendorf, Field)

c. Guam, Mariana Is. (Hq, 30th Weather Sq.)

d. Fairfield-Suisun AFB, Calif. (308th Recon Gp)

e. Hickam Field (Hq, 31st Weather Sq.)

Using these locations as home bases the technicians will attempt to service all the neighboring installations with regard to more difficult maintenance problems. Transportation for this purpose will be obtained from ATC, the local Weather Squadron, if it has any aircraft available, or by the partial use of one (1) aircraft (C-54) of the 514th Recon Squadron.

5. Recording and Transmission of Data.

Data will be recorded in a manner to be determined by Tracerlab technicians. All data except that pertaining to the ionization chamber and precipitation will be encoded, enciphered and transmitted to the Filter Center according to instructions in the Communications Annex.

6. Air Filter Teams - Tracerlab.

a. Tracerlab, Inc. will establishair filter teams at the following locations:

(1) Hickam Field

(2) North Field, Guam

(3) Kwajalein

(4) Fairfield-Suisun AFB

b. The purpose of these teams will be to chemically analyze the air filters at the locations mentioned in E6a above. In addition, they will assist the Station Weather Officer at these locations as necessary in order to effectively accomplish the mission assigned the weather station in connection with Project FIRSTRATE.

I. Instructions for Aerial Air Filter Units

A. Installation of Air Filter Units.

Immediately upon receiving the Aerial Air Filter Kits, the Weather Reconnaissance units concerned will proceed to install the air filters in all of their B-29 reconnaissance aircraft according to instructions contained in the kit.

B. Operation of Filter Units.

1. Initiation of Operations.

a. As soon as the following installations have been completed:

(1) Installation of the air filter unit in the aircraft.

(2) Installation of the wrap around counter in the local weather station.

all regular weather reconnaissance flights will operate the filter unit as prescribed below.

b. Special cloud chasing flights requested by the Task Force Commander will operate the filter units on all detection flights according to the schedule below.

2. Change of Filter Papers.

a. Filter papers will be inserted in the filter unit after take-off (to prevent dust contamination during run-up) and withdrawn before landing.

b. Filter papers will be changed in flight according to the following schedule:

Base	Times
Kwajalein (Sp.Cloud Chasing)	prior to explosion....every three hrs and/or change of search leg.

	X to X - 36 .....every hour and/or change of search leg
	X - 36 to X - 72 .....every two hours and/or change of search leg
	after X - 72 .....every 3 hrs and/or change of search leg
Guam (Reg Recon)	every 3 hrs.
Hickam Fld (Sp. Cloud Chasing)	every 3 hrs and/or change of search leg
Yakota (Japan) (Sp. Cloud Chasing)	every 3 hrs and/or change of search leg
Shemya (Sp. Cloud Chasing)	every 4 hrs and/or change of search leg
Ladd Fld (Reg. Rcn)	every 4 hrs.
Fairfield-Suisun (Reg Rcn)	every 4 hrs.
Bermuda (Reg. Rcn)	every 4 hrs.

3. Handling of the Filter Papers.

Upon withdrawing each filter paper from the unit, the paper will be placed in a large, brown manila envelope and immediately sealed. Filter papers may be folded, but envelopes utilized will be of such a size as to reduce the number of folds to a minimum. No notation will be made in any manner upon the filter paper itself.

4. Identification of Filter Paper.

A copy of a flight data sheet (see attached copy) will be completed with an appropriate entry in each space provided, upon the removal of each filter paper from the unit. Should there be a change of altitude without change of search leg, both altitudes will be entered in the appropriate space on the flight data sheet. This flight information sheet will be firmly affixed to the sealed envelope containing the filter paper in such a manner as to preclude the possibility of separation of the data sheet and envelope containing the filter paper.

5. Disposition of Filter Papers.

Upon completion of the flight all filter papers exposed on the flight will be immediately hand carried to the local Weather Station. The reception of these filter papers will be arranged for in advance by proper coordination between the Flight Commanders and the Station Weather Officers.

FLIGHT DATA SHEET

Time at which filter paper was inserted into filter assembly..... _____. _____
Day of Month Hour

Length of exposure of filter paper in minutes..... _____

Octant* of point at which filter paper was inserted..... _____

*Octant will be determined from table below:

North Latitude		South Latitude	
0°W to	90°W . . . 0	0°W to	90°W . . . 5
90°W to	180°W . . . 1	90°W to	180°W . . . 6
180°E to	90°E . . . 2	180°E to	90°E . . . 7
90°E to	0°E . . . 3	90°E to	0°E . . . 8

Latitude when filter paper was inserted..... _____

Longitude when filter paper was inserted..... _____

Altitude of aircraft during exposure in feet. _____

Octant* of point at which filter paper was extracted..... _____

* Octant will be determined as above.

Latitude when filter paper was extracted..... _____

Longitude when filter paper was extracted.... _____

LIST OF LOCATIONS FOR PROJECT FIRSTRATE

Location	Operating Unit	Radiological Recording Counter	Ground Air Filter Units
Bolling Field	AWS (CWW)	NRL	AMC SC
Guam (North Field)	AWS (30th Wea Sq)	NRL	AMC
Okinawa (Kadena)	AWS (15th Wea Sq)	NRL	
Iwo Jima (Central)	AWS (30th Wea Sq)	NRL	SC
Ft Randall, Alaska	AWS (7th Wea Gp)	NRL	AMC
Chitose, Japan	AWS (20th Wea Sq)	NRL	SC
Adak, Alaska	AWS (7th Wea Sq)	NRL	SC
Clark Field, Phil.Is.	AWS (15th Wea Sq)	NRL	SC
Guadalcanal (Henderson Field)	AWS (31st Wea Sq)	NRL	
Kwajalein	AWS (31st Wea Sq)	NRL	AMC
Kimpo, Korea	AWS (20th Wea Sq)	NRL	
Barter Island, Alaska	AWS (7th Wea Gp)	NRL	
Nome, Alaska	AWS (7th Wea Gp)	NRL	

LIST OF LOCATIONS FOR PROJECT FIRSTRATE (Cont'd)

Location	Operating Unit	Radiological Recording Counter	Ground Air Filter Units
Fairfield-Suisun	AWS (308th Rcn Gp)		AMC
March Field	AWS (CWW)		SC
Spokane Field	AWS (CWW)		AMC
Shemya, Alaska	AWS (7th Wea Gp)		
Hawaii (Hickam)	AWS (31st Wea Sq)		
Fairbanks (Ladd Field)	AWS (7th Wea Gp)		
Bermuda (Kindley Field)	AWS (8th Wea Gp)	NRL	
Albrook Fld, CZ	AWS (8th Wea Gp)		AMC
Elmendorf Field Anchorage, Alaska	AWS (7th Wea Gp)		
Wake	US Weather Bureau	NRL	AMC
Annette Island	US Weather Bureau	NRL	AMC

A N N E X

B

DIARY OF SIGNIFICANT EVENTS

The following is a diary of significant events affecting the FIRSTRATE project. The period (18 March to 7 June) covers the complete operational test phase of Project FIRSTRATE from the time the ground installation personnel began to arrive at their appointt statiens until the day the project went into the interim net period under [redacted]

18 March

Publication of Plan "Air Weather Service Participation in Project FITZWILLIAM".

19 March

(1) Captain Glenn E. Davis and Staff Sergeant E. A. Anderson arrived Hickam AFB to install and operate Project FIRSTRATE equipm

(2) Major Montescue T. Moree arrived March AFB to install FIRS RATE equipment. Basic equipment had not arrived.

20 March

(1) Test flight of B-29 aircraft on loan to NRL from Andrews A to Fairfield-Suisun AFB, California. Flight made at 20,000 ft with 30 minute observations at one hour intervals. All NRL equipment sa factory throughout entire flight. Report by Lt. L. H. Brande, USAF

(2) Publication date of Operations Plan - FITZWILLIAM by Department of Air Force (AFMSW-1).

22 March

(1) Fairfield-Suisun AFB FIRSTRATE station activated. AMC blower not installed.

(2) All basic equipment arrived at March AFB with exception of filter paper.

(3) Letter to Commanding Generals of Pacific Air Command, Alaskan Air Command, Far Eastern Air Command, and Caribbean Air Command by Chief of Staff, USAF directing cooperation for the establishment of FIRSTRATE installations on a highest priority basis.

23 March

(1) Lt. Jack R. Smith arrives Albrook AFB. Equipment found in good condition. Filter paper missing.

(2) Equipment at March AFB set up - and calibrated; background levels was determined on 23, 24 and 25 March.

24 March

(1) Major Harry C. Crim arrived at Kwajalein. Equipment had arrived 1 March 1948.

(2) Project Officer arrived Spokane AFB from Fairfield-Suisun AFB.

25 March

FIRSTRATE equipment arrived Shemya, Alaska.

26 March

(1) WOJG Robert L. Dunlop arrived Thornbrough AFB (Fort Randall), Alaska. All equipment available except AMC Air Filter Unit.

(2) March AFB received forty (40) rolls of filter papers and routine operation began this date.

(3) Test flight of B-29 (on loan to NRL) with Lt. L. H. Brande, USAF, from Fairfield-Suisun AFB to Barber's Point, Hawaii. Two units operated for 30 minutes periods at one hour intervals. Two (2) of the three units carried failed during flight due to faulty Geiger-Mueller tubes.

27 March

(1) Captain H. T. Bingham and Mr. Roger A. Coulombe arrive at Adak to install FIRSTRATE equipment.

(2) Elmendorf Field station began operation.

(3) Technical Sergeant Wilson H. Craig, Jr. arrived Henderson Field, Guadalcanal.

(4) Project Officer arrived Kimpo, Korea.

(5) Tracerlab, Inc. engineer, Mr. Jay T. Thomas, arrived Kwajalein to supervise installation of Wells Survey Unit. Failures in island power supply necessitated installation of a 5KVA from Air Force Task Group 7.4.

28 March

(1) Lt. Wilson arrived North AFB, Guam, followed by Mr. G. E. Howser of Tracerlab on 29 March. Conference of Base Commander, Base Weather Officer and other concerned personnel was held. Base Commander granted all requests and assured all possible cooperation.

(2) Captain Thomas A. Hope arrived Shemya to assume responsibility for operation of equipment.

29 March

Clark AFB installed one (1) NRL Counting Rate meter and two (2) Esterline-Angus Recorders in good condition.

30 March

(1) Annette Island (USWS) rendered first reports to filter center.

(2) Shemya, Alaska FIRSTRATE station becomes operational.

31 March

(1) Thornbrough Air Force Base operative except for Air Materiel Command, Air Filter Unit.

(2) Captain Francis P. Smith arrived Central Air Force Base, Iwo Jima, as operator for Project FIRSTRATE.

(3) Headquarters, Air Weather Service requires Fairfield Air Freight Terminal to be checked in an effort to locate lost FIRSTRATE equipment.

1 April

(1) General Radio Count Rate Meter and E-A Recorder placed in operation at Bolling Air Force Base.

(2) Kimpo FIRSTRATE Section ready for operation.

2 April

(1) Signal Corps Filter Unit and El-tronics Scaler placed in operation at Bolling Air Force Base.

(2) Reporting began from North Air Force Base, Guam.

(3) Test flight of B-29 (on loan to NRL) from Hawaii to American Samoa and return. Operation of equipment for one hour periods at one hour intervals. All equipment functioned satisfactorily.

3 April

(1) Adak begins operation 1700Z hours.

(2) NRL General Radio-EA Recorder arrived Guadalcanal and became operational as of 1025Z 6 April 1948.

(3) Spokane Air Force Base project equipment became operative.

4 April

(1) Adak transmits first data 0500Z.

(2) Bolling begins operation of NRL background counter and Esterline-Angus recorder.

(3) TWX to 308th from Commander, Air Forces JRF-7 to execute Plan DOUBLEDAY by 13 April.

5 April

(1) Filter paper (600 sheets) arrives Albrook Air Force Base.

(2) Air Materiel Command, Air Filter Unit for Thornbrough Air Force Base arrived by air but could not be installed since additional power requirements exceeded capabilities of base power units. Headquarters, 7th Weather Group was notified of difficulty and was directed to provide an adequate source for power.

(3) Fairing assemblies and adapters for 373d Reconnaissance Squadron, VLR, Weather, have not arrived Kindley Air Force Base.

(4) 375th Reconnaissance Squadron had not received air filters or fairing assemblies.

(5) 514th had not received air sample kits and oxygen cylinders.

(6) Signal Corps Ground Filter Unit not yet received by Central Air Force Base, Iwo Jima.

(7) 375th Reconnaissance Squadron, Ladd Field, Alaska, not in receipt of fairing assemblies and air filters.

6 April

(1) Air Materiel Command blower finally installed at Fairfield-Suisun.

(2) Flight of B-29 (loaned to NRL) repeated (see 2 April).

7 April

Operation of NRL Recorder began at Iwo Jima. First report submitted this date.

8 April

Hickam Air Force Base fully operative with Wells Survey Ionization Unit and LS-64 scalers.

9 April

(1) Adak sets up Signal Corps Dust Sampling Unit.

(2) Air Materiel Command Ground Air Filter Unit became operative at Iwo Jima. Reports not transmitted until later.

(3) Headquarters, Air Weather Service advises 8th Weather Group that Albrook and Kindleyhave not been reporting data.

(4) 375th Reconnaissance, Flight Baker received seven (7) air filters, fairing assemblies, and adapters.

12 April

(1) Adak begins operation with Signal Corps Air Filter Unit.

(2) FITZWILLIAM Forward confirms that Air Weather Service Plan DOUBLEDAY will be strictly adhered to.

(3) 514th Reconnaissance Squadron received air filter units for installation.

13 April

(1) First message sent from Albrook Air Force Base to WXL (Radio) at 2030Z after power supply completed.

(2) Plan DOUBLEDAY executed.

14 April

(1) First filter mission flown by 514th Reconnaissance Sq VLR, Weather.

(2) NRL background counter arrived Chitose Air Base.

(3) Thornbrough received by "air lift" a 35 KV gasoline p generator to operate the Air Materiel Command Air Filter Unit w was set up in an abandoned fire house approximately one (1) mil the Weather Station.

(4) Air Materiel Command Filter Unit put in operation at F lein. Inadequate base power supply presented a problem which, w the cooperation of Captain Hutchinson, USN, was solved by obtain a 50 KVA Generator.

15 April

(1) EXPLOSION X-RAY accomplished.

(2) Signal Corps [redacted]

(3) One (1) B-29 from 375th Reconnaissance Squadron, VLR, arrived Shemya and remained on stand-by status.

16 April

(1) Reporting to WXIA (Radio) began at Iwo Jima. Reports not be submitted prior to this date since ciphers were not avail

(2) The 50 KVA generator at Kwajalein became "inop" (field coils burned out). Air Materiel Command Filter Unit was moved near base laundry where adequate power was available.

(3) Headquarters, Air Weather Service advised 373d Reconnaissance Squadron that three (3) fairing assemblies required had not been completed by factory as yet. To be shipped via Air Transport Command immediately upon availability.

(4) Following equipment still not operative: Guam, Ground Air Filter; Chitose, Ground Air Filter; Clark Air Force Base, Ground Air Filter.

(5) Search flight of B-29 on loan to NRL made out of Barber's Point, Hawaii.

17 April

B-29 (loaned to NRL) made two search flights out of Barber's Point.

18 April

(1) Regular observations began at Chitose FIRSTRATE station.

(2) NRL B-29 made search flight out of Barber's Point.

19 April

(1) Adak Wells Survey Unit and Speedomax Recorder gave trace increase of 2½" length.

(2) General Radio Recorder at Adak showed increase of several times background. After five (5) hours no further increase was evident. Decrease in count gradual to 30 April-but did not return to normal. During this period ground filter papers showed considerable activity.

20 April

(1) Signal Corps [redacted] was put in operation after replacement of GM tube which was damaged in shipment.

(2) 373d Reconnaissance Squadron advised of possibility of special priority flights on 22 April: Bermuda to 21°30' N 86°00' W; to Albrook Air Force Base. Return flight 23 April: Albrook Air Force Base to Ramey Air Base; to Bermuda. Tracks at 20,000 ft. with air filters in continuous operation.

(3) Reconnaissance flight out of Fairfield to 15° 20'N 130°20'W to 15°00'N 115°30'W and return. Altitude: 20,000 ft.

(4) Headquarters, Air Weather Service advised 373d Reconnaissance Squadron of possibility of reconnaissance missions from Bermuda to 21°30'N 86°00'W; to Albrook. Track to be flown on 22 April at 20,000 ft. Gull ABLE also to be flown. Authority to cancel Gull BAKER and Gull CHARLIE flights given. Return flight on 23 April from Albrook to Ramey Air Force Base to Kindley at 20,000 ft.

21 April

(1) TWX from Headquarters, Air Weather Service, to 373d Reconnaissance Squadron confirming special flights to Albrook on 22 - 23 April.

(2) 308th Reconnaissance Group advised that USAF (AFMSW-1) would require daily B-29 reconnaissance (Special Lark) flights to 107°30'W, 15°00'N at 20,000 ft. and return at 30,000 ft. Flights to continue through 26 April. Cancellation of other Lark flights conceded. Stork Baker to continue as scheduled.

(3) Reconnaissance flight: Fairfield and return via 11°20'N 108°00'W. Altitude: Out at 500 and 20,000 ft; return at 30,000 and 20,000 ft.

22 April

(1) After additional delays due to problems of transportation and electrical wiring Thornbrough began operation of Air Materiel Command Air Filter Unit.

(2) 373d Reconnaissance Squadron advised that beginning 24 April and continuing every other day for 10 days, a B-29 would land at Albrook Air Force Base. Station Weather Officer at Albrook Air Force Base and Howard Air Force Base notified to give immediate attention to airborne filter papers.

23 April

(1) Mr. G. E. Howser, Tracerlab, Inc., arrived Iwo Jima to replace El-tronics Scalar which had been erratic. The new scaler later gave same trouble - believed to be due to excessive dampness in that climate. The dessicant bags proved inadequate.

(2) Air Materiel Command blower shut-down at Spokane due to failure of supercharger. Replacement made 25 April.

(3) Reconnaissance flight: Fairfield to 15°30'N 107°30'W and return. Altitude: Out, 400 ft and 20,000 ft; return, 30,000 ft.

24 April

Support of 373d Reconnaissance, VLR, Weather directed out of Lagens, Azores, from 25 April to 1 May 1948.

25 April

(1) B-29 #2220 departed Bermuda and arrived Lagens Air Force Base, Azores. B-29 #744 departed Bermuda and arrived Lagens. B-29 #225 departed Bermuda and arrived Lagens.

(2) Reconnaissance flight: Fairfied to 15°00'N 107°25'W and return. Altitude: Out at 1,000 and 20,000 ft; return at 30,000 ft.

26 April

(1) S/Sgt Anderson at Hickam Air Force Base hospitalized - leaving Captain Davis without assistance to operate the equipment.

(2) Two new PU-58/G gasoline generators were procured for Iwo Jima through FEAF to power FIRSTRATE equipment. This action necessary since island power supply was unreliable.

(3) Reconnaissance flight out of Albrook to 10°30'N 84°00'W thence to the Equator at 82°00'W and return to Albrook Air Force Base.

(4) Reconnaissance flight: Fairfield to 15°00'N 107°30'W. Out at 500 and 20,000 ft; return at 20,000 ft.

(5) Ferry flight: Kindley to Lagens at 20,000 ft.

(6) Ferry flight: Kindley to Lagens at 24,000 ft.

27 April

(1) Ferry flight from Bermuda to Lagens at varying altitudes: 18,000 ft, 25,000 ft, 11,000 ft, 14,000, and 15,000 ft.

(2) Ferry flight from Lagens to Tripoli at 25,000 ft.

(3) Reconnaissance flight from Fairfield to 15°00'N 107°30'W and return. Altitudes: Out at 3,000 and 20,000 ft; return at 30,000 ft.

(4) Reconnaissance flight: Fairfield and return via Oklahoma City at 20,000 and 10,000 ft.

28 April

(1) Readings from filter papers at Fort Randall showed marked increase 28 - 29 April.

(2) Reconnaissance flight to 50°00'N 142°00'W out of Fairfield and return. Altitude out, 11,000 ft; return, 30,000 ft.

(3) Reconnaissance flight (ferry) from Lagens to Tripoli at 18,000 ft.

29 April

(1) Thornbrough experienced trouble with Air Materiel Command Filter Unit. Solved difficulty by replacing 2-belt pulleys with 4-belt pulleys.

(2) AFMSW-1 requests of 373d Reconnaisssance Squadron a 1000 nautical mile flight out of Lagens on true heading of 020 degrees and return. Altitude: 30,000 ft.

(3) B-29 flight out of Lagens on true heading of 020 degrees departed 1122Z hours.

(4) Special FIRSTRATE flights from Bermuda.

(5) Headquarters, Air Weather Service advises 308th Reconnaissance Group to discontinue sampling air until next DOUBLEDAY operation. Tracerlab, Inc. laboratory at Boston could not complete analysis of all bottles.

30 April

(1) EXPLOSION YOKE executed.

(2) Increase in activity from filter paper evident at Fort Randall 30 April to 4 May.

(3) Spokane Air Materiel Command blower inoperative for five (5) hours.

(4) Reconnaissance flight: Fairfield to 15°00'N 108°00'W at 4000 and 20,000 ft; return at 30,000 ft.

(5) Reconnaissance flight out of Tripoli to 21°00'N 24°00'E thence to 21°30'N 25°00'E and return to Tripoli at 20,000 and 26,000 ft.

(6) 375th Reconnaissance Squadron advised by Headquarters, Air Weather Service of possible amendment to Plan DOUBLEDAY as follows: Planes may operate shuttle flights daily between Ladd Field and Barber's Point with altitudes up to 30,000 ft for a maximum period of six (6) days. These flights to take priority over Ptarmigan flights.

(7) Headquarters, Air Weather Service advises 308th Reconnaissance Group of change in Plan DOUBLEDAY. Operation units were directed to be prepared to execute (in addition to the present one (1) flight per day for seven (7) days at altitudes up to 30,000 ft) two (2) missions - one flight for two successive days. All flights directed as per Plan DOUBLEDAY. Filter paper change as often as every hour.

1 May

(1) A second B-29 of the 375th Reconnaissance Squadron, VLR, Weather, arrived at Shemya and remained on stand-by status.

(2) Reconnaissance flight: Fairfield to 15°15'N 106°48'W at 2000 and 20,000 ft; return at 30,000 ft.

2 May

(1) At Kwajalein the General Radio Recorder went off the 20,000 CP scale due to a "hot" rain. Recorder returned to readable position 7 May 1948. This period was marked by very high activity on filter papers.

(2) Both B-29's of the 375th Reconnaissance Squadron departed Shemya for Ladd Air Force Base. No aerial operations conducted from Shemya.

(3) Ferry flight: Bermuda to Fairfield at 21,000 ft (Flight #2).

(4) Ferry flight: Bermuda to Fairfield at 21,000 ft (Flight #2).

3 May

(1) Reconnaissance flight: Barber's Point to Barber's Point via 1°42'S 164°18'W. Out at 10,000 ft and return at 20,000 ft.

(2) Reconnaissance flight: Ladd Air Force Base to Barber's Point at 10,000 ft.

(3) Reconnaissance flight: Kindley to Fairfield at 10,000 and 20,000 ft.

4 May

(1) Reconnaissance flight out of Barber's Point to 1°30'S 164°18'W. Altitude at 10,000 ft., 20,000 ft. and 30,000 ft.

(2) Reconnaissance flight out of Barber's Point to 1°30'N 164°00'W at 1000 ft. and return at 20,000 ft.

(3) Reconnaissance flight out of Barber's Point to 1°30'N 164°00'W at 100 ft. and return at 10,000 ft.

(4) Ferry flight from Elmendorf Field to Barber's Point at 20,000 ft.

5 May

(1) Captain Davis at Hickam Air Force Base received orders to report to ZI for schooling. S/Sgt. Anderson still hospitalized so Lt. William E. Pedigo (31-4 AWS Det.) was selected to replace Captain Davis. After three (3) days of intensive training Lt. Pedigo assumed responsibility for operating station.

(2) Ionization chamber at Hickam gave only indication of high positive activity with a trace displacement of 3½ inches or approximately 2 inches above background.

(3) Reconnaissance flight from Fairfield to 15°00'N 170°30'W at 20,000 ft and return same altitude.

6 May

(1) Reconnaissance flight: Barber's Point to 01°30'S 164°00'W at 1000 ft and return at 30,000 ft.

(2) Ferry flight from Barber's Point to Ladd Field at 21,000 ft.

(3) Reconnaissance flight from Fairfield to 49°48'N, 142°12'W and return. Flight out at 10,000 and 20,000 ft; return flight at 20,000 ft and 10,000 ft.

(4) Reconnaissance flight: Fairfield to 15°30'N 108°24'W and return. Flight at 10,000 and 20,000 ft.

7 May

(1) Reconnaissance flight out of Barber's Point to 1°30'S 164°00'W and return.

(2) Ferry flight: Barber's Point to Fairfield at 19,000 ft.

(3) Reconnaissance flight: Fairfield to 15°00'N 107°30'W at 1000 ft out; 22,000 ft return (Flt. #1).

(4) Reconnaissance flight: Fairfield to 15°00'N 107°30'W at 1000 ft out; 21,000 ft return.

(5) Reconnaissance flight to 50°00'N 142°00'W from Fairfield at 1000 ft and return at 21,000 ft.

8 May

(1) Reconnaissance flight (ferry): Barber's Point to Fairfield at 10,000 ft.

(2) Reconnaissance flight (ferry): Barber's Point to Fairfield at 21,000 ft.

(3) Reconnaissance flight out of Fairfield to 15°00'N 107°30'W. Out at 10,000 ft; return, 21,000 ft.

(4) Reconnaissance flight out of Fairfield to 15°00'N 107°30'W. Out at 11,000 ft; return at 3000 ft.

(5) Reconnaissance flight out of Fairfield to 15°00'N 107°30'W. Out at 11,000 ft; return at 30,000 ft. (Flt. #2)

(6) Reconnaissance flight northwest from Fairfield to 50°00'N 140°00'W at 10,000 ft and 30,000 ft.

(7) Reconnaissance flight northwest from Fairfield to 50°00'N 142°00'W at 1000 ft and 21,000 ft.

(8) Ferry flight from Fairfield to Kindley Field at 22,000 ft.

(9) Reconnaissance flight southward out of Kindley Field to 12°36'N 75°48'W at 11,000 ft and 30,000 ft.

(10) Reconnaissance flight from Kindley Field to 15°00'N 75°00'W at 1000 ft and return at 21,000 ft.

(11) Kindley Field reconnaissance flight to 45°00'N 75°00'W at 1000 ft and return at 21,000 ft.

(12) Kindley Field reconnaissance flight to 45°00'N 55°00'W; return at 11,000 ft.

9 May

[redacted]

(3) General Radio Counter at Chitose stopped functioning when PU-PE-197 fluctuated from zero RPM to "full" RPM due to impurities in fuel. The resulting surge in current above the maximum allowed burned two fuses and caused a shutdown.

(4) Reconnaissance flight out of Fairfield to 15°00'N 107°30'W and return. Altitudes: 11,000 ft and 24,000 ft.

(5) Reconnaissance flight out of Fairfield to 15°00'N 107°30'W and return. Altitudes: 11,000 ft and 24,000 ft.

(6) Reconnaissance flight out of Fairfield to 15°00'N 107°30'W and return. Flight out at 10,000 ft and return at 21,000 ft.

(7) Reconnaissance flight from Fairfield to 50°00'W 142°00'W at 11,000 ft and return at 30,000 ft.

(8) Reconnaissance flight from Fairfield to 50°00N 142°00'W at 1000 ft and return at 21,000 ft.

(9) Reconnaissance flight: Kindley Field to 45°00'N 55°00'W at 1000 ft and return at 21,000 ft.

(10) Reconnaissance flight: Kindley Field, Bermuda to 13°30'N 77°00'W at 10,000 ft and return at 21,000 ft.

(11) Reconnaissance flight: Kindley Field to 12°30'N 76°18'W at 11,000 ft and return at 29,000 ft.

10 May

(1) Reconnaissance flight: Kindley Field, Bermuda and return via 11°12'N 54°6'W. Altitudes: 900 ft and 19,400 ft.

(2) Reconnaissance flight: Kindley Field and return via 45°00'N 55°00'W. 11,000 and 30,000 ft.

(3) Reconnaissance flight: Kindley Field and return via 45°00'N 55°00'W, 1000 and 20,000 ft.

(4) Reconnaissance flight: Fairfield to 50°00'N 142°00'W at 10,000 ft and 21,000 ft.

(5) Reconnaissance flight: Fairfield to 15°00'N 107°30'W at 11,000 ft and 30,000 ft.

11 May

(1) Flight to northwest out of Fairfield at 11,000 ft to 50°00'N 142°00'W and return at 30,000 ft.

(2) Reconnaissance flight: Kindley Field, Bermuda to Azores at 21,000 ft.

(3) Reconnaissance flight northward out of Kindley Field at 11,000 ft to 43°42'N 56°00'W and return at 30,000 ft.

(4) Reconnaissance flight out of Kindley Field to 45°00'N 55°00'W. Altitude out 1100 ft; return at 20,000 ft.

(5) Reconnaissance flight out of Kindley Field to 11°00'N 55°00'W at 1000 ft and 20,000 ft.

(6) Reconnaissance flight: Kindley Field and return via 11°00'N 54°00'W at 11,000 ft and 29,000 ft.

(7) Personnel of 373d Reconnaissance Squadron learned that 308th Reconnaissance Group was following certain decontamination and personnel protective procedures. This caused some conjecture and apprehension on the part of the 373d Reconnaissance crews. The 373d Reconnaissance Squadron was advised that decontamination procedures were unnecessary for personnel of that organization.

(8) Teletype from 7th Weather Group to Headquarters, Air Weather Service advises that Dr. Peacock of Tracerlab, Inc., had notified FIRSTRATE stations under the 7th Weather Group that the responsibility of FIRSTRATE personnel on TDY ended with transfer of equipment (see reply by Headquarters, Air Weather Service on 13 May).

12 May

(1) El-tronics scaler at Fort Randall replaced with Tracerlab (L-64) scaler. Frequent failures of the El-tronics scaler necessitated this change.

(2) Reconnaissance flight out of Fairfield to 50°00'N 142°12'W and return.

(3) Reconnaissance flight (ferry): Kindley Field to Legens at 21,000 ft.

(4) Reconnaissance flight south out of Fairfield to 15°00'N 107°30'W and return. Leg out at 10,000 ft; return leg at 30,500 ft.

(5) Ferry flight: Fairfield to Elmendorf at 20,000 ft.

(6) Reconnaissance flight (ferry): Kindley Field to Azores at 21,500 ft.

13 May

(1) Base power at Adak failure for five (5) hours. New calibration necessary.

(2) Fort Randall filter papers showed increase in activity. Reason unknown.

(3) Reconnaissance flight: Azores to 15°30'N 25°42'W. Out at 1500 ft; return at 21,000 ft.

(4) Reconnaissance flight: Azores to Azores via 17°00'N 25°12'W.

(5) Reconnaissance flight (ferry): Azores to Tripoli at 21,000 ft.

(6) Azores reconnaissance flight to 49°00'N 08°00'W and return.

(7) Teletype Headquarters, Air Weather Service to 7th Weather Group advises Dr. Peacock not authorized to send messages concerning FIRSTRATE personnel other than Tracerlab. Personnel on TDY to continue to monitor the operation, maintenance, and training until further orders.

14 May

(1) Adak power off for four (4) hours - recalibration again.

(2) Reconnaissance flight: Tripoli to Tripoli via 12°42'N 29°18'E. Out at 10,000 ft: return at 30,000 ft.

(3) Reconnaissance flight (ferry): Azores to Tripoli at 21,000 ft.

(4) Reconnaissance flight (ferry): Kindley Field, Bermuda to Lagens at 21,000 ft.

(5) Reconnaissance flight (ferry): Fairfield to Barber's Point at 12,000 ft (Flt #1).

(6) Reconnaissance flight (ferry): Fairfield to Barber's Point at 11,000 ft (Flt #2).

(7) Headquarters, 7th Weather Group advised by Headquarters, Air Weather Service that FIRSTRATE personnel on TDY at Adak, Fort Randall, Elmendorf, Nome, Shemya, Barter Island, and Ladd Field will be relieved to return to home stations shortley after 1 June 1948. After this date station weather officers will personnally monitor the project as a part of routine station operation. Subject FIRSTRATE personnel were to have properly trained permanent station personnel in operational procedures prior to departure.

15 May

(1) Explosion ZEBRA.

(2) Reconnaissance flight: Alaska to Barber's Point at 1000 ft.

(3) Reconnaissance flight: Barber's Point and return via 1°12'S 163°48'W. Out at 10,000 ft; return 21,000 ft.

(4) Reconnaissance flight: Lagens to Lagens via 48°48'N 8°48'W. Out at 11,000 ft; return at 30,000 ft.

16 May

(1) Captain Smith departed Iwo Jima leaving full responsibility of Project FIRSTRATE to Captain Jacob Follmer, Weather Detachment Commander.

(2) Reconnaissance flight: Elmendorf Field to Barber's Point at 21,000 ft.

(3) Reconnaissance flight: Barber's Point to 1°12'S 164°00'W and return. Altitude out, 1200 ft and return at 31,000 ft.

(4) Reconnaissance flight: Barber's Point and return via 1°30'N 163°12'W.

17 May

(1) S/Sgt Anderson of Hickam Air Force Base released from hospital and reproted to duty 18 May.

(2) Elmendorf Field to Barber's Point reconnaissance flight at 22,000 ft.

(3) Barber's Point to Equator reconnaissance flight via 0°3'N 163°18'W and return. Altitude out - 1000 ft; return 20,000 ft.

(4) Reconnaissance flight: Barber's Point to 1°30'S 164°00'W to Barber's Point. Flight out at 10,500 ft and return at 20,000 and 29,000 ft.

18 May

(1) At Chitose Air Force Base the General Radio Counter showed incorrect reading. At 115V, 60 cycles and the scale at 6000 CPM, the meter read 360 for line frequency. After maximum meter reading, the meter showed a slow decline in current until meter was back to zero. After routine checks it was concluded that a faulty 6AG7 tube, coupled possibly, with a high relative humidity caused the malfunctioning.

(2) Burned out bearing 35KW power plant at Fort Randall caused shut-down of Air Materiel Command Air Filter Unit until 21 May.

(3) Reconnaissance flight; Barber's Point to 1°30'N 165°54'W and return to Barber'sPoint Altitude: 20,000 ft.

(4) Barber's Point to Elmendorf Field reconnaissance flight at 1000 ft.

19 May

(1) Reconnaissance flight: Barber's Point to Equater and return via 0°24'S 163°12'W at 11,000 and 21,000 ft.

(2) Reconnaissance flight from Fairfield to Albrook at 21,000 ft., 15,000 ft., and 11,000 ft.

(3) Fairfield to Kindley Field reconnaissance flight at 20,000 ft (Flt #1).

(4) Fairfield to Bermuda (Kindley) at 20,000 ft (Flt #2).

(5) Reconnaissance flight from Barber's Point to Alaska at 1000 ft.

20 May

(1) At 0730Z Annette Island experienced "count" increase from normal 1800CPM to 4320CPM for five (5) minute period on Radiological Recording Counter. Cause unknown.

(2) Operation at March Air Force Base temporarily suspended for move to Sonora Pass.

(3) Reconnaissance flight: Barber's Point to Ladd Air Force Base. Altitude variable; 11,000 to 16,000 ft.

(4) Reconnaissance flight: Barber's Point to Alaska at 1000 ft.

(5) Reconnaissance flight: Fairfield to Fairfield via 15°00'N 107°30'W.

(6) Reconnaissance flight: Barber's Point to Barber's Point via 1°30'S 164°00'W.

21 May

(1) Adak base power shut-down for three (3) hours.

(2) Reconnaissance flight from Fairfield and return via 44°00'N 139°00'W and 51°00'N 137°00'W. Altitude 11,000 ft all legs.

(3) Reconnaissance flight: Barber's Point to Barber's Point via 3°30'N 163°30'W. Out at 10,000 ft; return at 20,000 ft.

22 May

(1) Chitose Air Force Base forced to make observations for each six (6) hours instead of each three (3) hours due to filter paper shortage. Condition releived after five (5) days.

(2) NRL General Radio Background Counter received at Hickam Air Force Base from Barber's Point (Navy).

(3) Reconnaissance flight from Fairfield to Albrook via 15°00'N 107°30'W.

(4) Reconnaissance flight from Fairfield to Albrook via 15°00'N 105°00'W.

(5) Reconnaissance flight: Fairfield and return via 31°30'N 123°00'W at 18,000 ft.

(6) Reconnaissance flight from Fairfield to Fairfield via 23°20'N 136°00'W.

(7) Reconnaissance flight Barber's Point to Fairfield at 10,000 ft.

(8) Barber's Point to Fairfield (reconnaissance) at 20,000 ft.

(9) Reconnaissance flight: Barber's Point to Fairfield at 11,000 ft.

23 May

(1) Adak power shut-down for three (3) hours.

(2) General Radio Counter Meter at Chitose dropped to negative reading. When instrument was turned on, with CPM on 6000 scale and calibration switch (on), the meter would indicate normal build-up to line frequency and then decrease to zero. A 6C5 tube was found defective and replaced. This improved functioning of the meter but not satisfactorily. Check showed low mutual conductance reading in 6AG7 tube but replacement was not immediately available. Later when the 6AG7 tube was replaced normal functioning resumed. High relative humidity noted at time of breakdown was again believed to be a contributing cause for failure.

(3) Operation in Sonora Pass by March Air Force Base 23-30 May (8500 ft NSL). Major Moree, operator.

(4) Reconnaissance flight Barber's Point to Fairfield via 21°30'N 122°00'W.

(5) Reconnaissance flight: Fairfield to Fairfield via 15°00'N 107°30'W.

(6) Reconnaissance flight from Barber's Point to 1°30'S 164°00'W and return.

(7) Anchorage, Alaska, to Barber's Point at 27,000 and 22,000 ft.

24 May

(1) Reconnaissance flight from Albrook Air Force Base and return via 20°00'S 86°00'W at 20,000 ft.

(2) Reconnaissance flight from Kindley Field to Albrook at 10,000 ft.

25 May

(1) Fort Randall had increase in readings from exposed filter papers 25-26 May.

(2) Reconnaissance flight from Fairfield and return via 15°00N 107°30'W.

(3) Reconnaissance flight from Fairfield to Fairfield via 21°00'N 119°00'W.

26 May

(1) Reconnaissance flight from Kindley Field to 12°00'N 77°00'W and return.

(2) Reconnaissance flight out of Albrook Air Force Base to 0°00'N 82°00'W, thence to 19°00'N 86°00'W, and then to Albrook.

27 May

(1) Reconnaissance flight: Fairfield to Barber's Point via 37°30'N 146°00'W. First Leg flown at surface; second leg at 10,000 ft.

(2) Reconnaissance flight: Fairfield to 16°00'N 111°00'W at 20,000 ft.

(3) Reconnaissance flight: Bermuda to Lagens at 20,000 ft.

28 May

(1) Fort Randall: Magneto on Kohler power unit failed. NRL counter moved from dock to weather station where power was available. Filter papers at Fort Randall showed marked increase in activity on this date.

(2) Reconnaissance flight from Albrook Air Force Base, Panama, Canal Zone, to Fairfield at 11,000 ft.

(3) Fairfield and return via 15°00'N 108°00'W. Out at 4,000 ft and return at 22,000 ft.

(4) Reconnaissance flight from Lagens to 50°00'N 16°30'W. Out at 1000 ft; return at 10,000 ft.

(5) Bermuda (Kindley Field) to Lagens at 11,000 ft.

29 May

(1) Reconnaissance flight from Fairfield to Barber's Point via 22°30'N 136°30'W. First leg at 1000 ft; second leg at 10,000 ft.

(2) Reconnaissance flight: Barber's Point to Fairfield via 37°30'N 146°30'W. First leg, 1000 ft; second leg 10,000 ft.

(3) Reconnaissance flight Fairfield to Barber's Point via 22°30'N 137°30'W. Altitude: 1000 ft. and 10,000 ft. first and second legs respectively.

(4) Reconnaissance flight Lagens to Cape Verde Islands and return. Leg out, 1000 ft; leg back, 21,000 ft.

30 May

(1) Lt. J. R. Smith at Albrook notified to return to Washington. Lt. Harold Rashin assigned to Project at Albrook.

(2) Fairfield and return via 15°00'N 107°30'W. Out at 3000 ft; back at 11,000 ft.

(3) Reconnaissance flight from Lagens to 15°30'N 25°30'W and return. Out at 1000 ft. and return at 21,000 ft.

31 May

(1) Reconnaissance flight: Lagens Air Force Base to Cape Verde Islands and return. Altitude out 1000 ft. return 20,000 ft.

(2) Reconnaissance flight: Barber's Point to Fairfield-Suisun via 36°00'N 147°30'W. First leg at 1000 ft; second leg at 10,000 ft.

(3) Reconnaissance flight: Barber's Point to Fairfield-Suisun via 37°31'N 146°30'W.

(4) Reconnaissance flight: Fairfield and return via 24°30'N 112°45'W. Altitude out, 1000 ft; return, 4000 ft.

1 June

Reconnaissance flight: Lagens to Lagens via 50°00'N 10°00'W.

2 June

Reconnaissance flight: Fairfield to Fairfield via 32°00'N 117°00'W.

3 June

Reconnaissance flight from Fairfield-Suisun and return via 15°00'N 107°30'W. Altitude out 3000 ft; back 11,000 ft.

4 June

Reconnaissance flight Lagens to Kindley Field. Altitude 9,000 ft.

6 June

(1) Thornbrough Air Materiel Command filter unit shutdown resulting from worn compressor unit which allowed impeller blades to strike the casing.

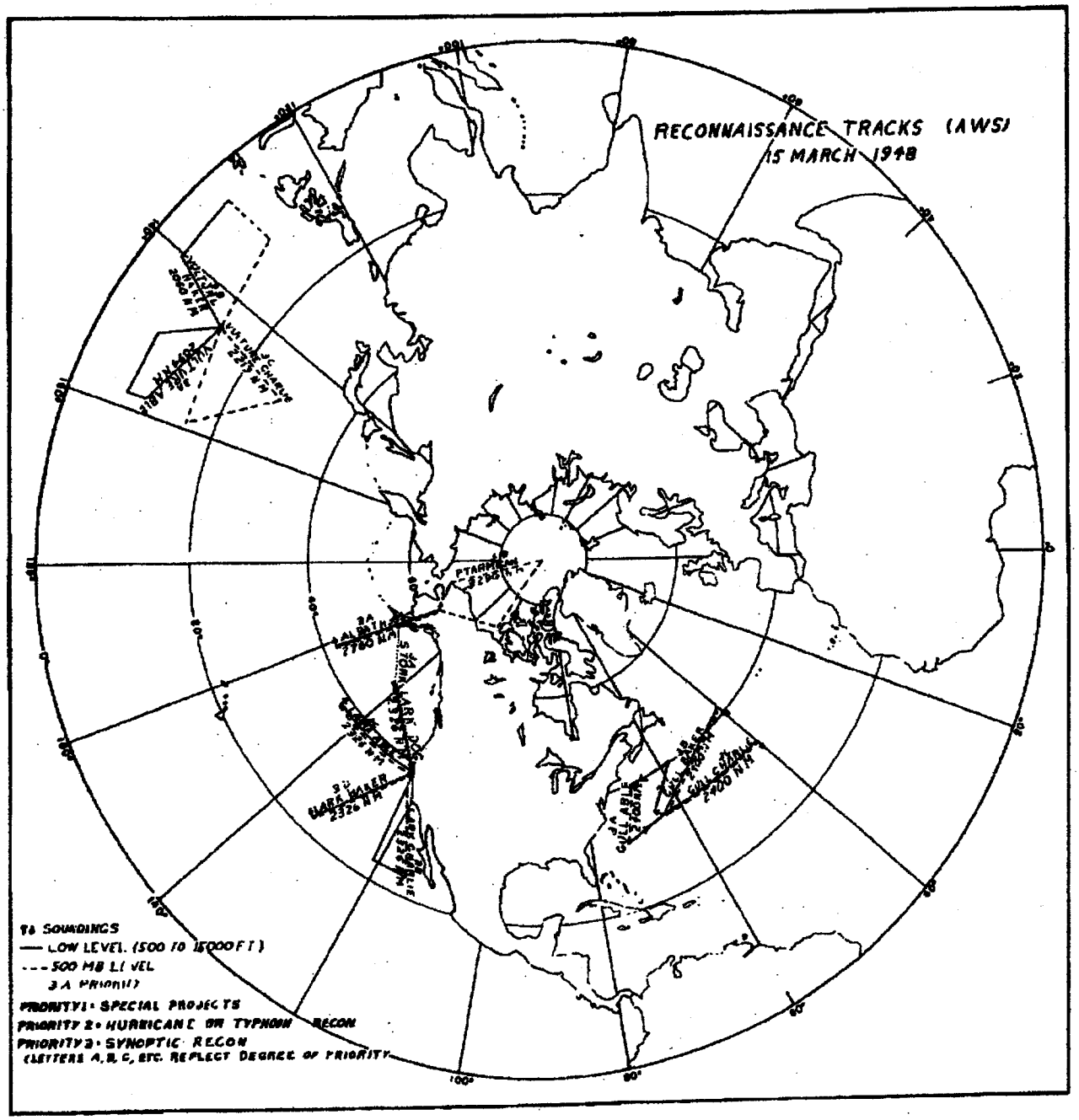
(2) Reconnaissance flight: Lagens to Lagens via 14°00'N 25°00'W.

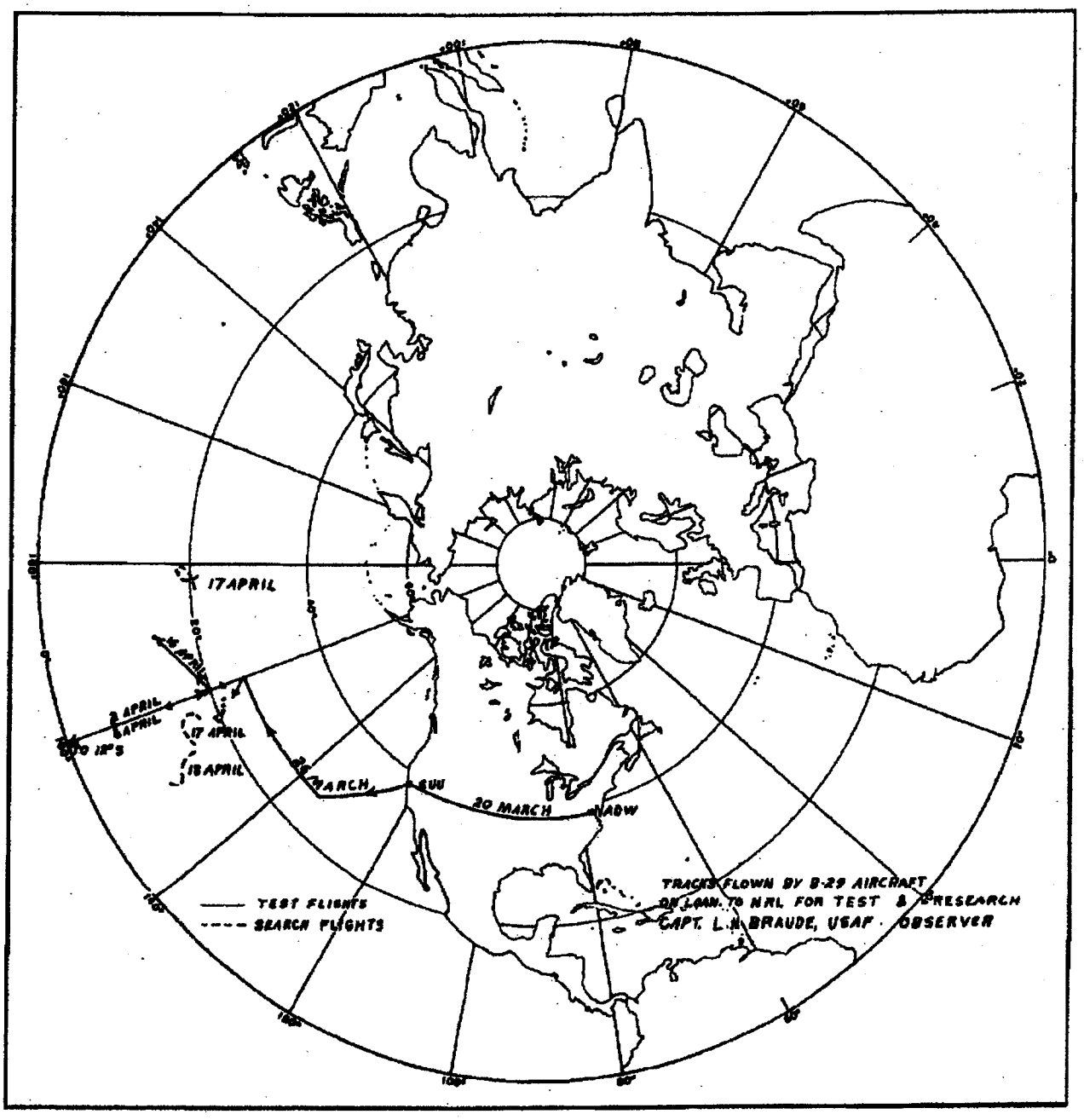
7 June

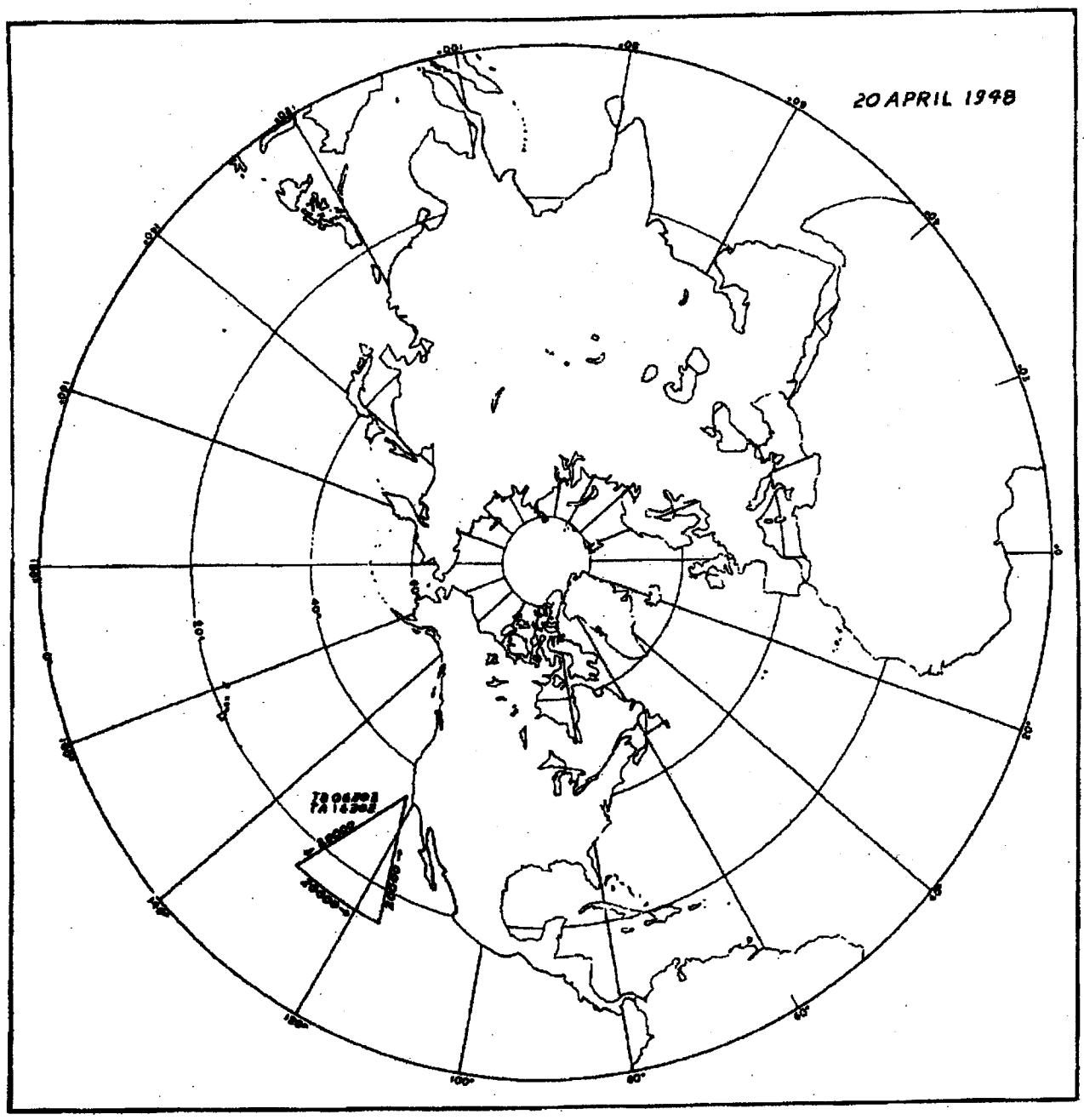
Roll-up. Project FIRSTRATE.

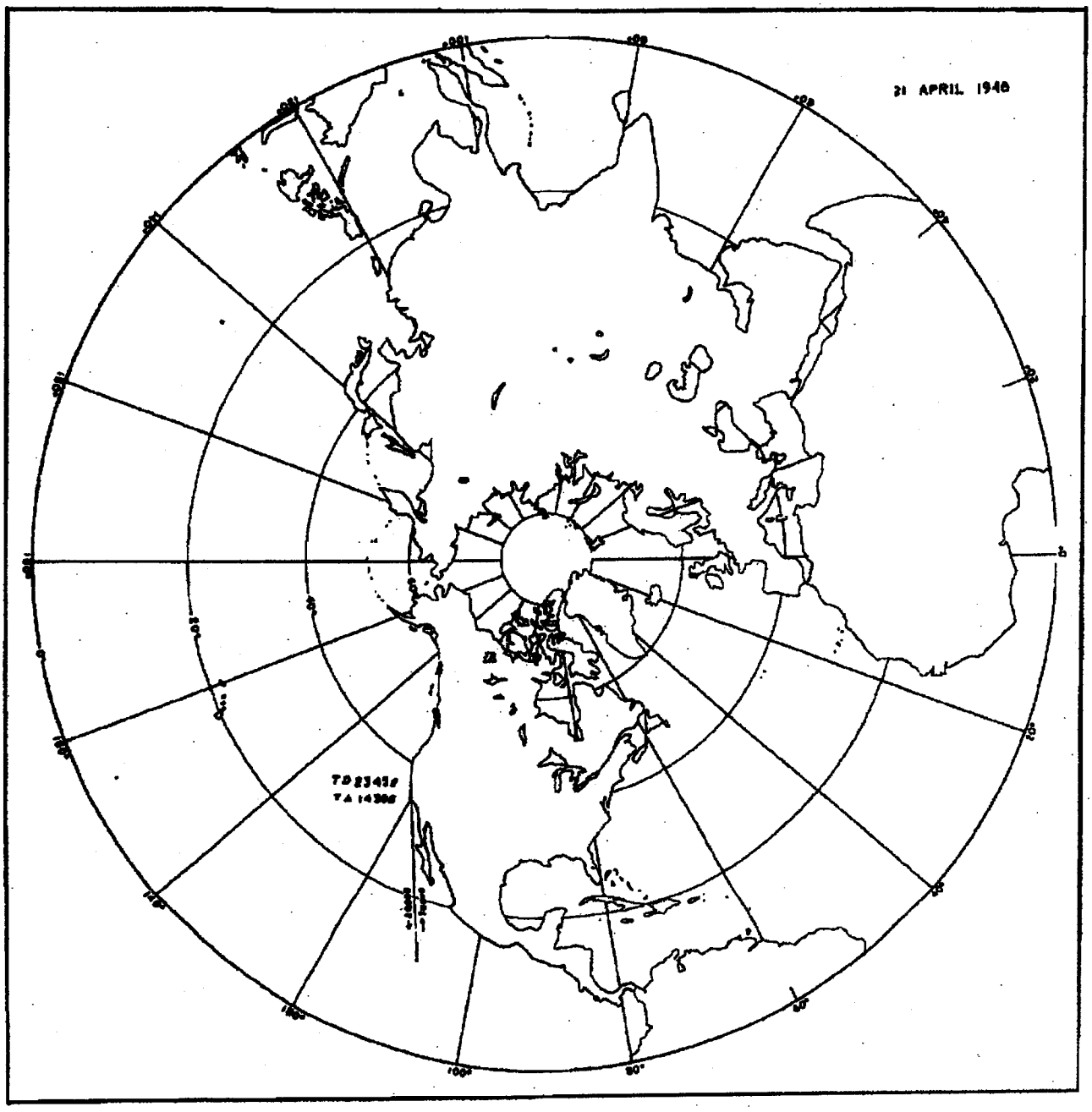
A N N E X

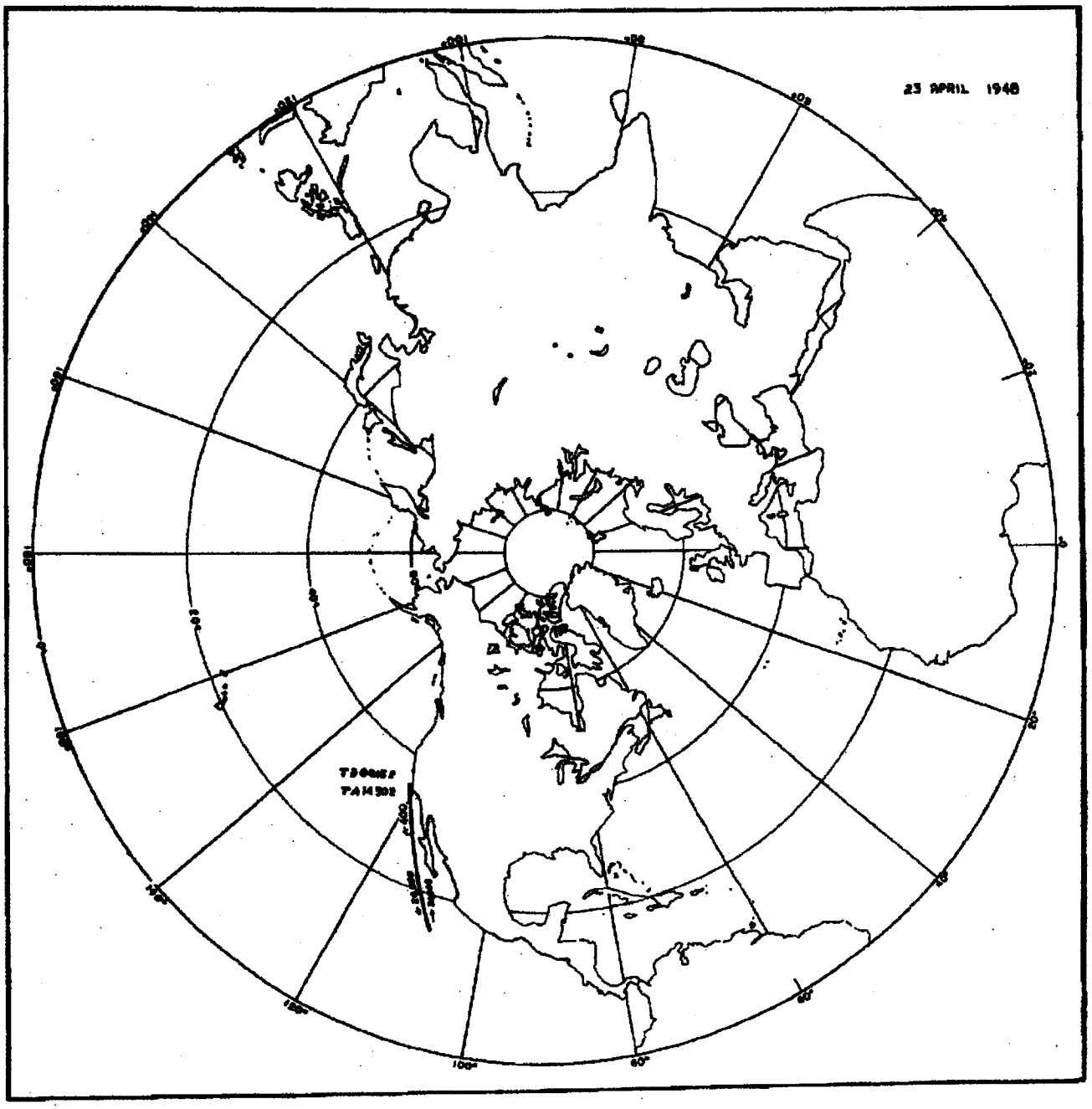
C

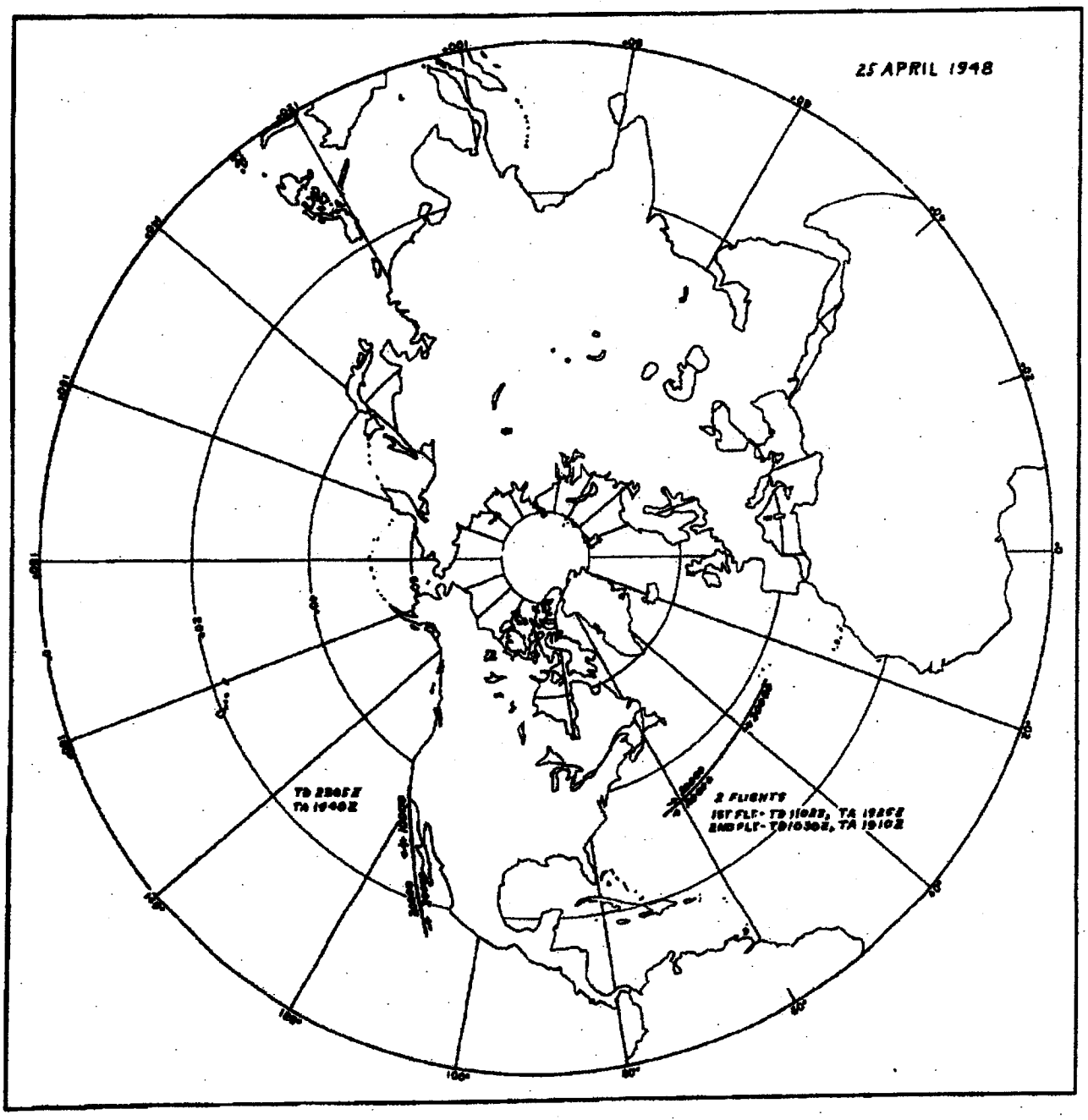

RECONNAISSANCE TRACKS (AWS)
15 MARCH 1948
PTARMIGAN
2200 N.M.
3A
ALERT
2700 N.M.
3A
GULL AFB
2700 N.M.
3A
THULE
2700 N.M.
3A
BLACK HALLER
2320 N.M.
3A
GOOSE
2700 N.M.
3A
SONDRESTROM
2700 N.M.
3A
KINDLEY
2700 N.M.
3A
HARMON
2700 N.M.
3A
LABRADOR
2700 N.M.
3A
GOOSE
2700 N.M.
3A
GULL AFB
2700 N.M.
3A
THUL

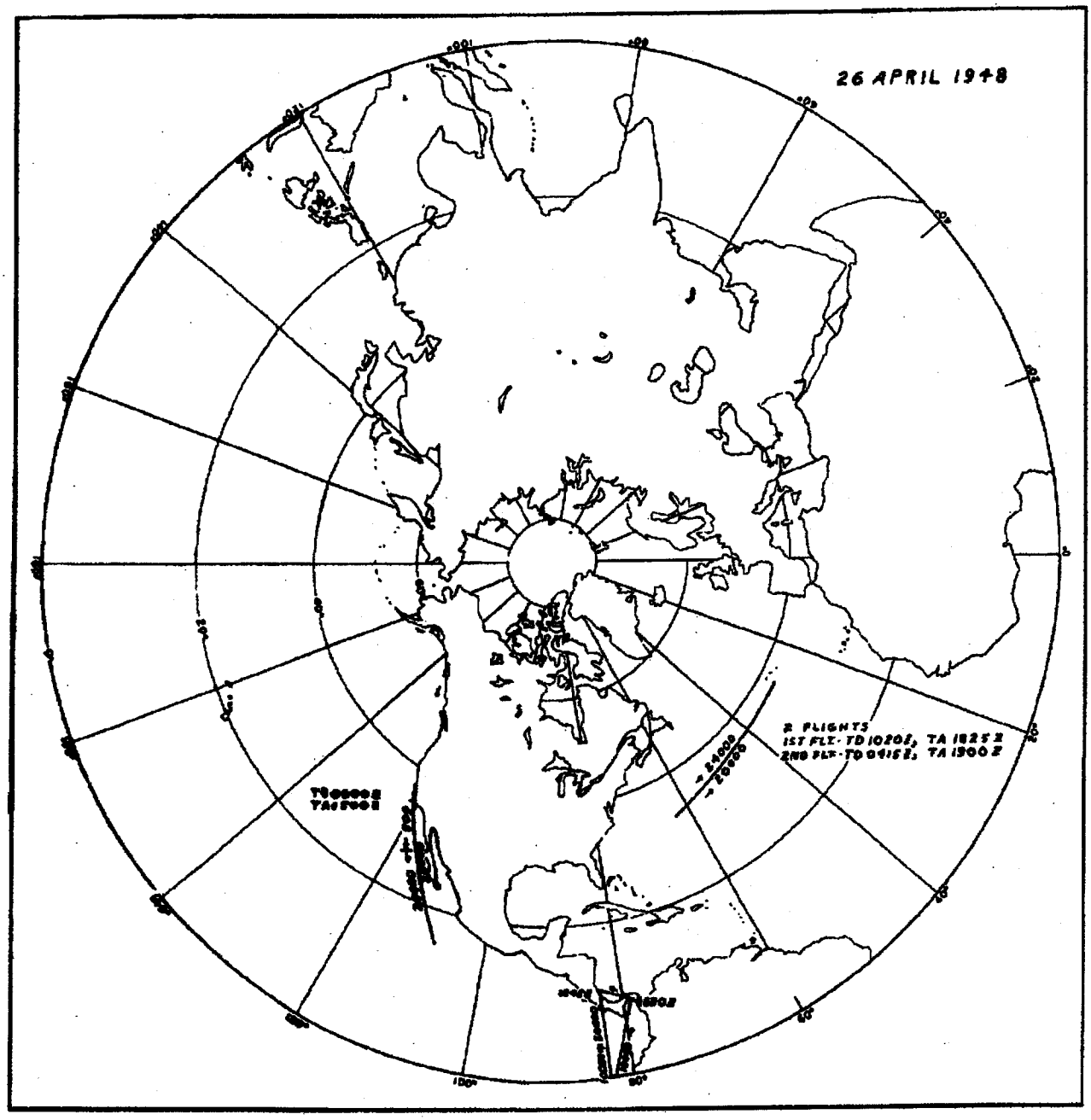

17 APRIL
8 APRIL
2 APRIL
6 APRIL
17 APRIL
18 APRIL
26 MARCH
20 MARCH
TO 12°S
TEST FLIGHTS
SEARCH FLIGHTS
TRACKS FLOWN BY B-29 AIRCRAFT
ON LOAN TO NRL FOR TEST & RESEARCH
CAPT. L.H. BRAUDE, USAF · OBSERVER

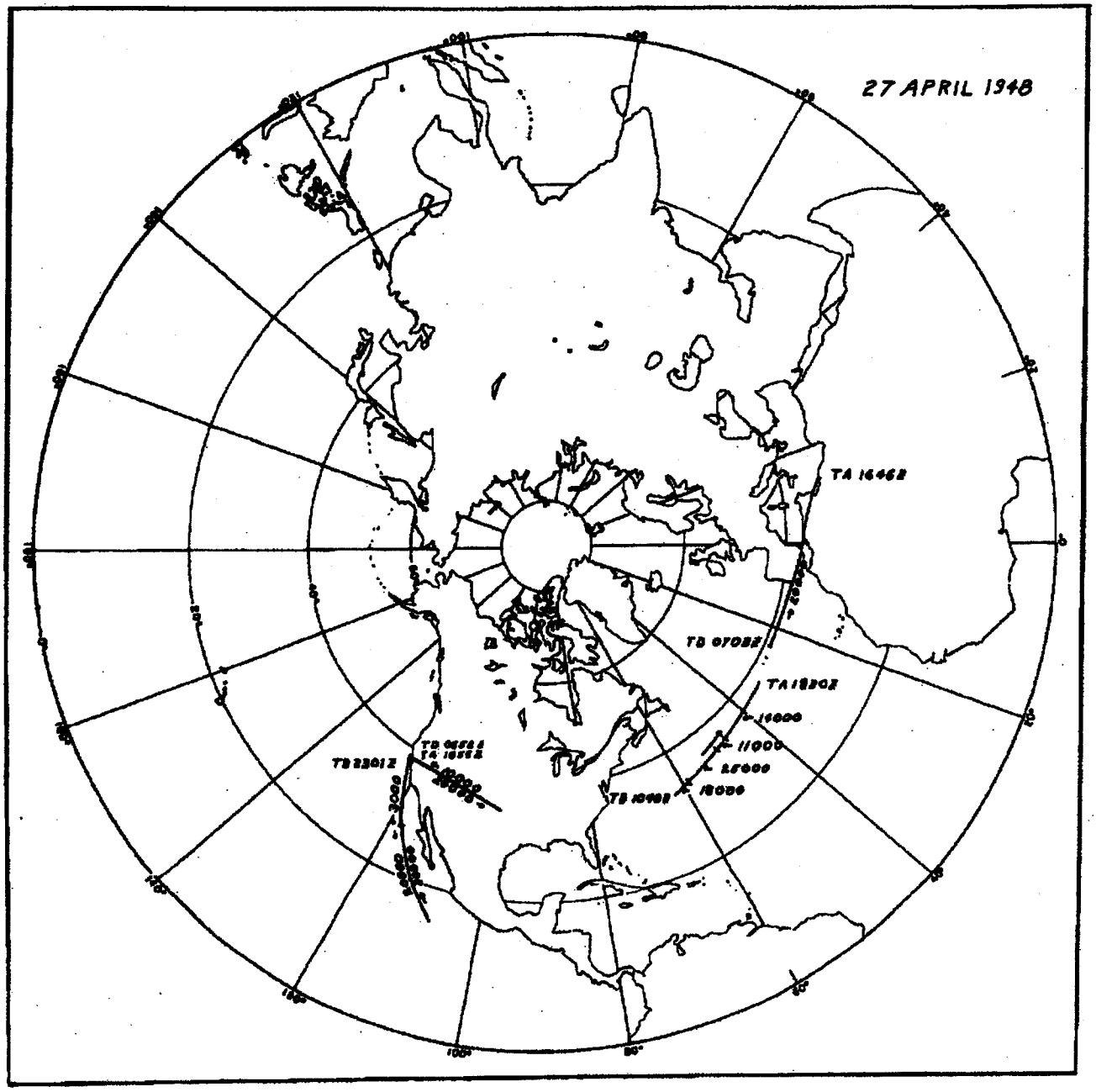

20 APRIL 1948

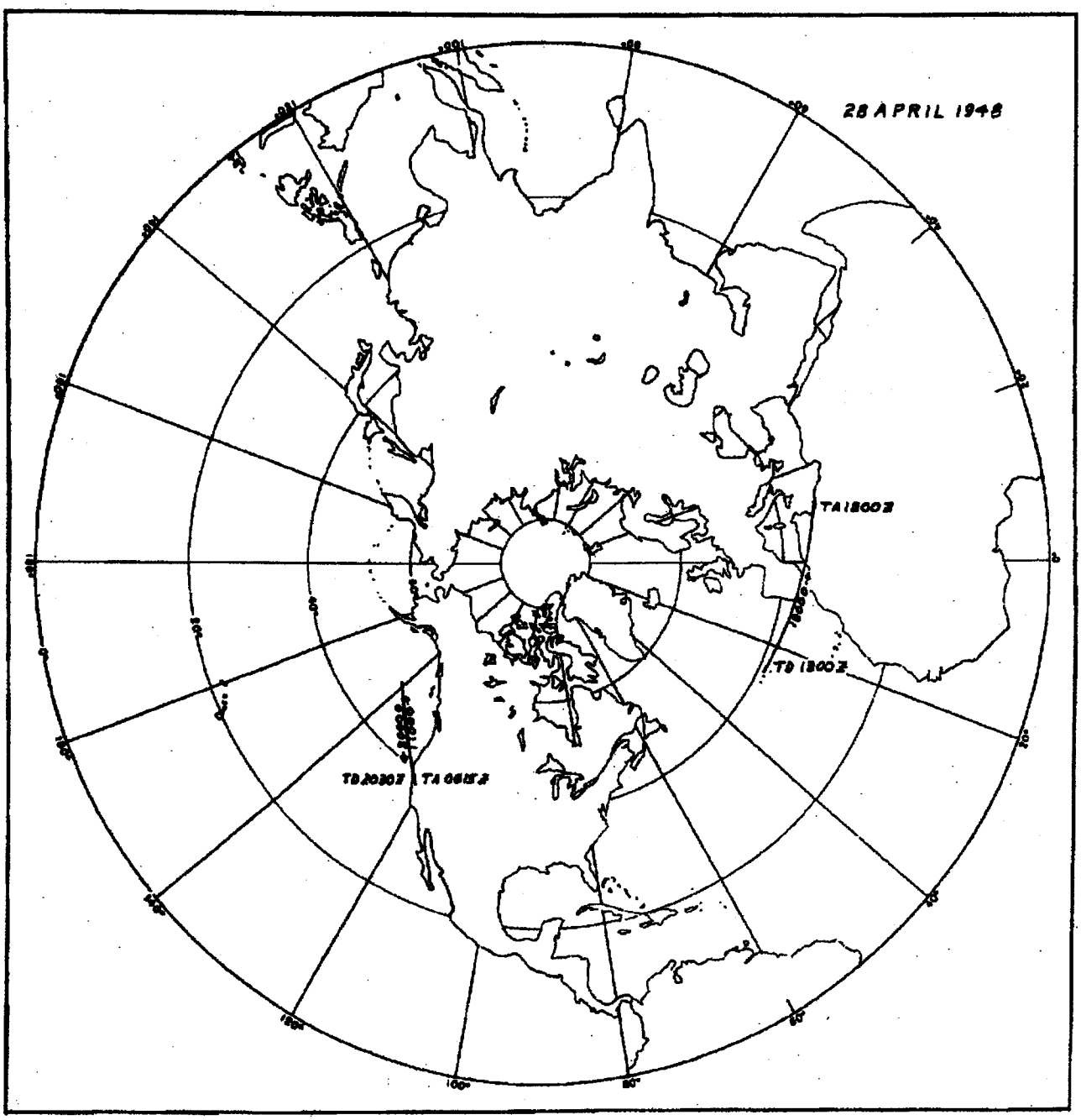

21 APRIL 1948

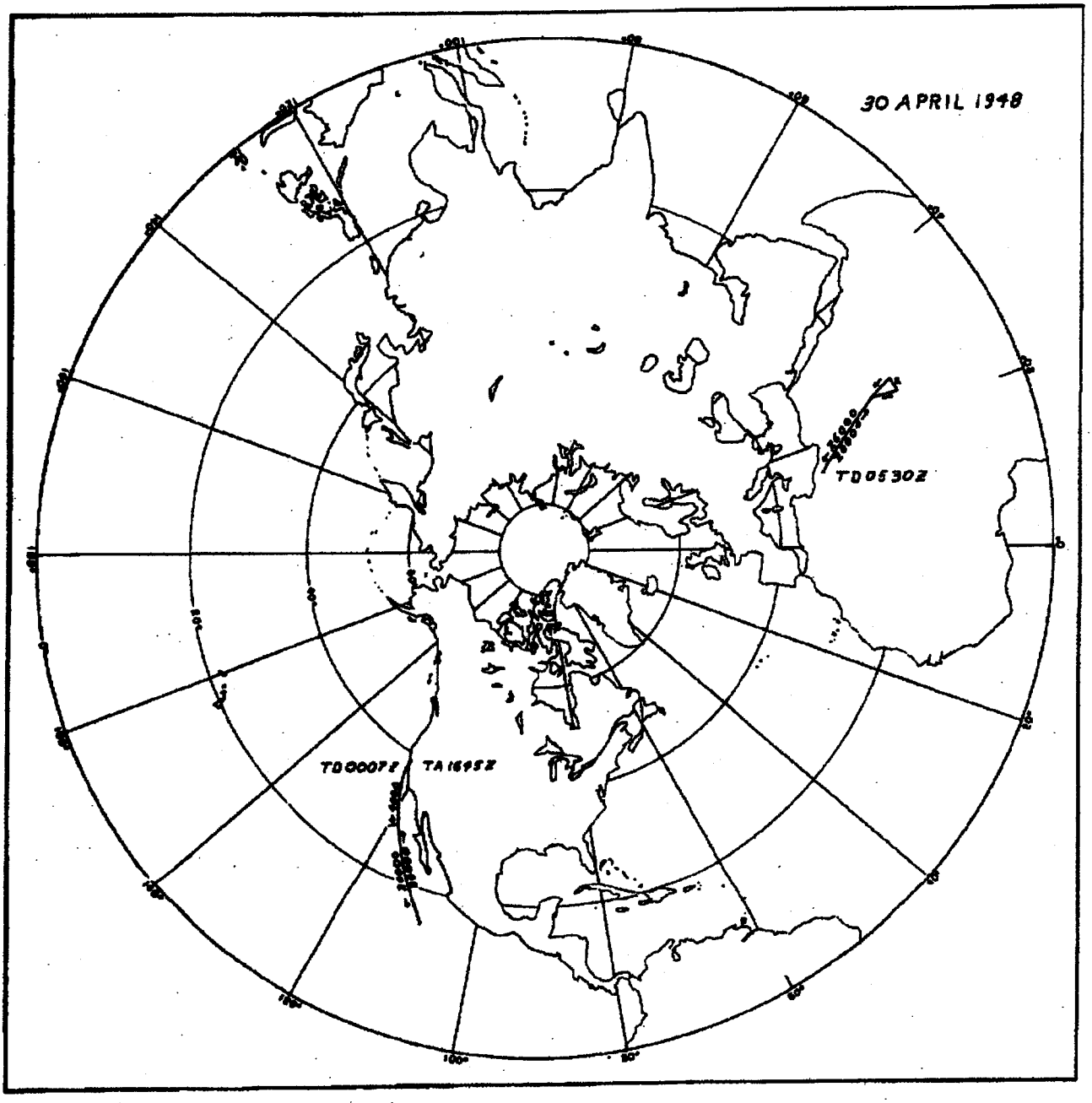

23 APRIL 1948

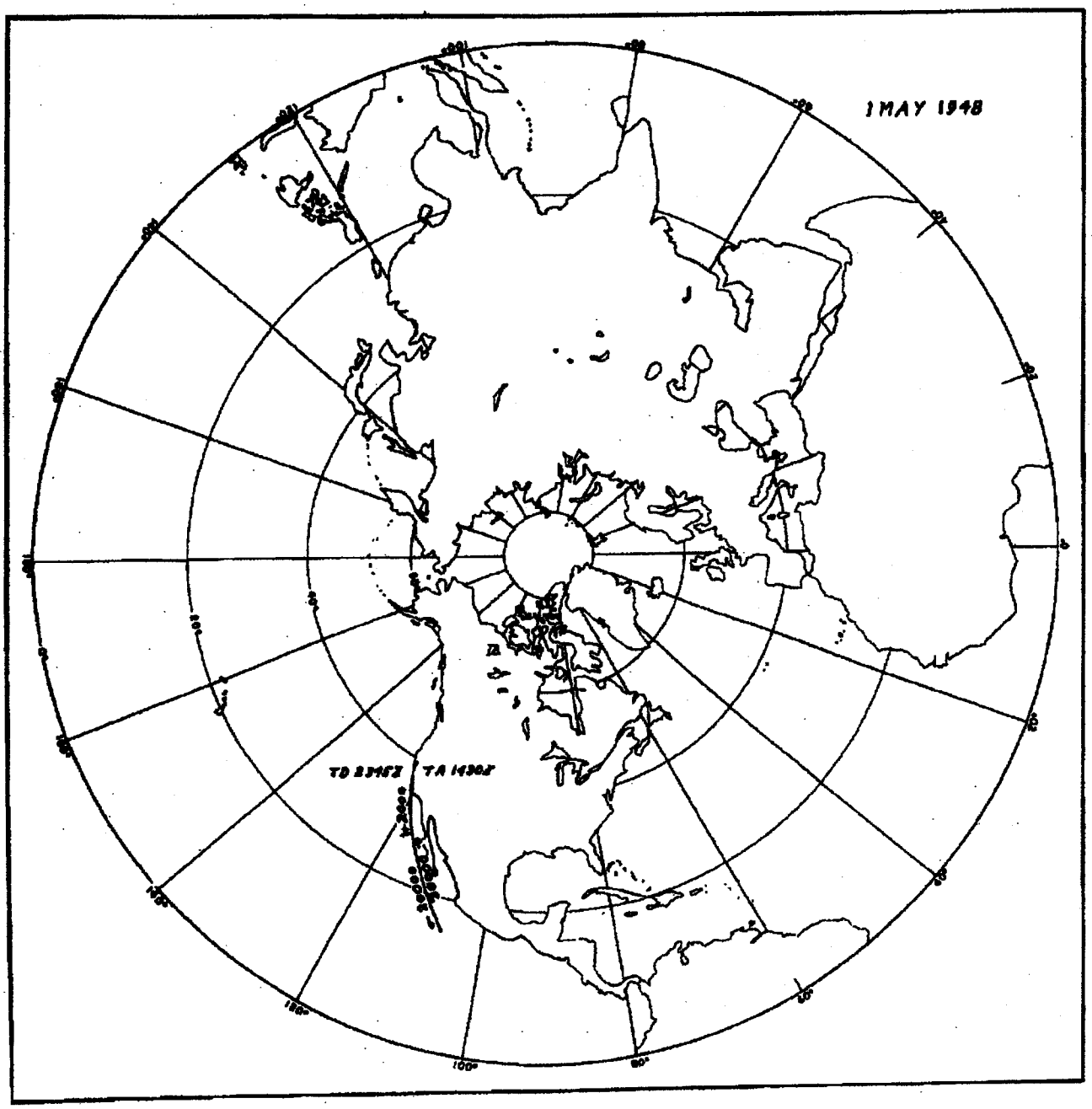

25 APRIL 1948
TD 2305Z
TA 1940Z
2 FLIGHTS
1ST FLT- TD 1102Z, TA 1925Z
2ND FLT- TD 1030Z, TA 1910Z

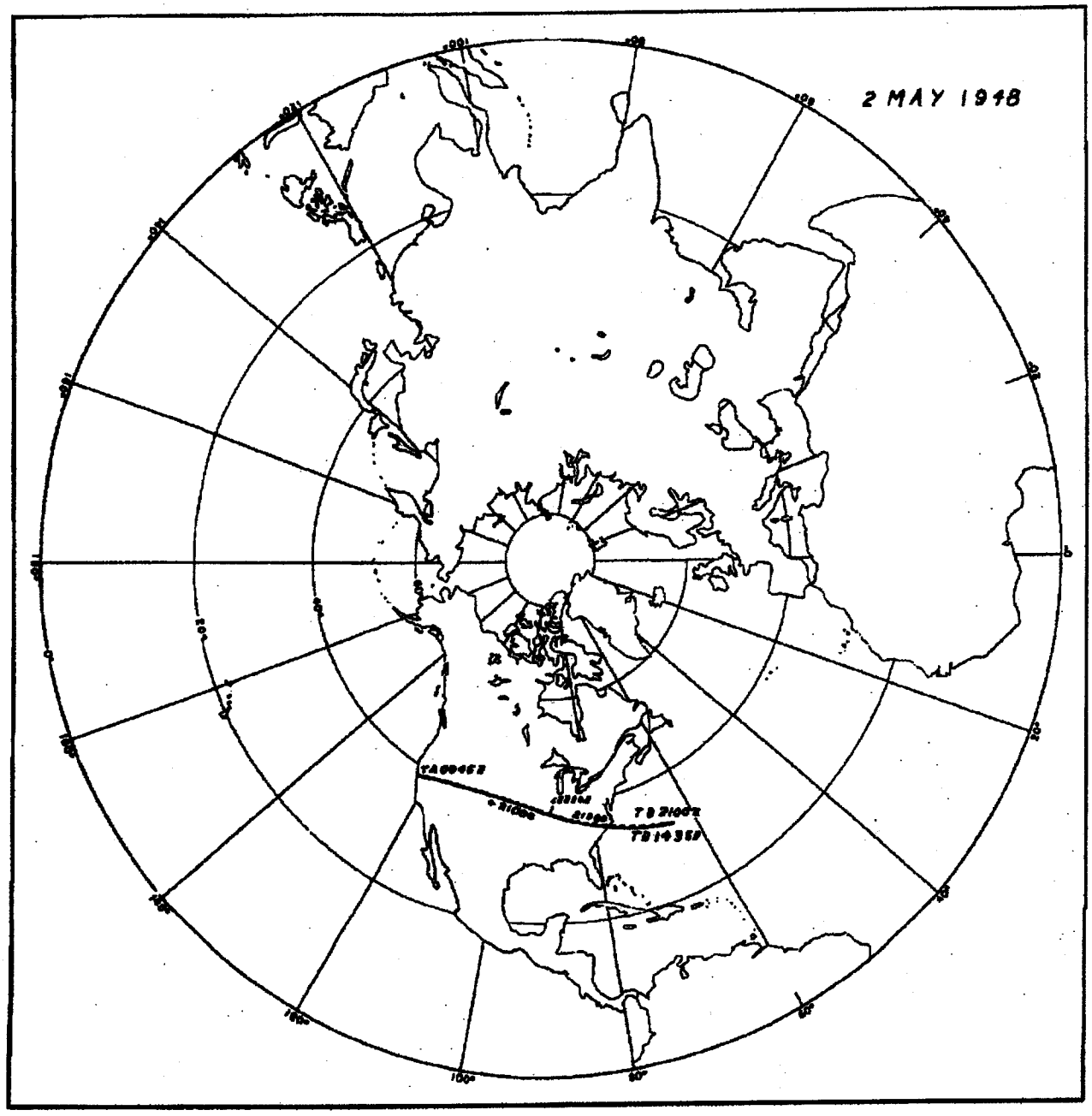

26 APRIL 1948
2 FLIGHTS
1ST FLT - TD 10202, TA 1825 Z
2ND FLT - TD 04152, TA 1900 Z

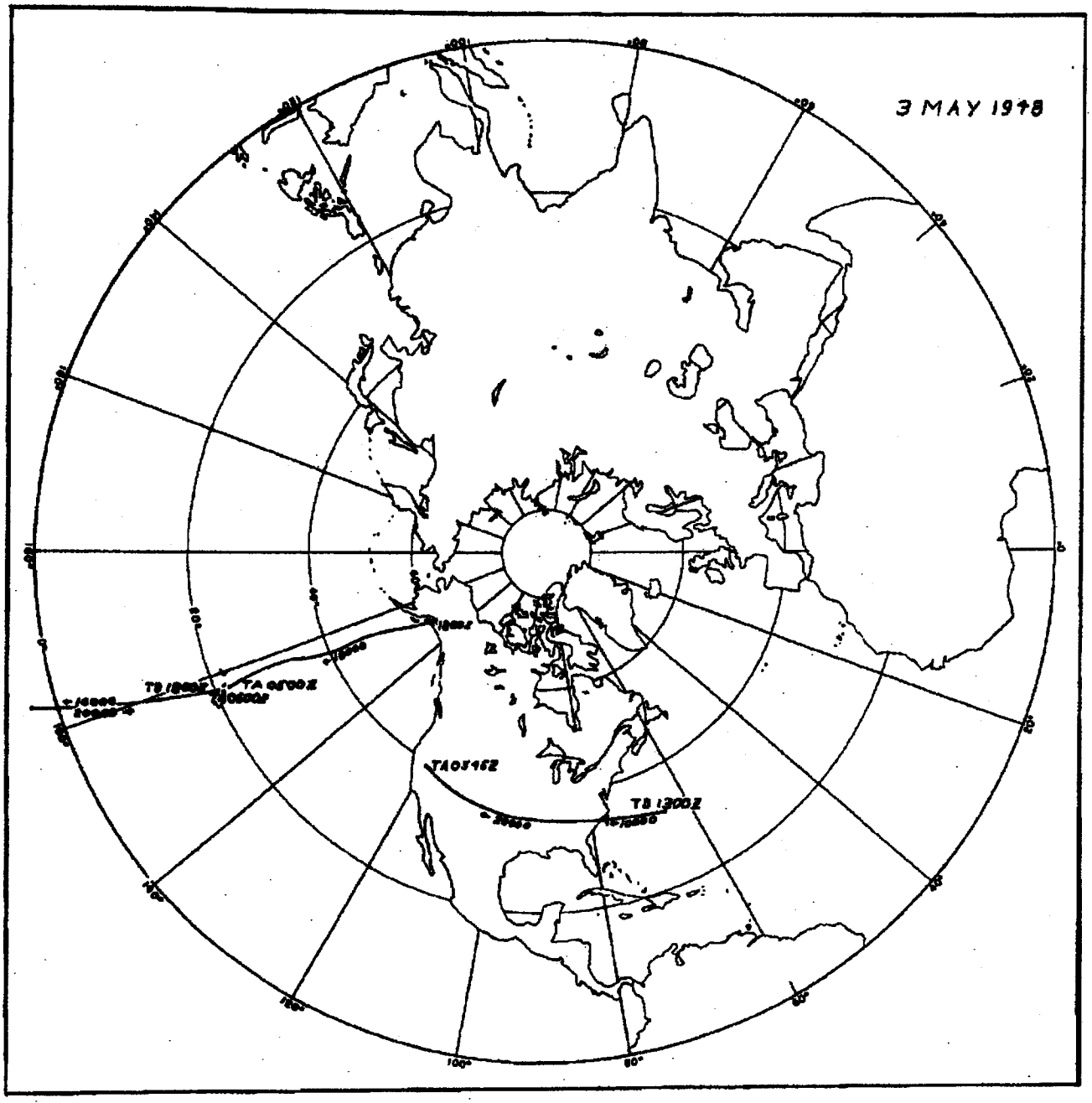

27 APRIL 1948
TA 16462
TB 07082
TA 18202
14000
11000
15000
18000
TB 10482
TB 22012
TB 19582
TA 19582
3000
6000
9000
12000
15000
18000
21000
24000
27000
30000
33000
36000
39000
42000
45000
48000
51000
54000
57000
60000
63000
66000
69000
72000
75000
78000
81000
84000
87000
90000
93000
96000
99000
102000
105000
108000
111000
114000
117000
120000
123000
126000
129000
132000
135000
138000
141000
144000
147000
150000
153000
156000
159000
162000
165000
168000
171000
174000
177000
180000

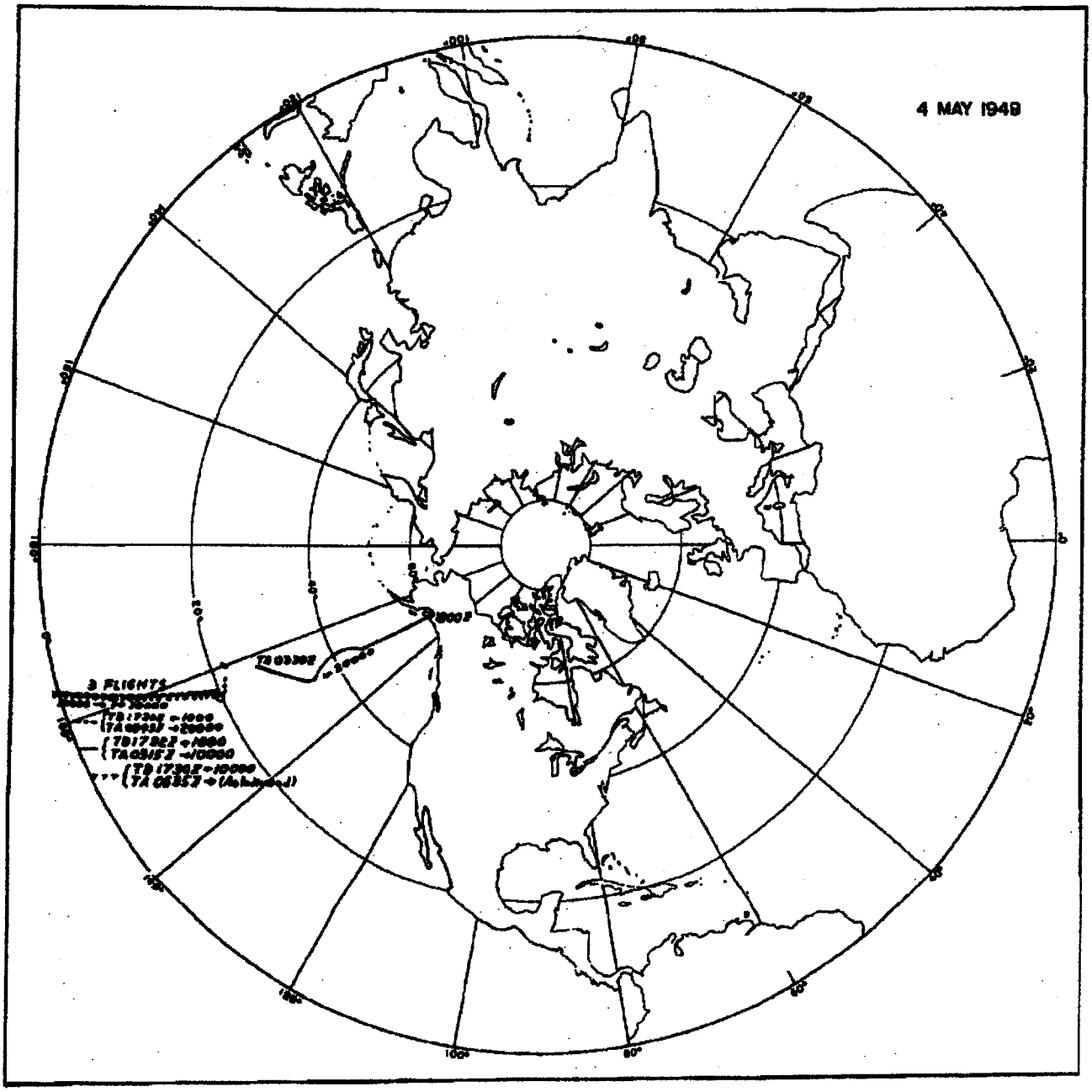

28 APRIL 1948
TA 1800Z
TD 1800Z
TD 2030Z
TA 0615Z

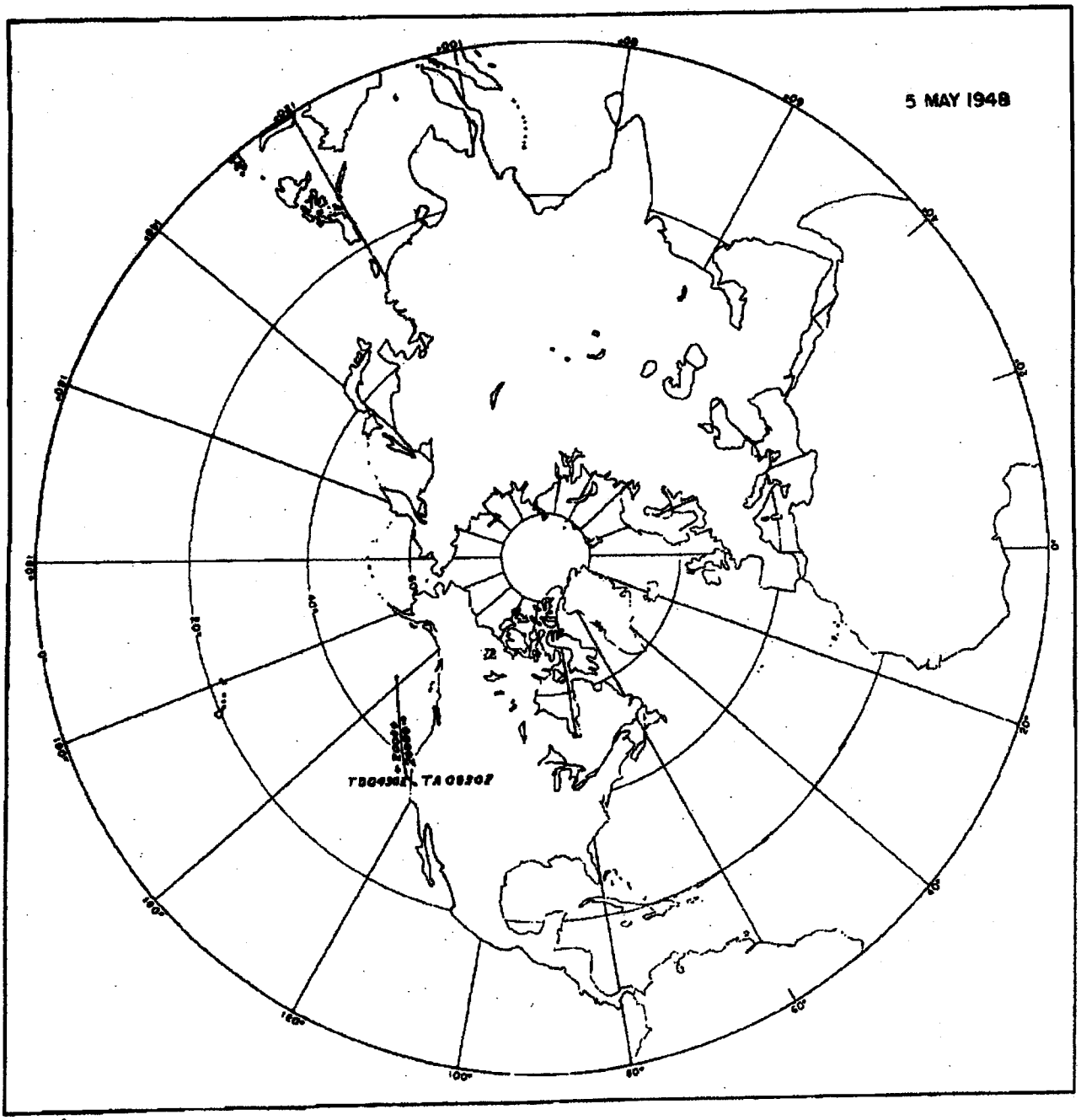

30 APRIL 1948
TD05302
TD00072
TA16952

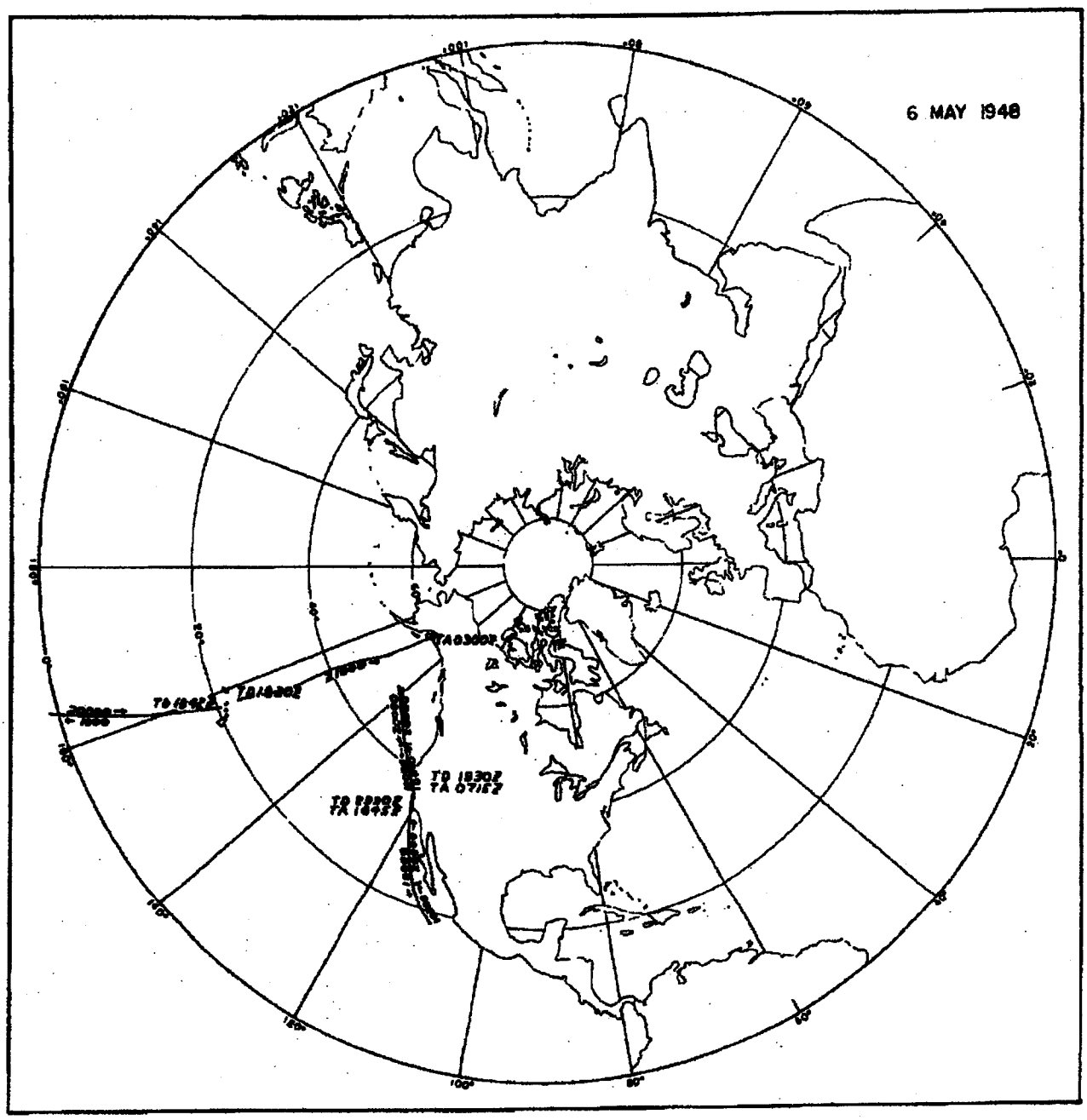

1 MAY 1948

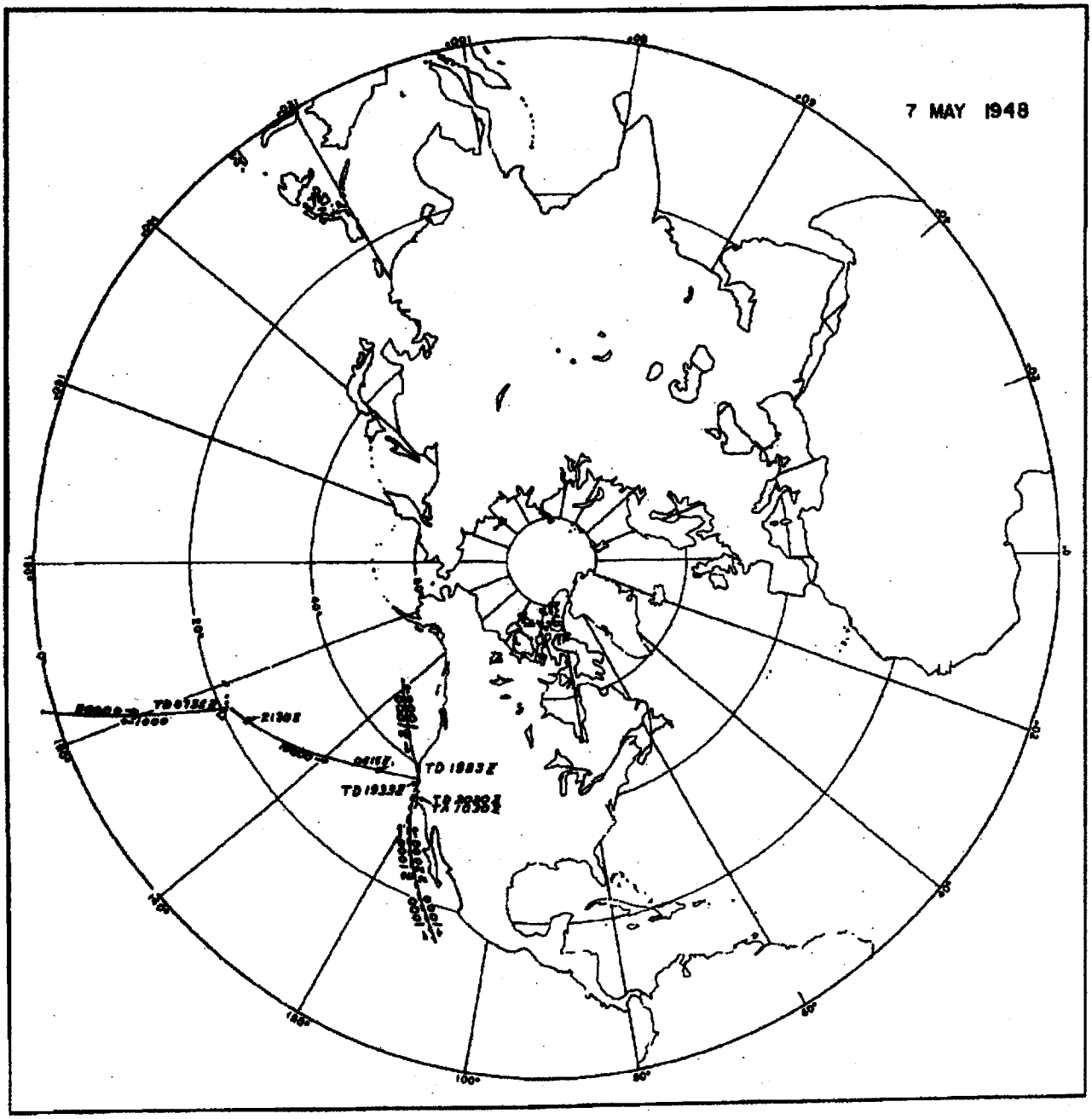

2 MAY 1948

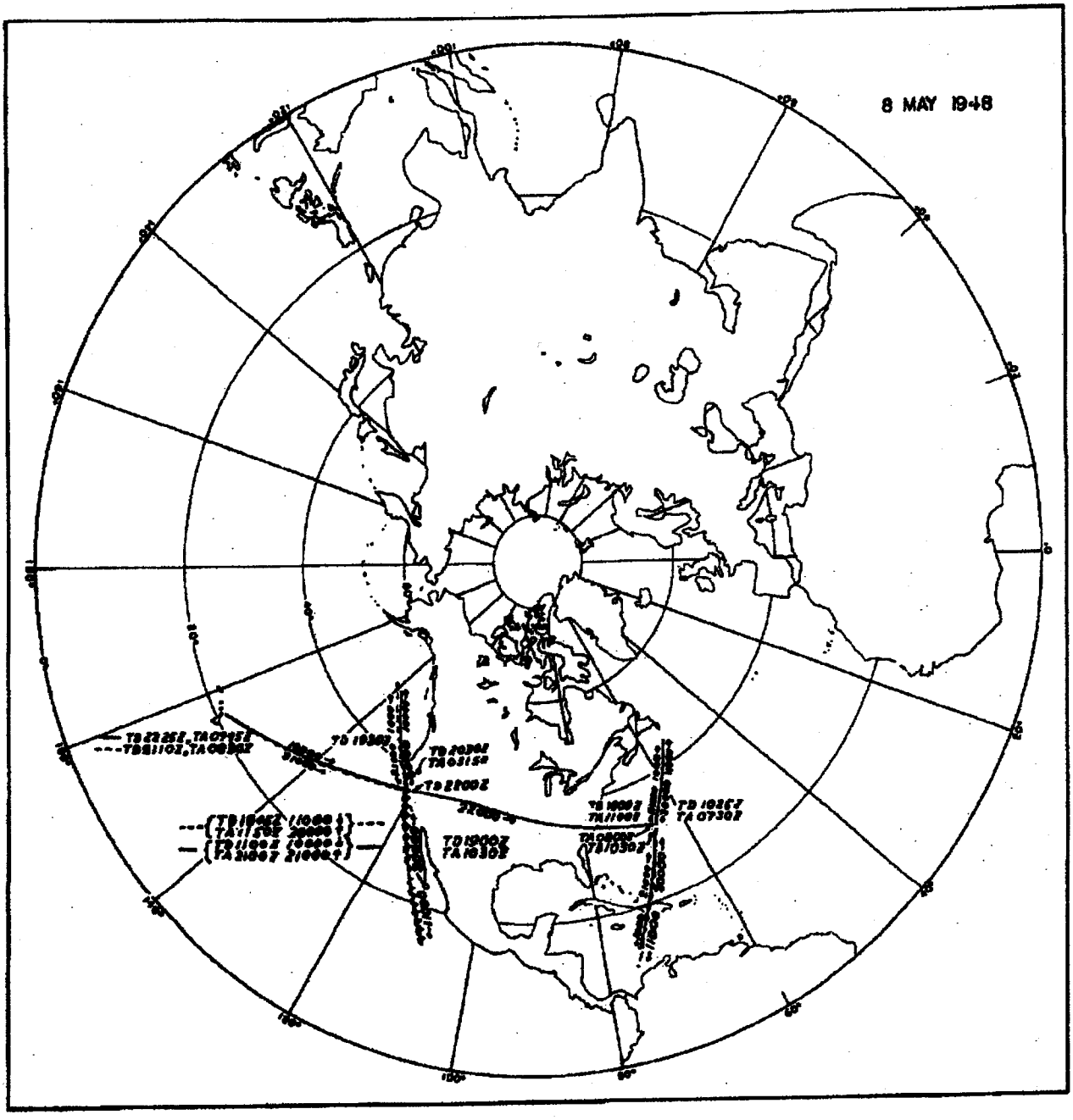

3 MAY 1948
TA 0500Z
TA 0515Z
TB 1300Z

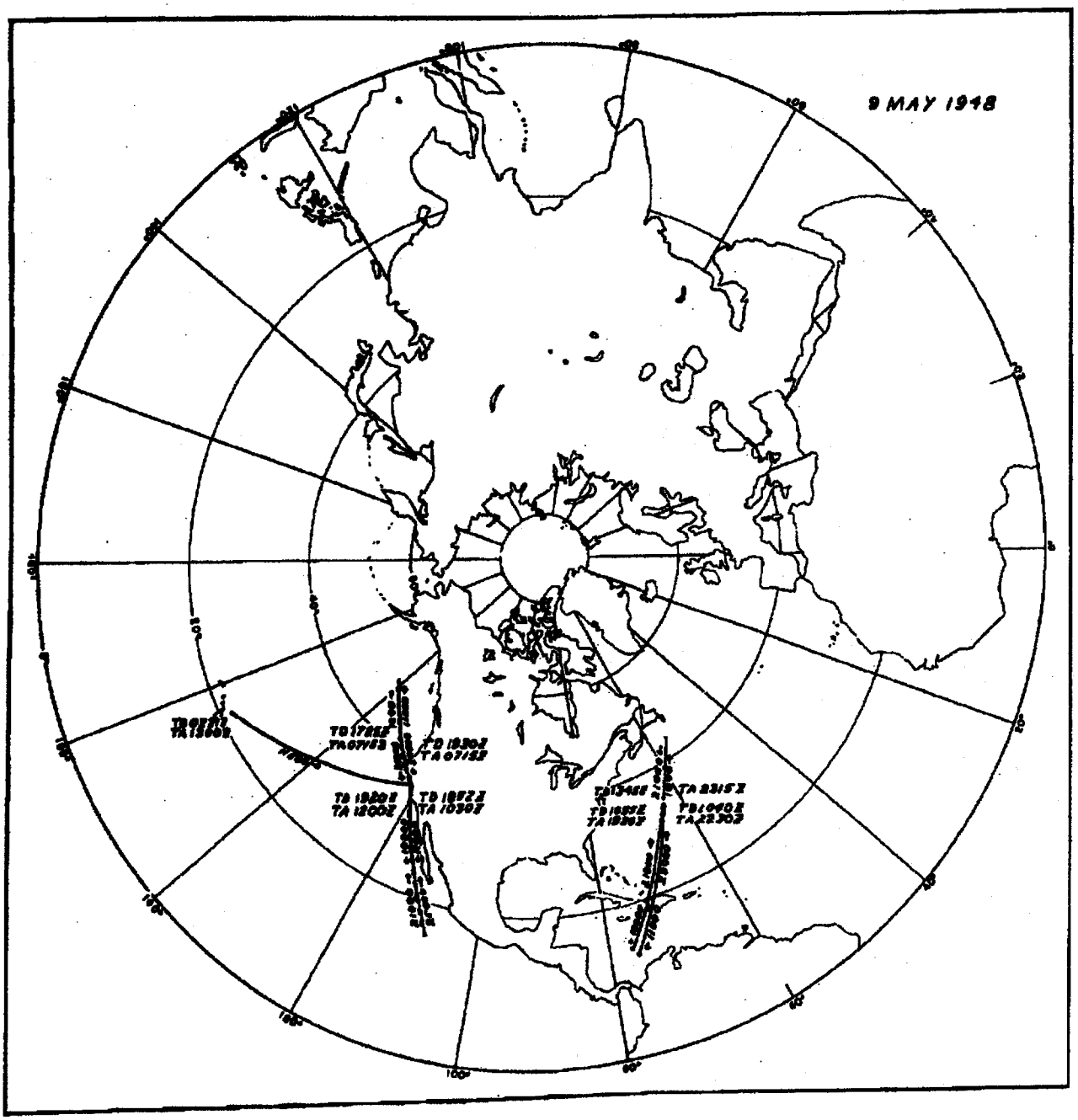

4 MAY 1948
3 FLIGHTS

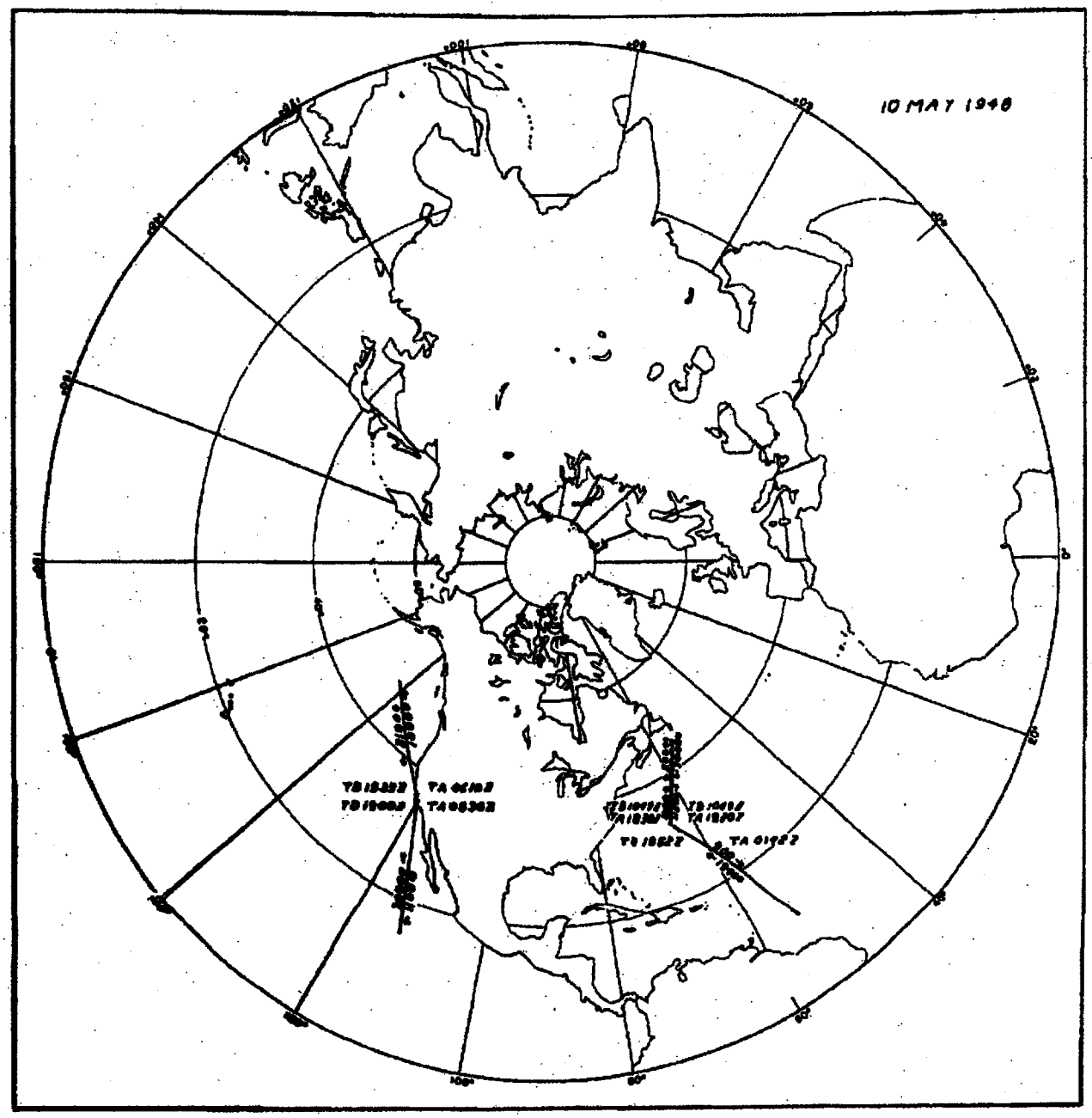

5 MAY 1948

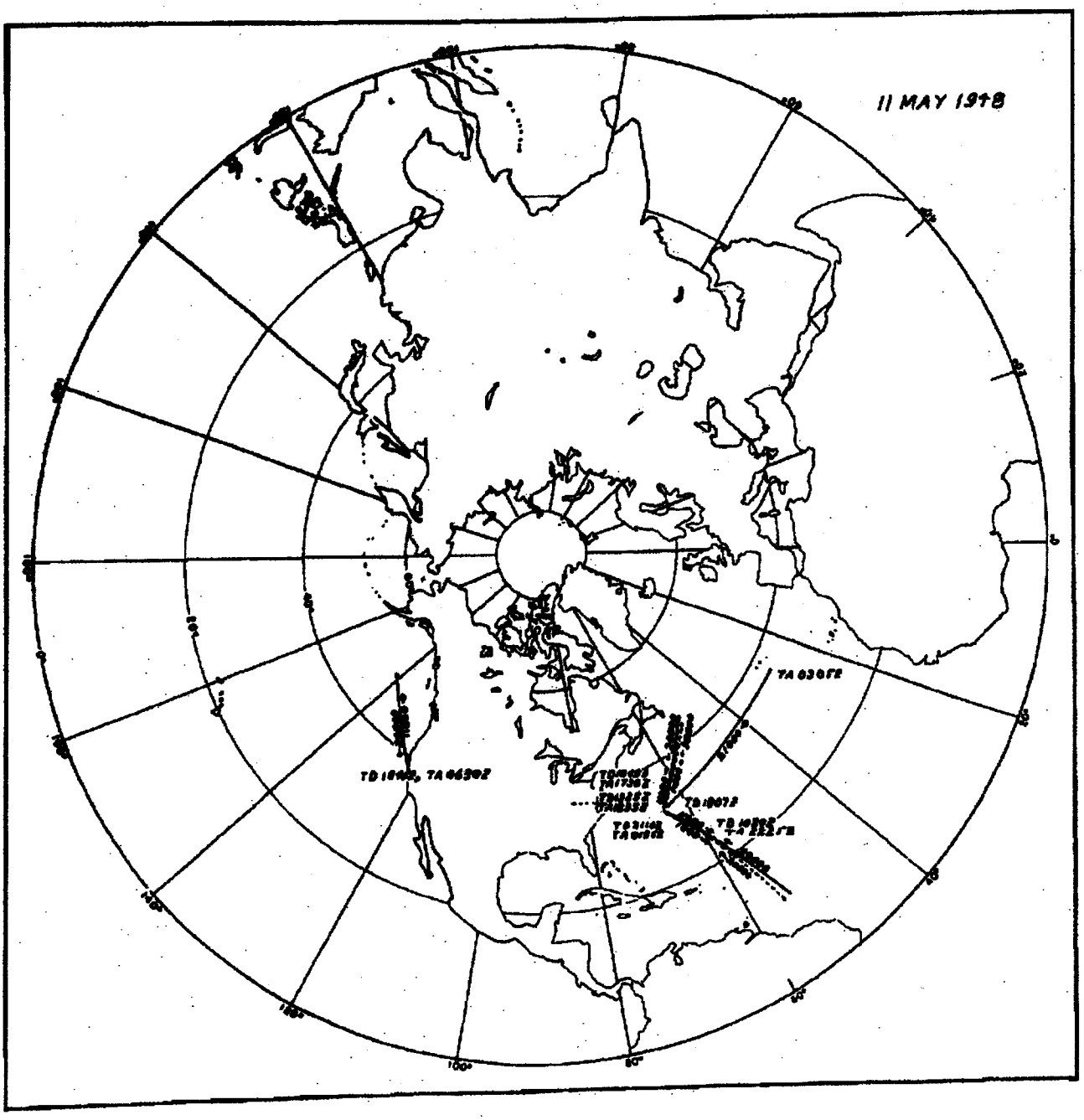

6 MAY 1948

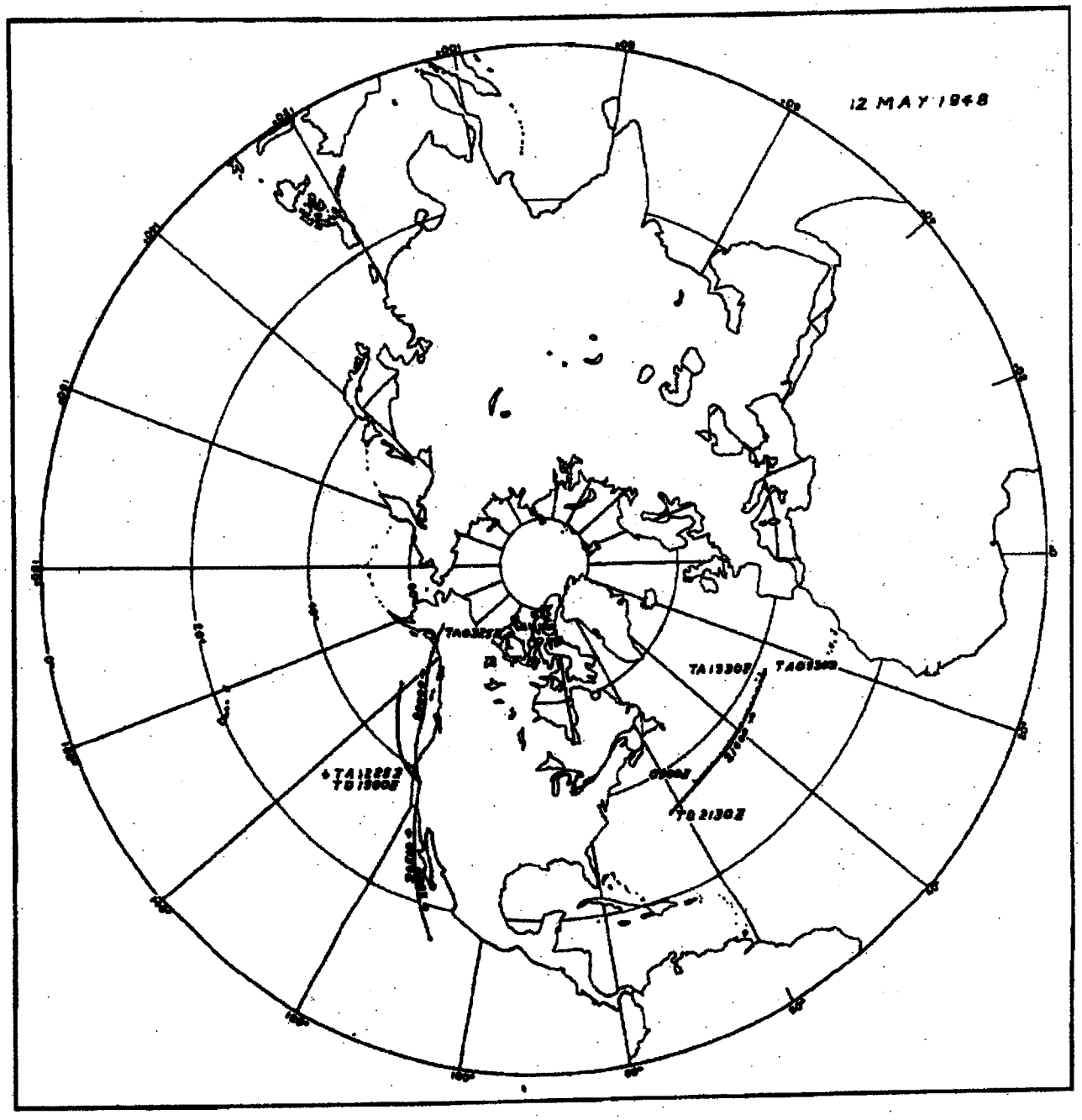

7 MAY 1948
TD 1883 E
TD 1933 E

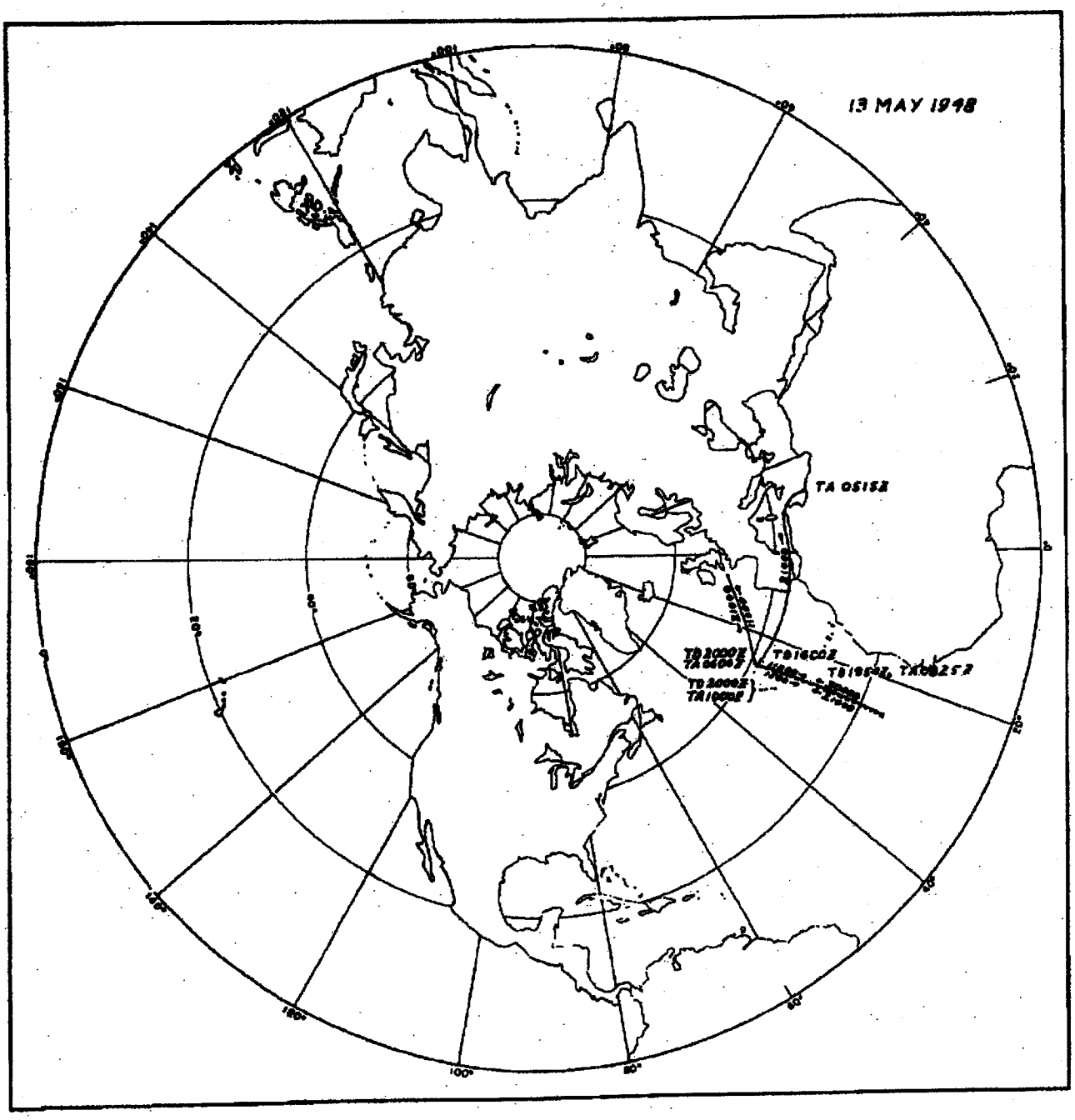

8 MAY 1948

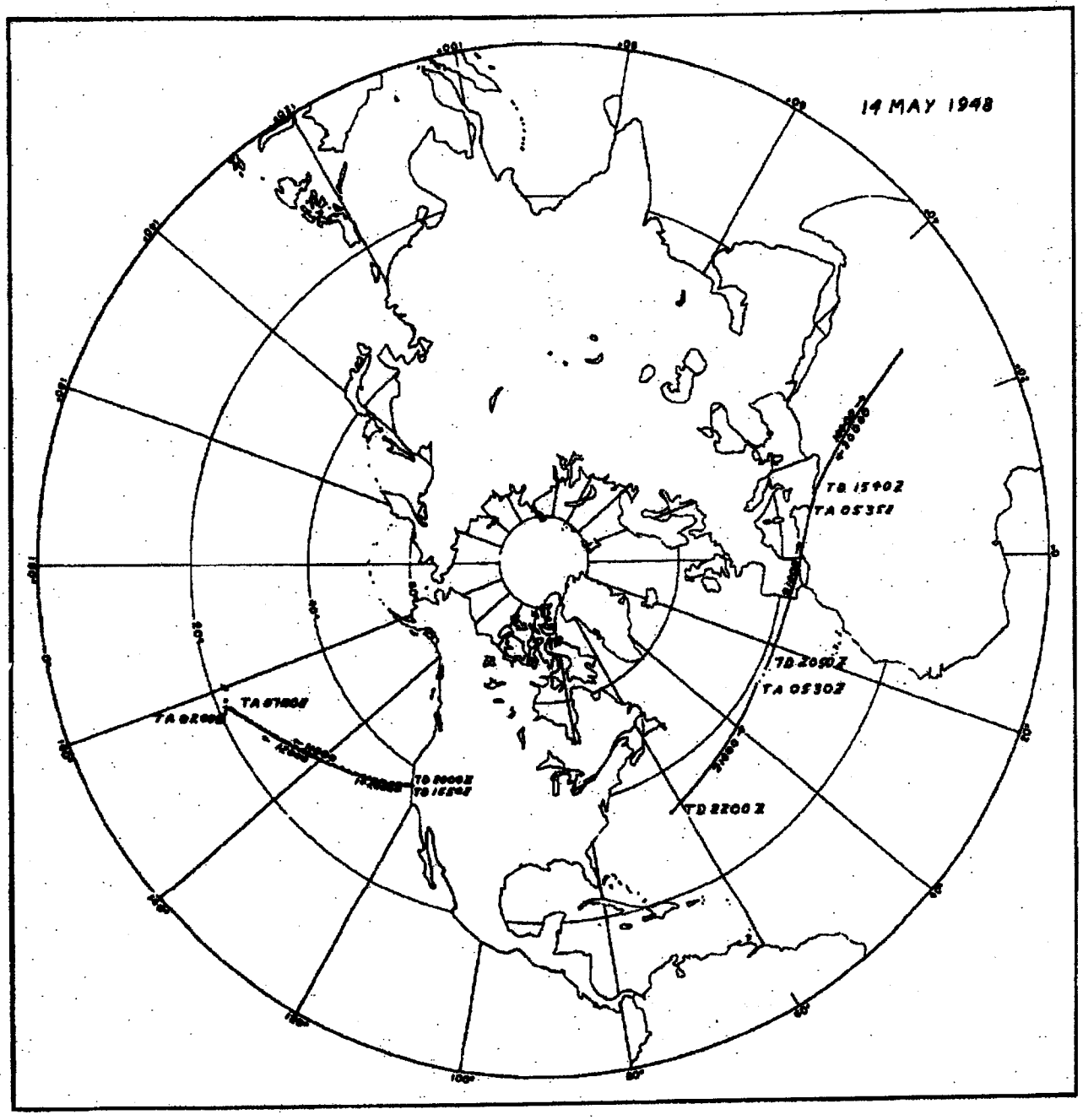

9 MAY 1948

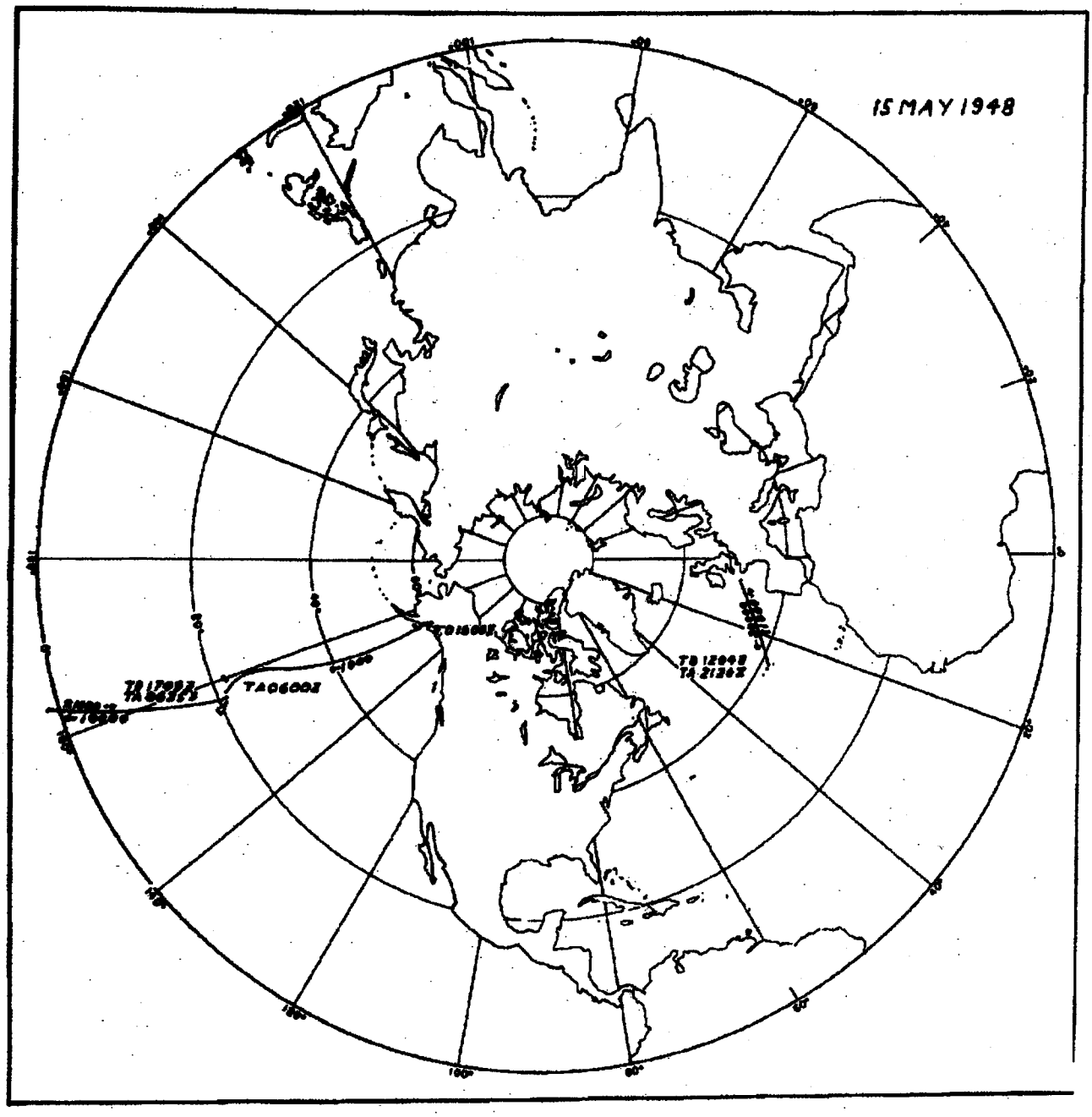

10 MAY 1948

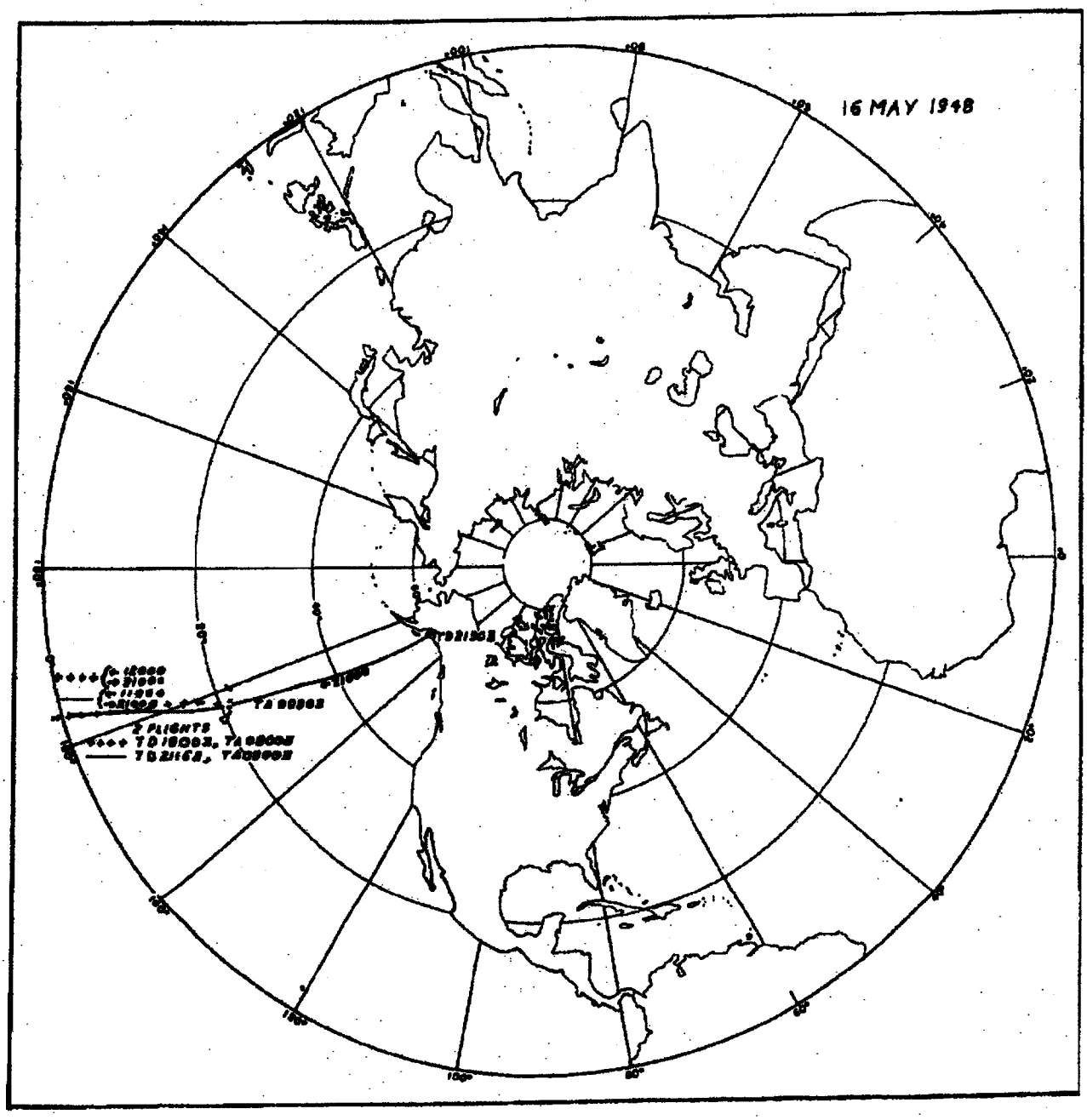

11 MAY 1918
TA 63072
TD 19072

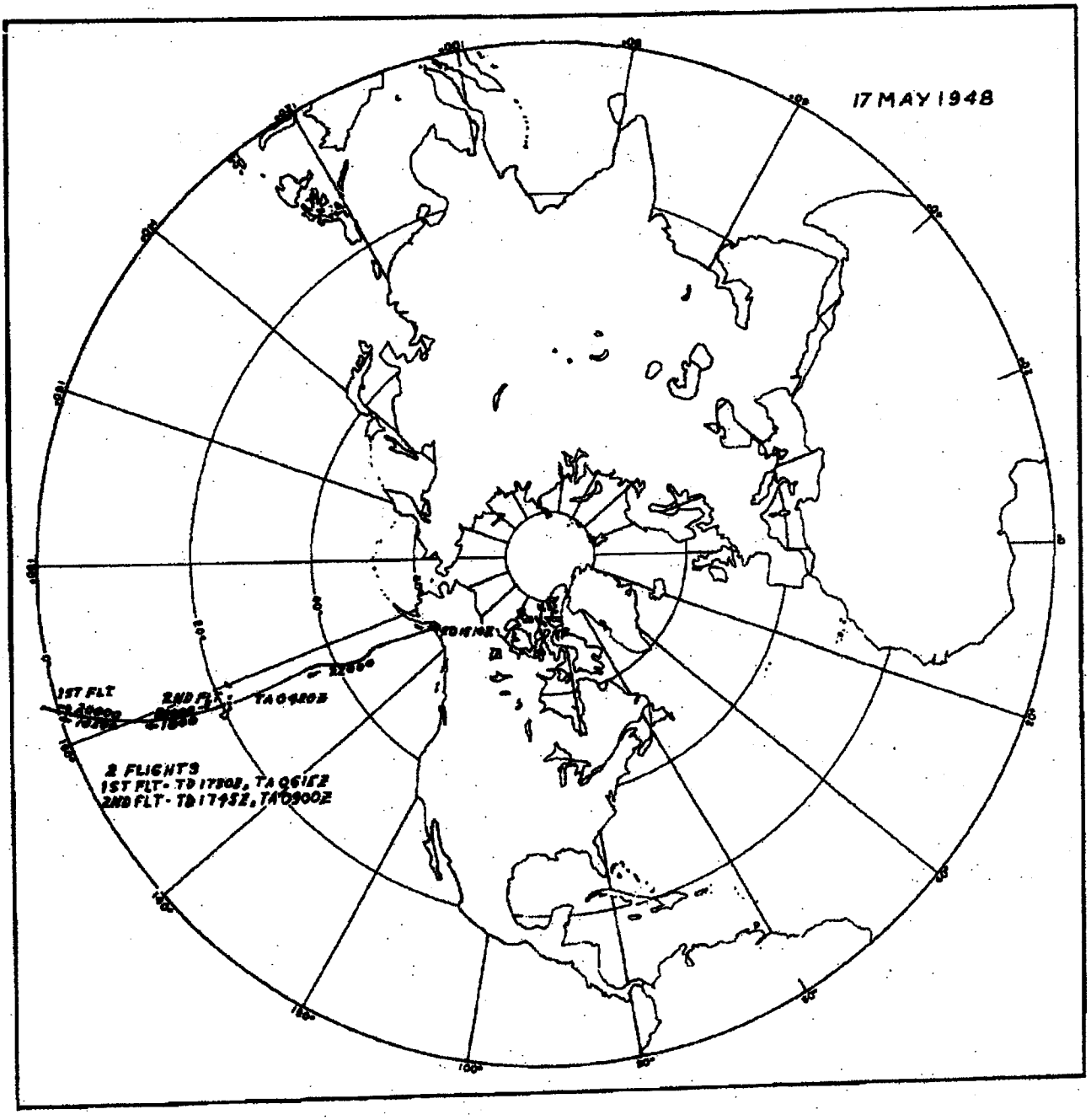

12 MAY 1948
TA 13302
TA 21302
TA 13302
TA 13302
TO 13002
TO 21302

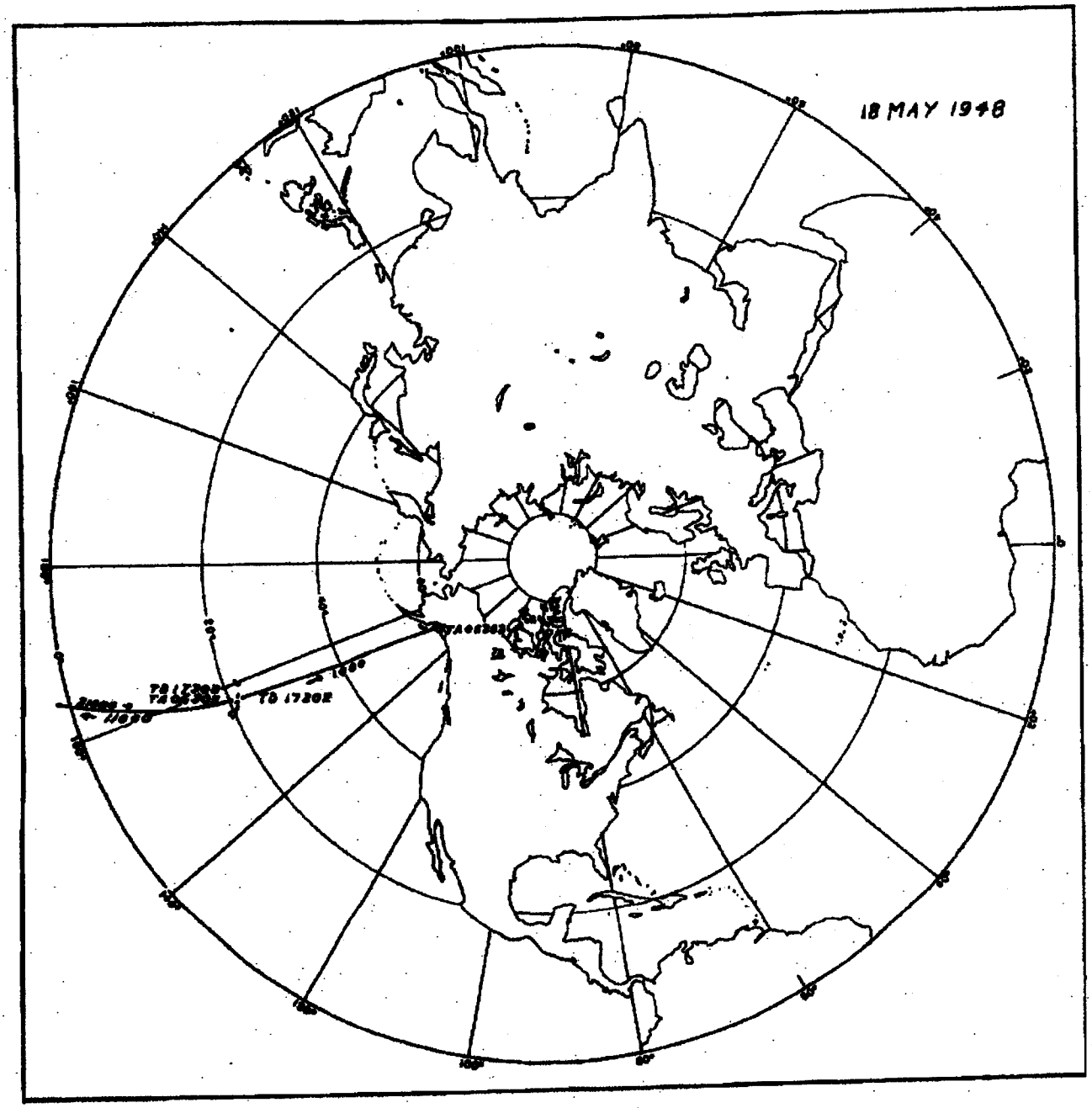

13 MAY 1948
TA 05152
TB 16002
TB 19002
TA 08252
TD 20002
TA 06002
TD 20002
TR 10002

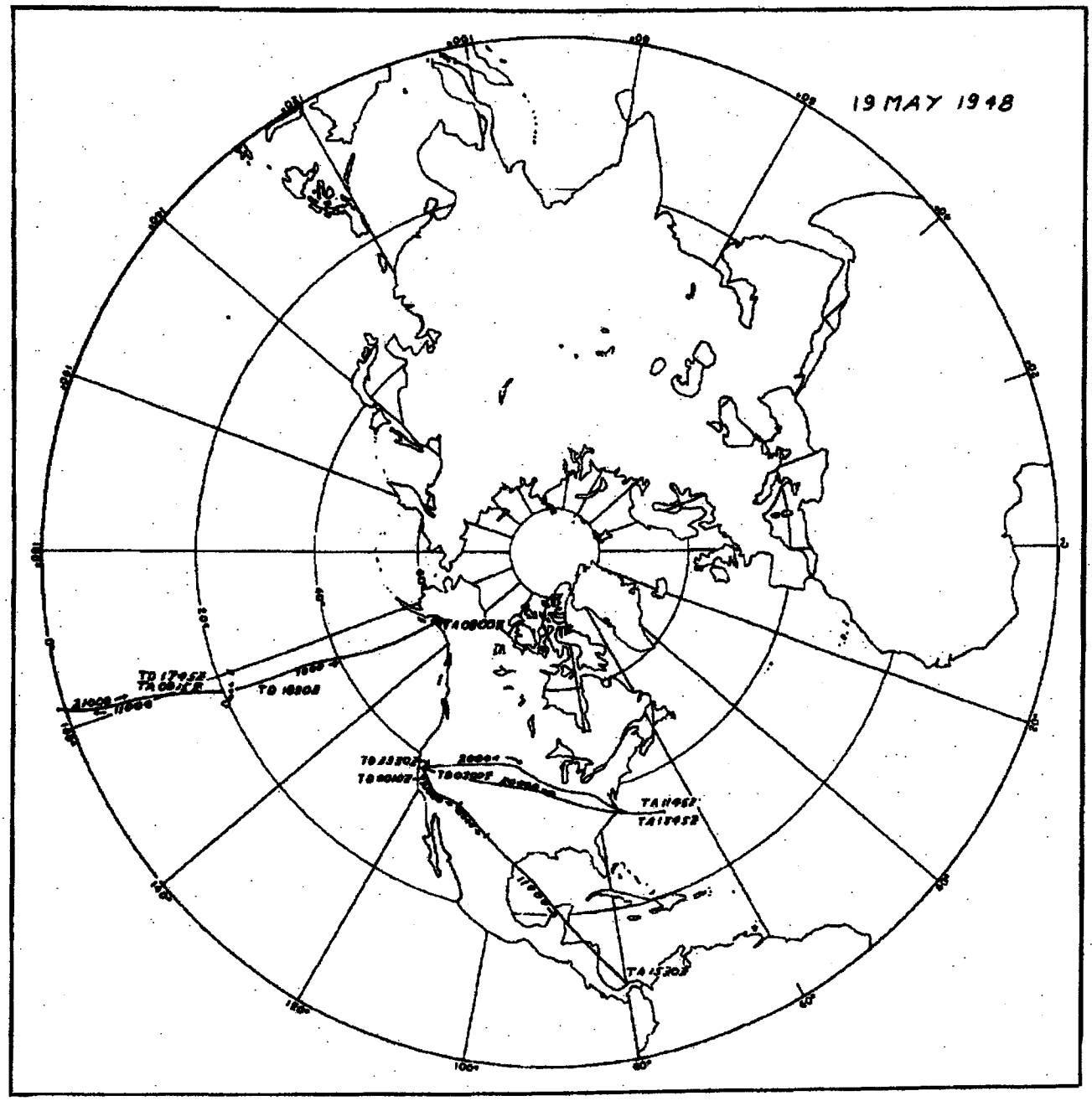

14 MAY 1948
TA 15402
TA 05351
TD 20502
TA 05302
TD 22002
TA 07002
TD 00002
TD 16502

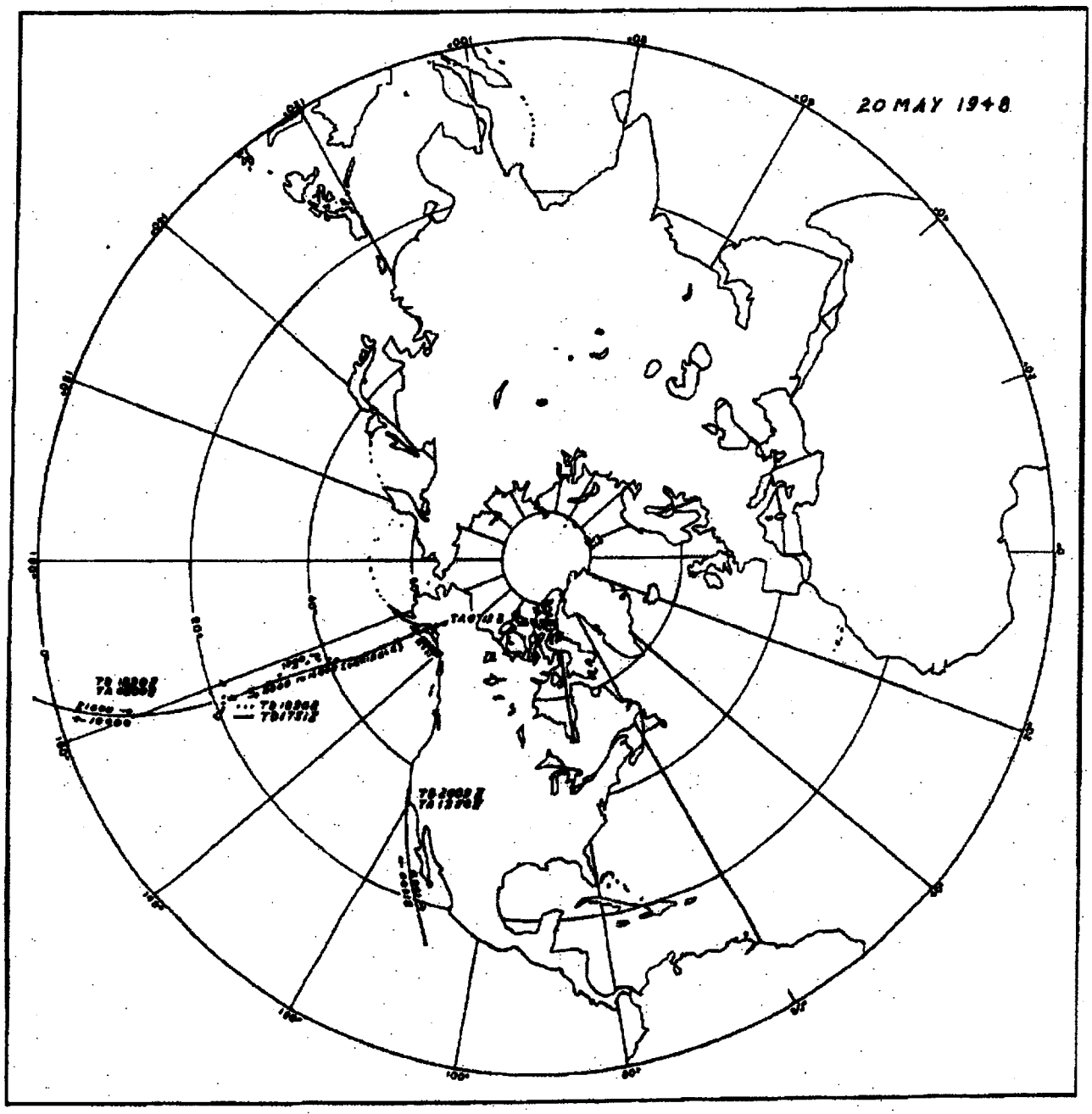

15 MAY 1948

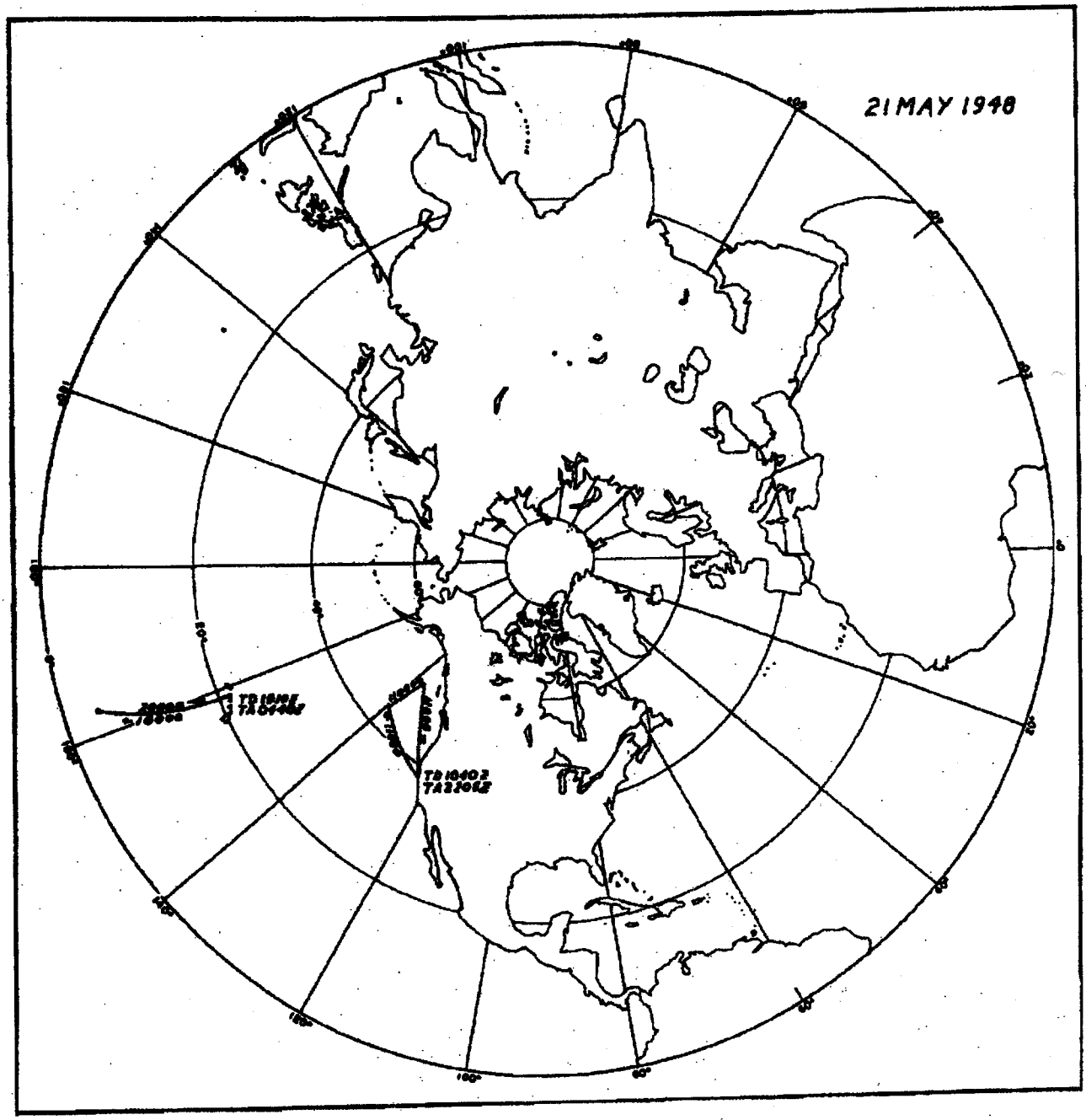

16 MAY 1948
2 FLIGHTS

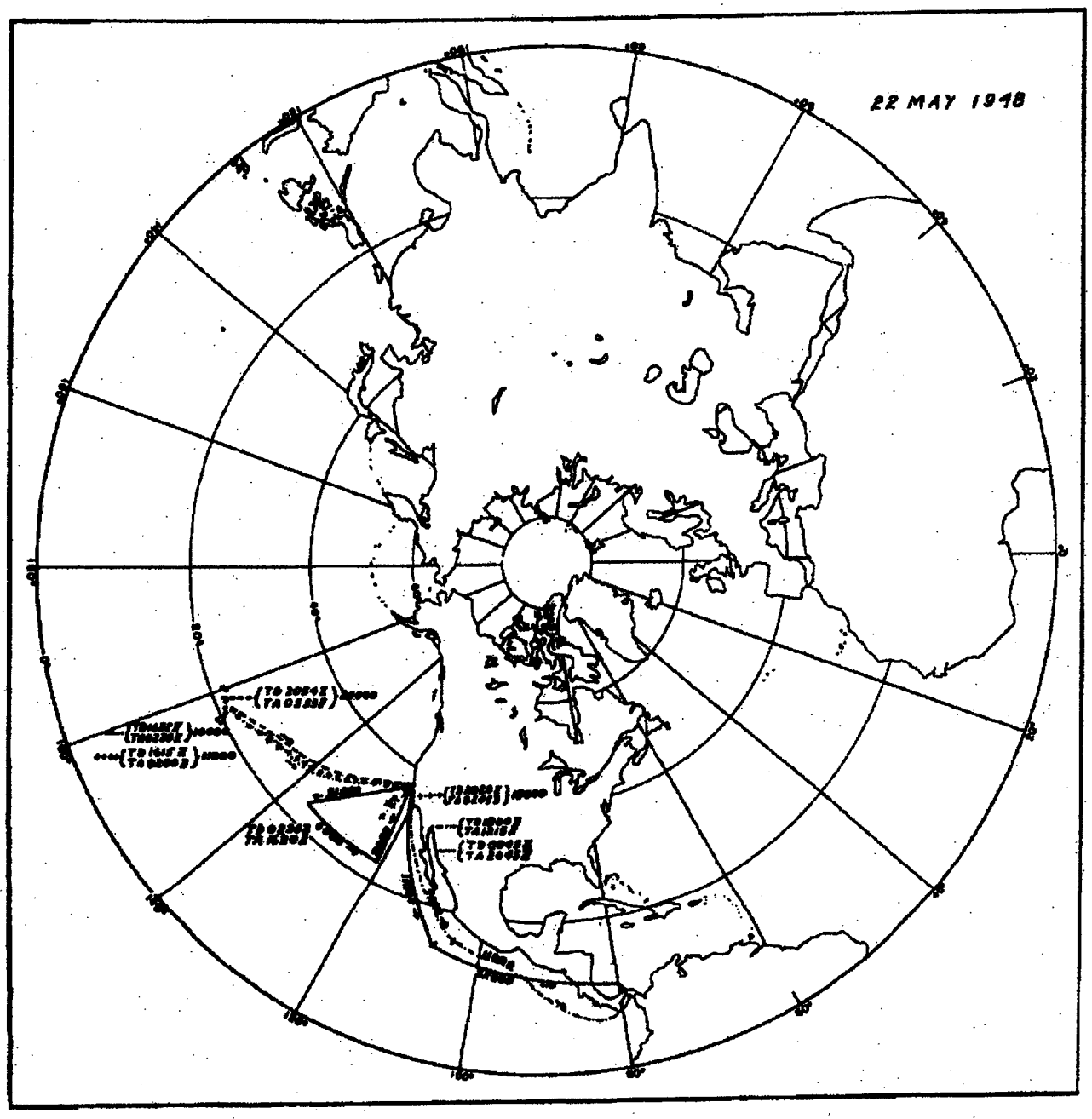

17 MAY 1948
1ST FLT
2ND FLT
TA06402
2 FLIGHTS
1ST FLT - TB 17308, TA06152
2ND FLT - TB 17452, TA09002

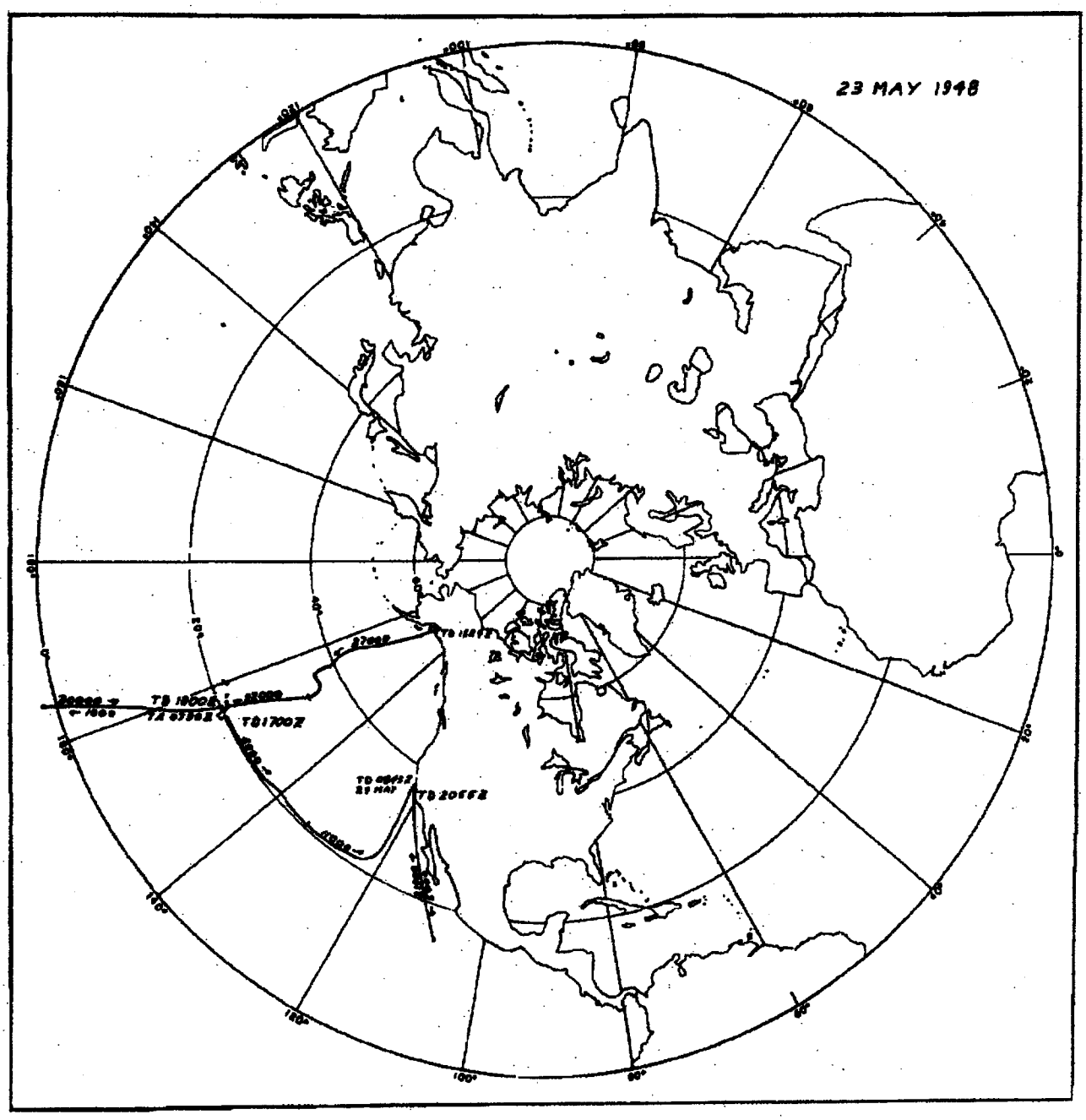

18 MAY 1948

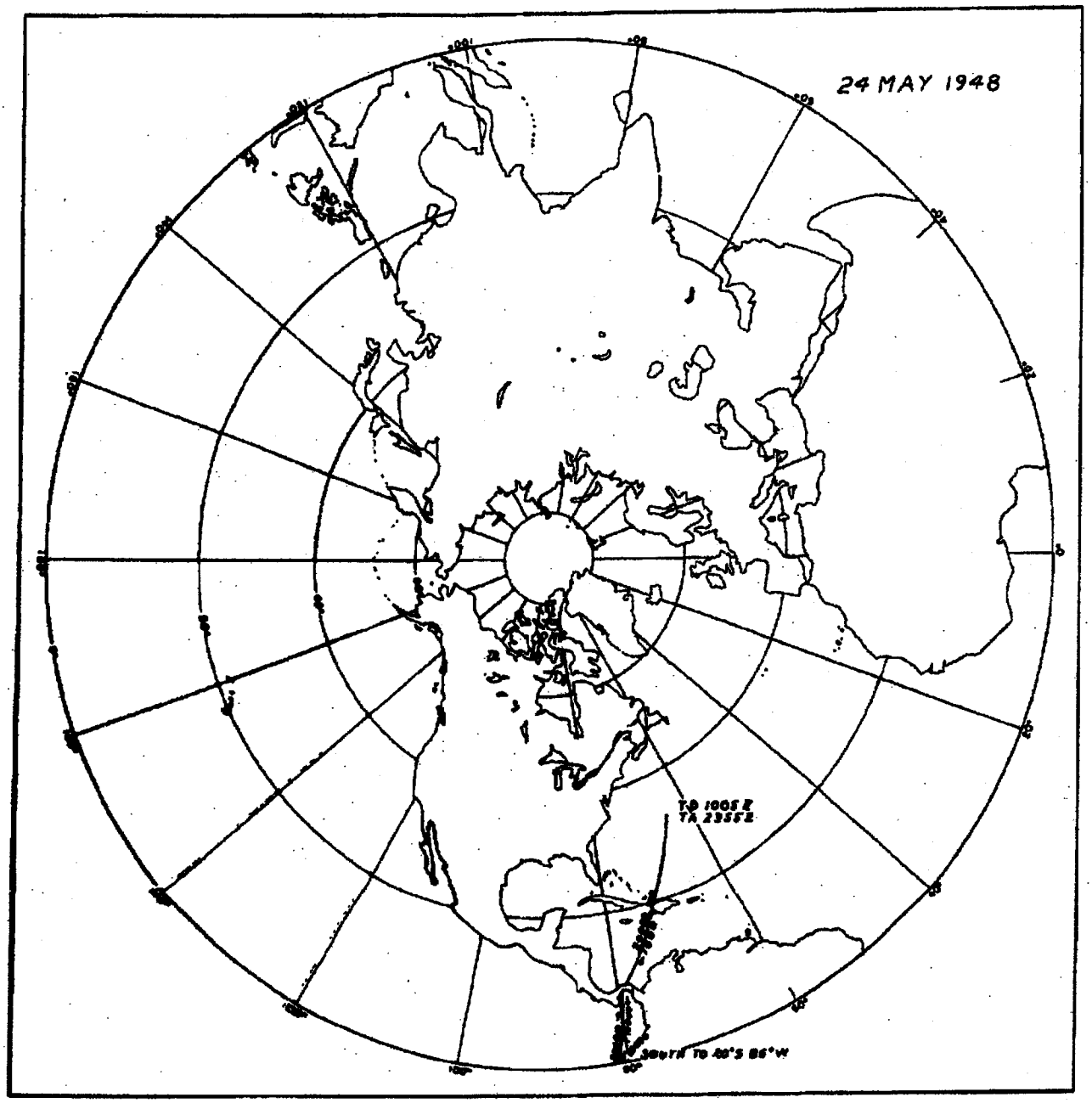

19 MAY 1948

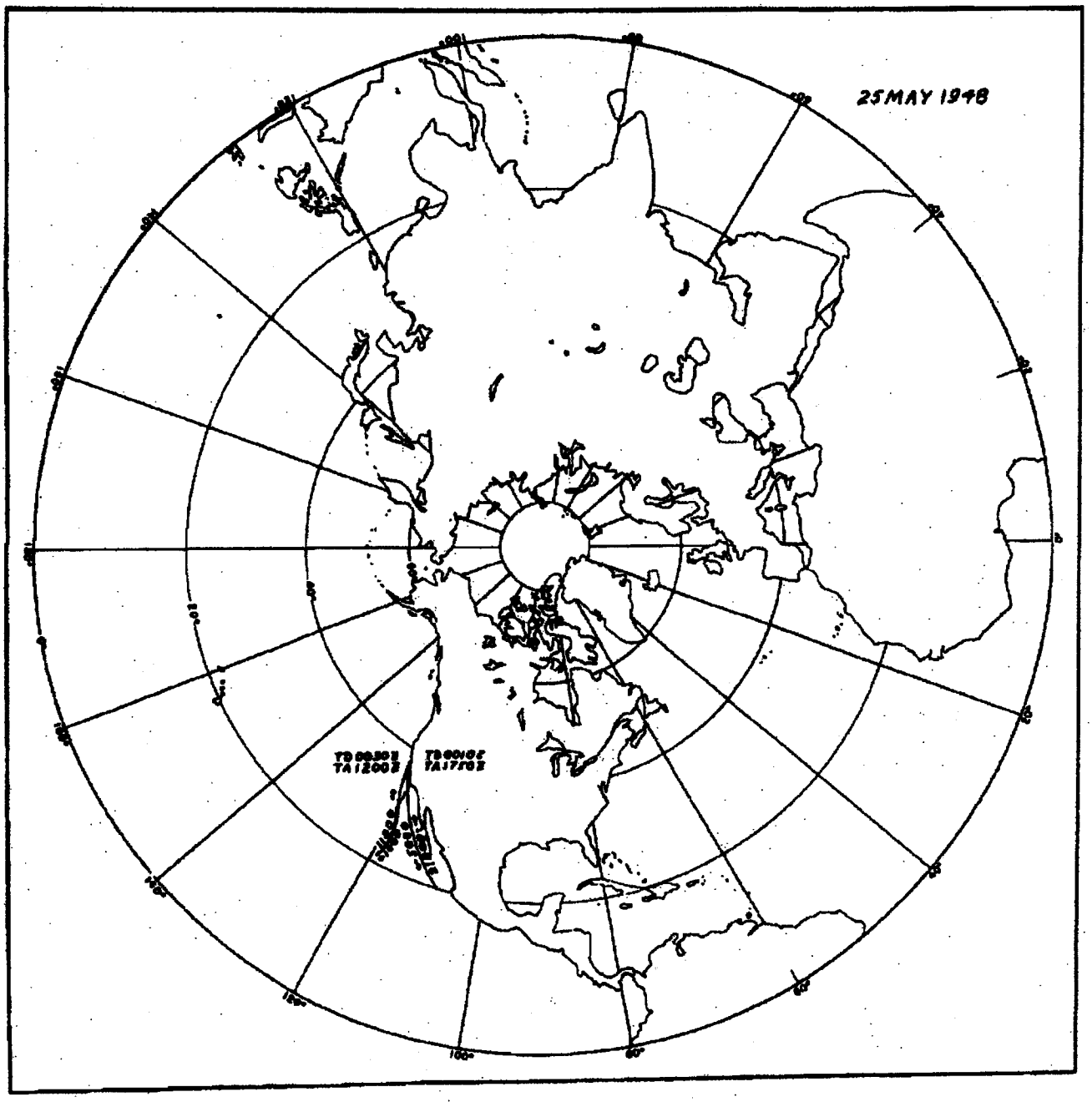

20 MAY 1948

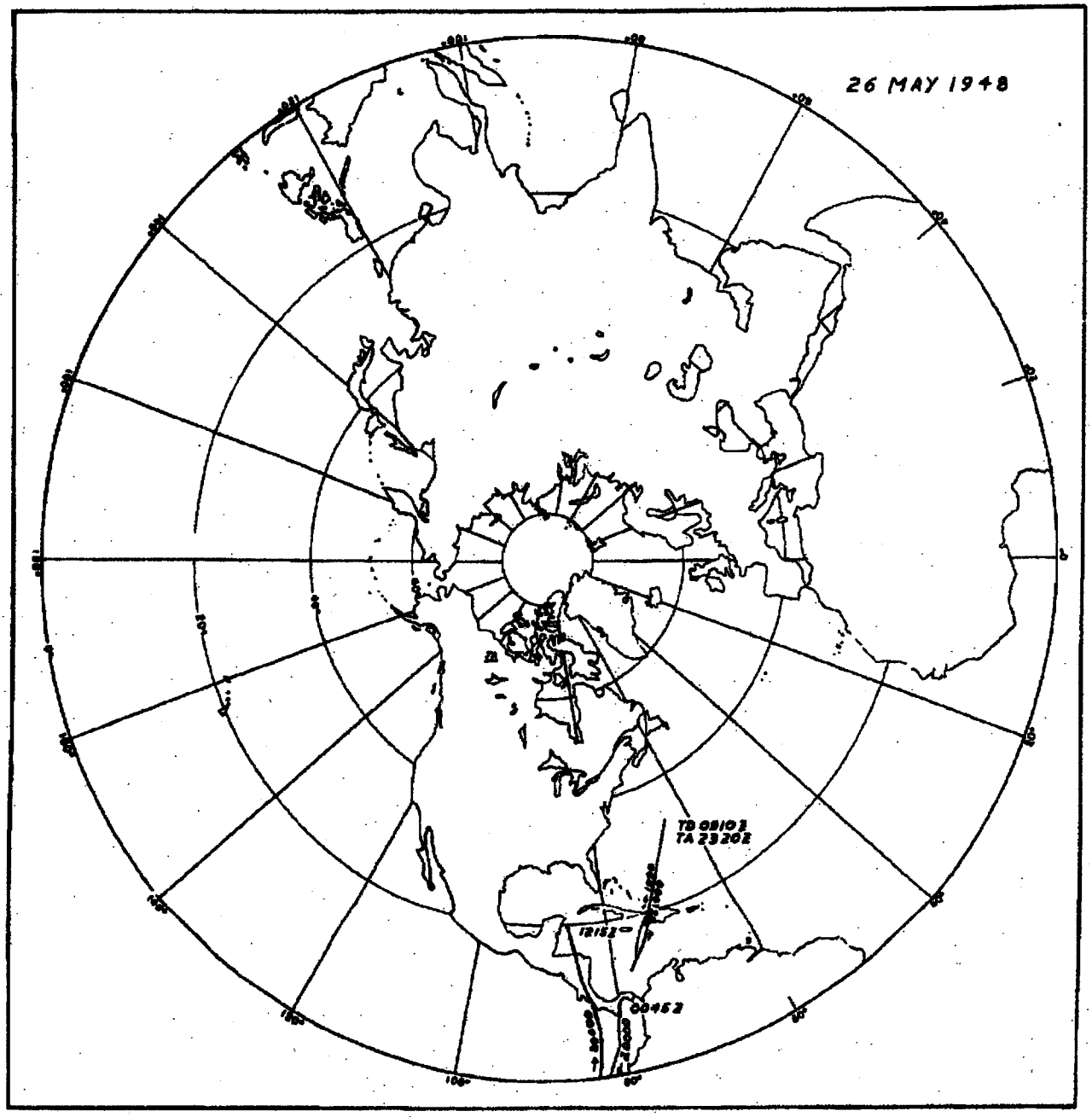

21 MAY 1948

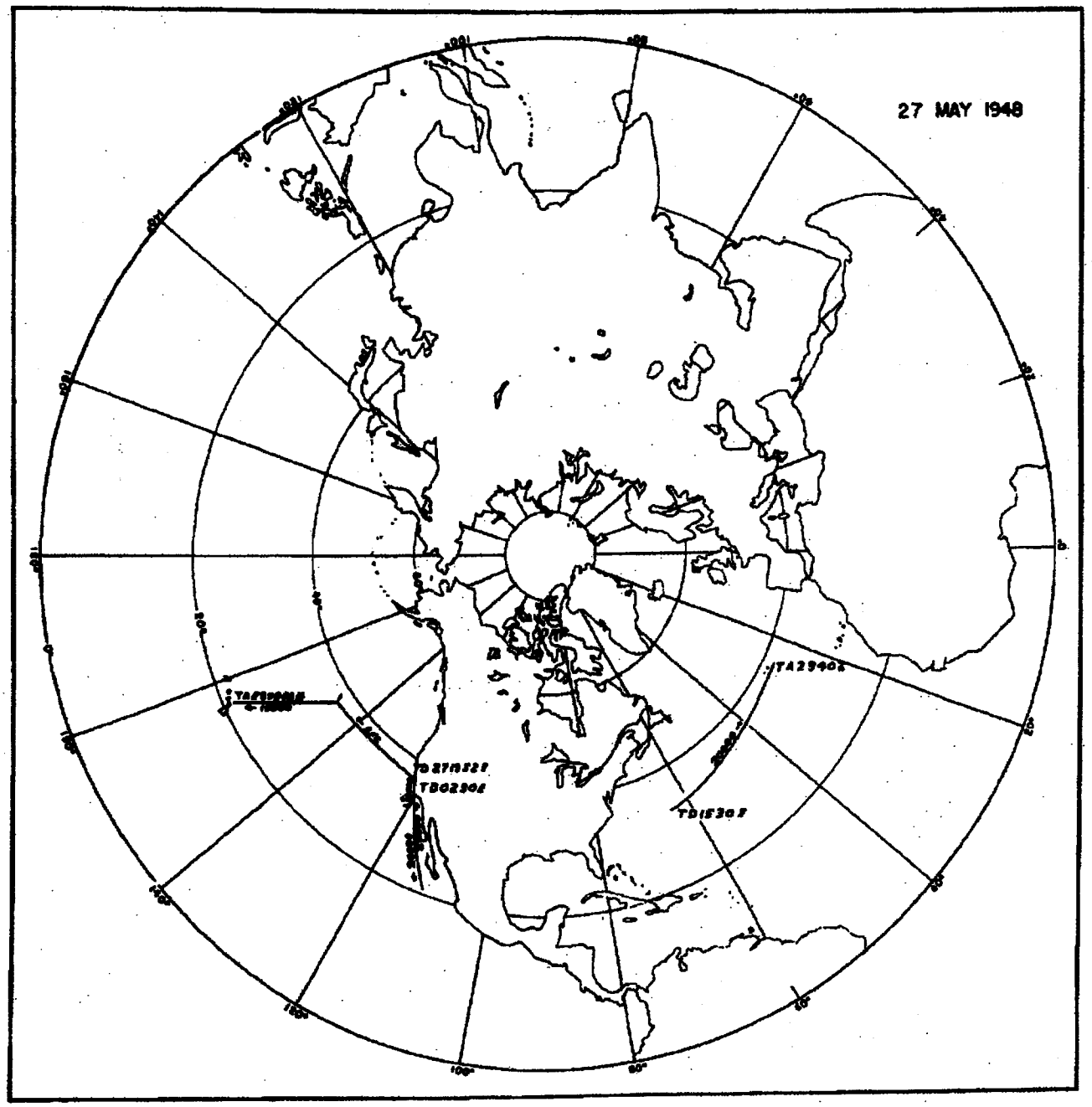

22 MAY 1948

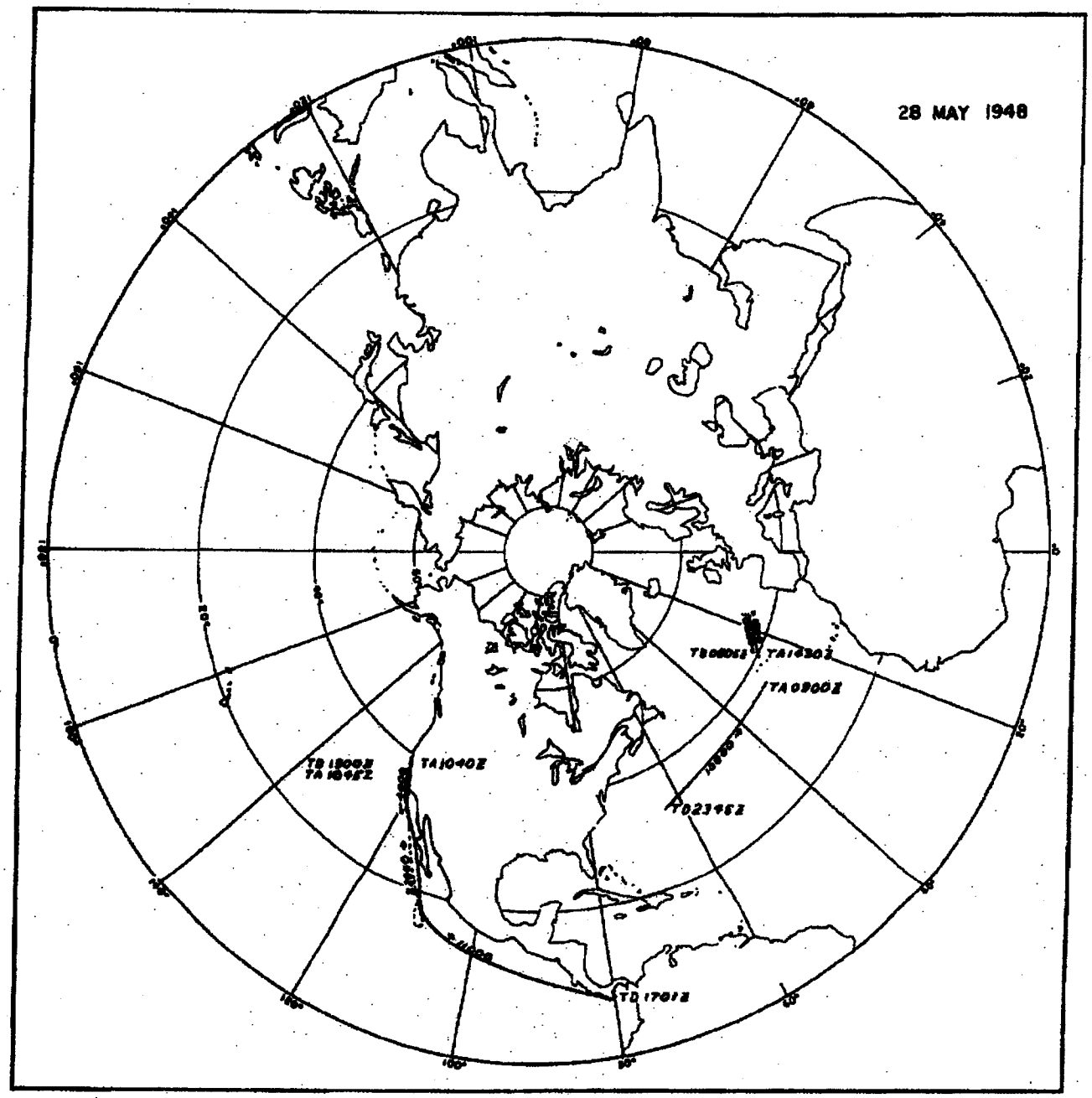

23 MAY 1948

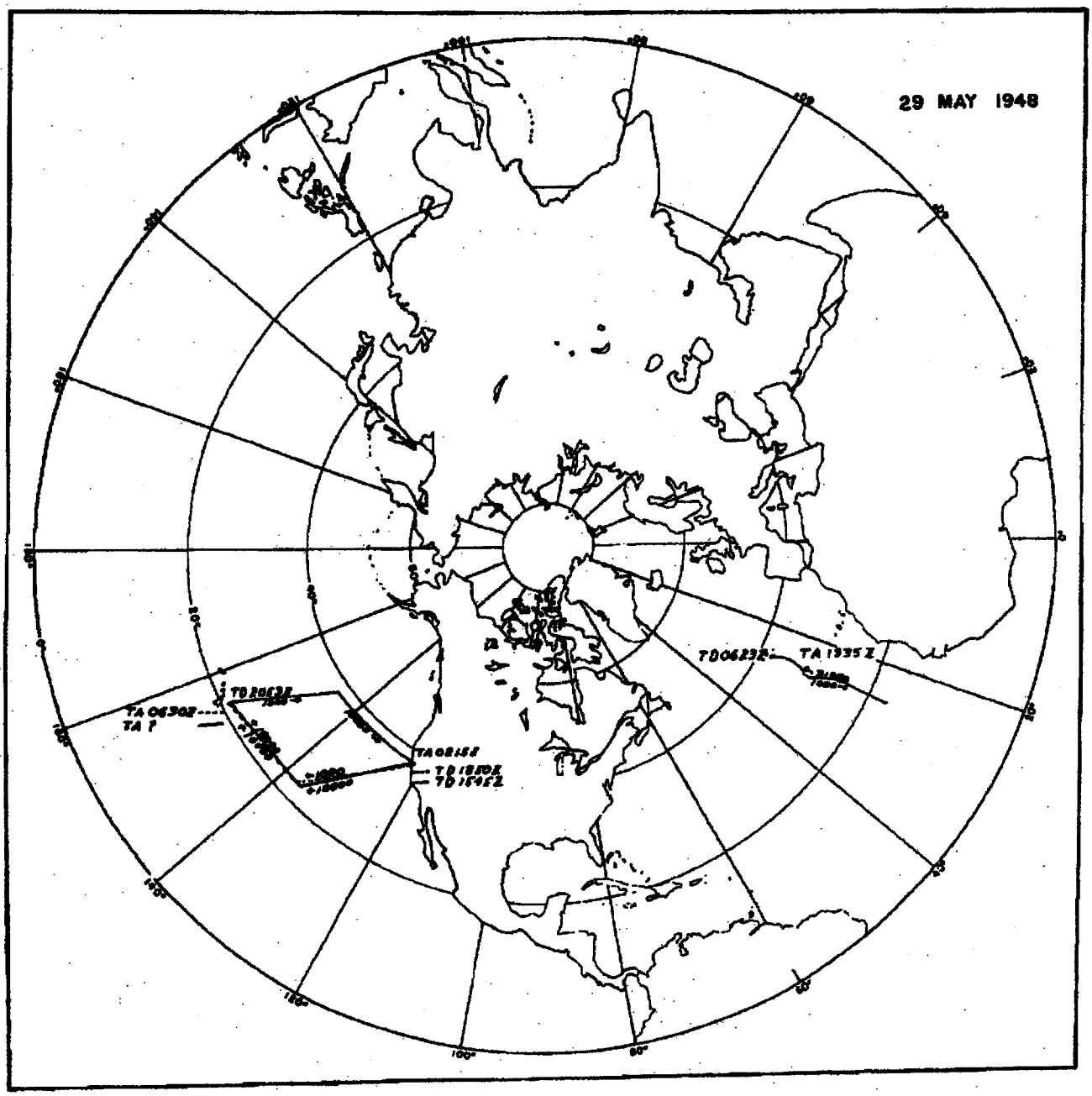

24 MAY 1948
TO 100S E
TA 235S E
South To 88°S 86°W

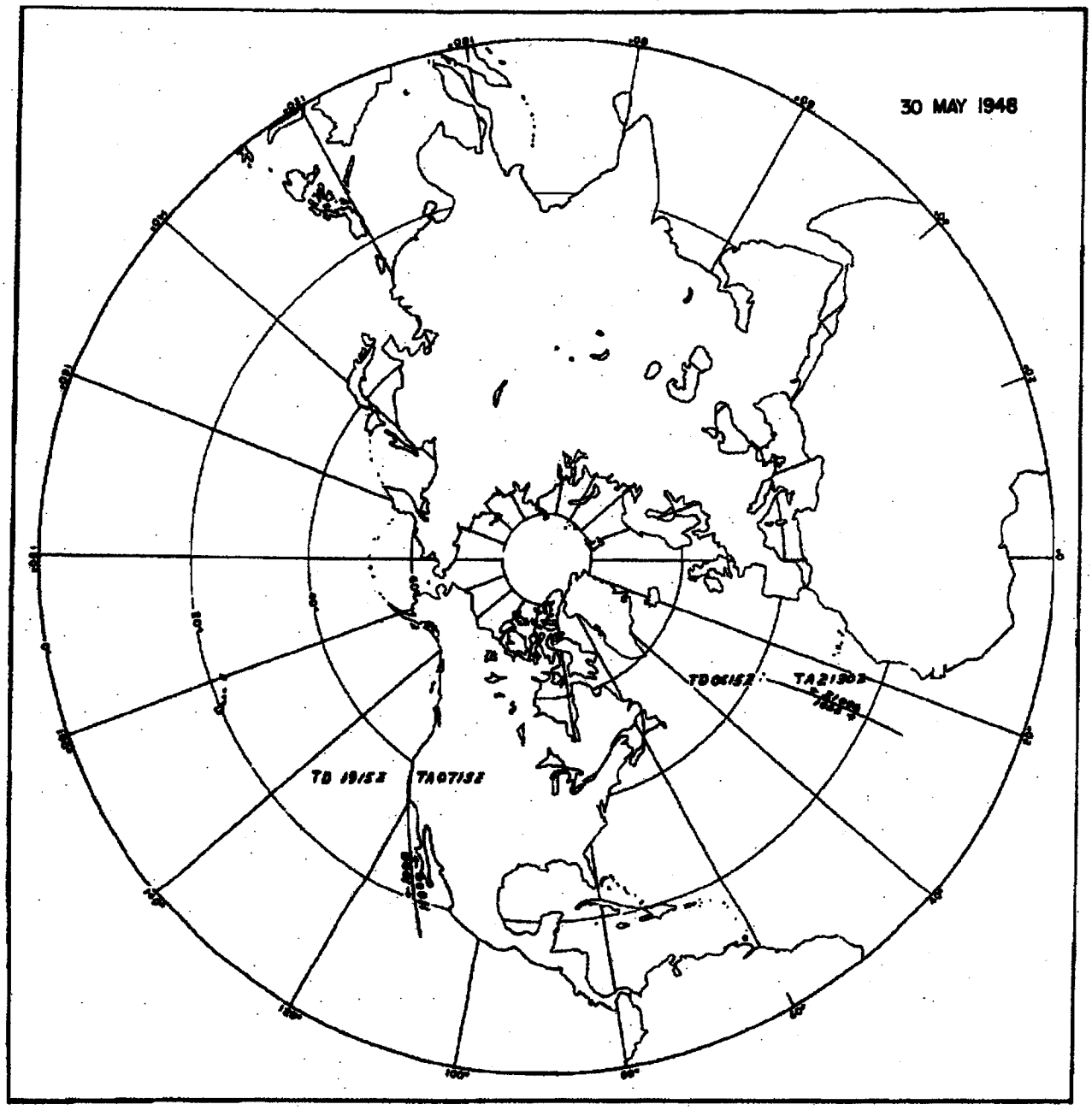

25 MAY 1948

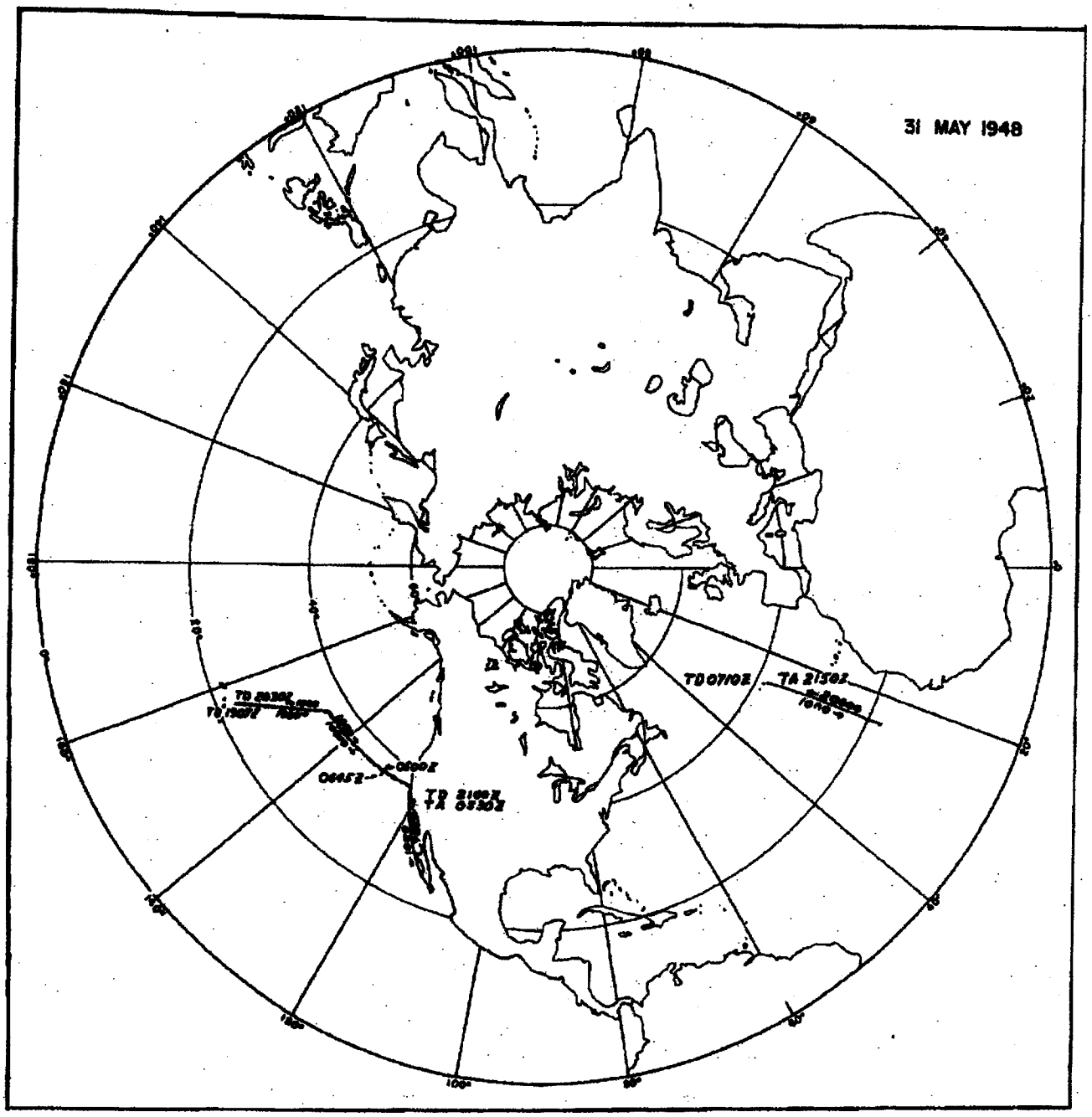

26 MAY 1948
TD 08103
TA 23202
12152
00452

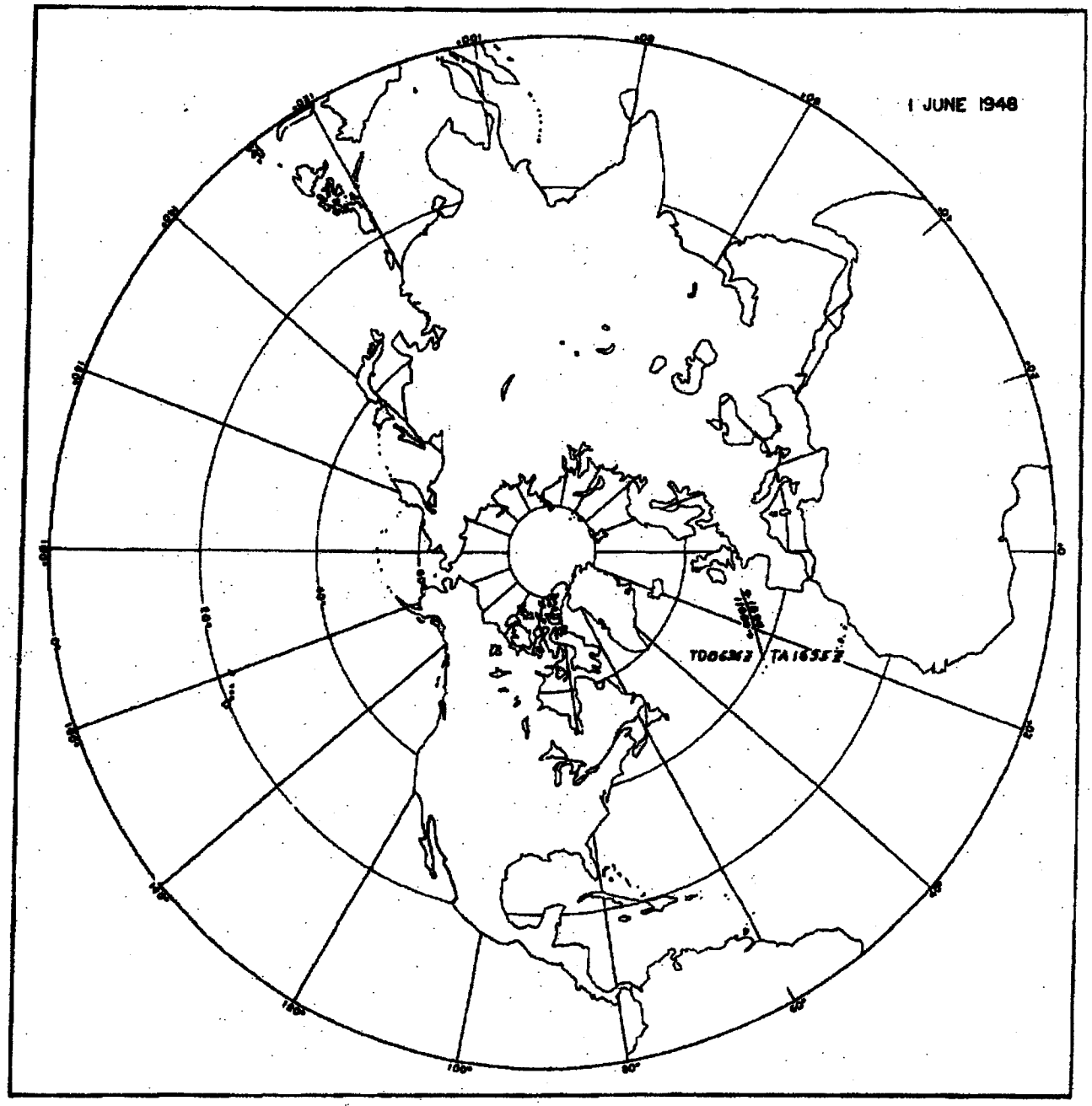

27 MAY 1948

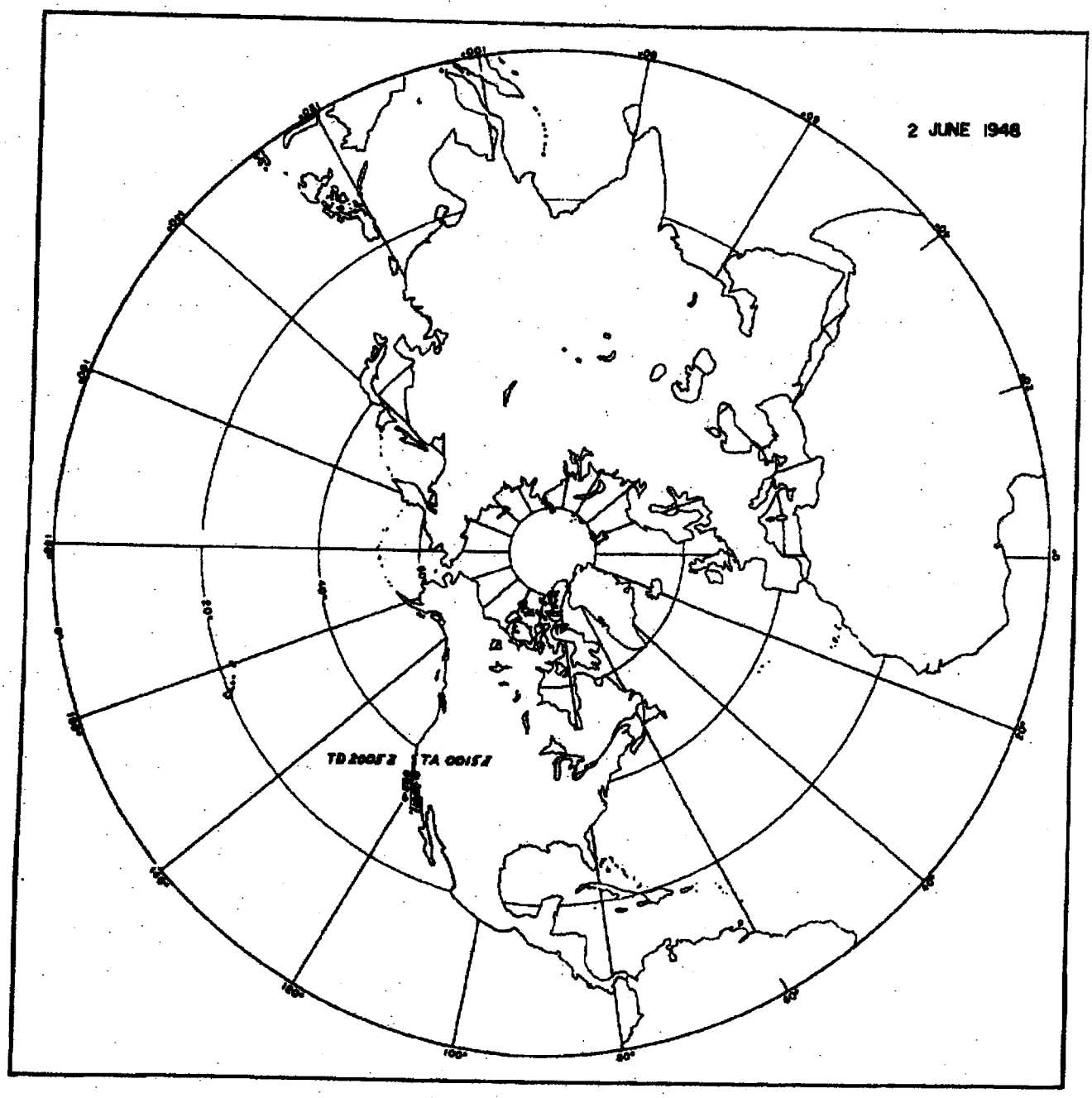

28 MAY 1948
TA0900Z
TA1040Z
TD1700Z

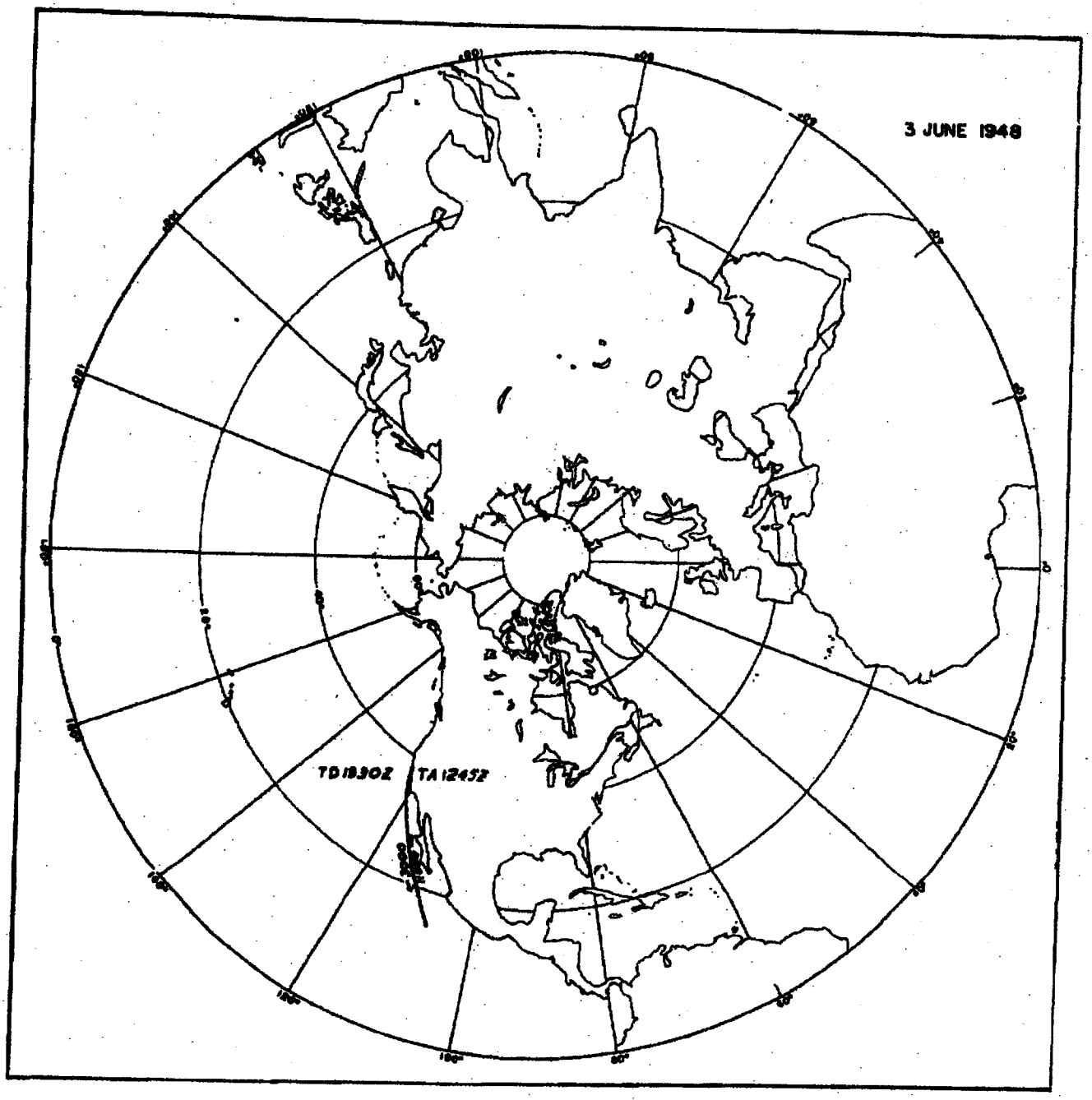

29 MAY 1948
TA 0630Z
TA ?
TD 0623Z
TA 0815Z
TD 1800Z
TD 1442Z
TD0623Z
TA 1935Z

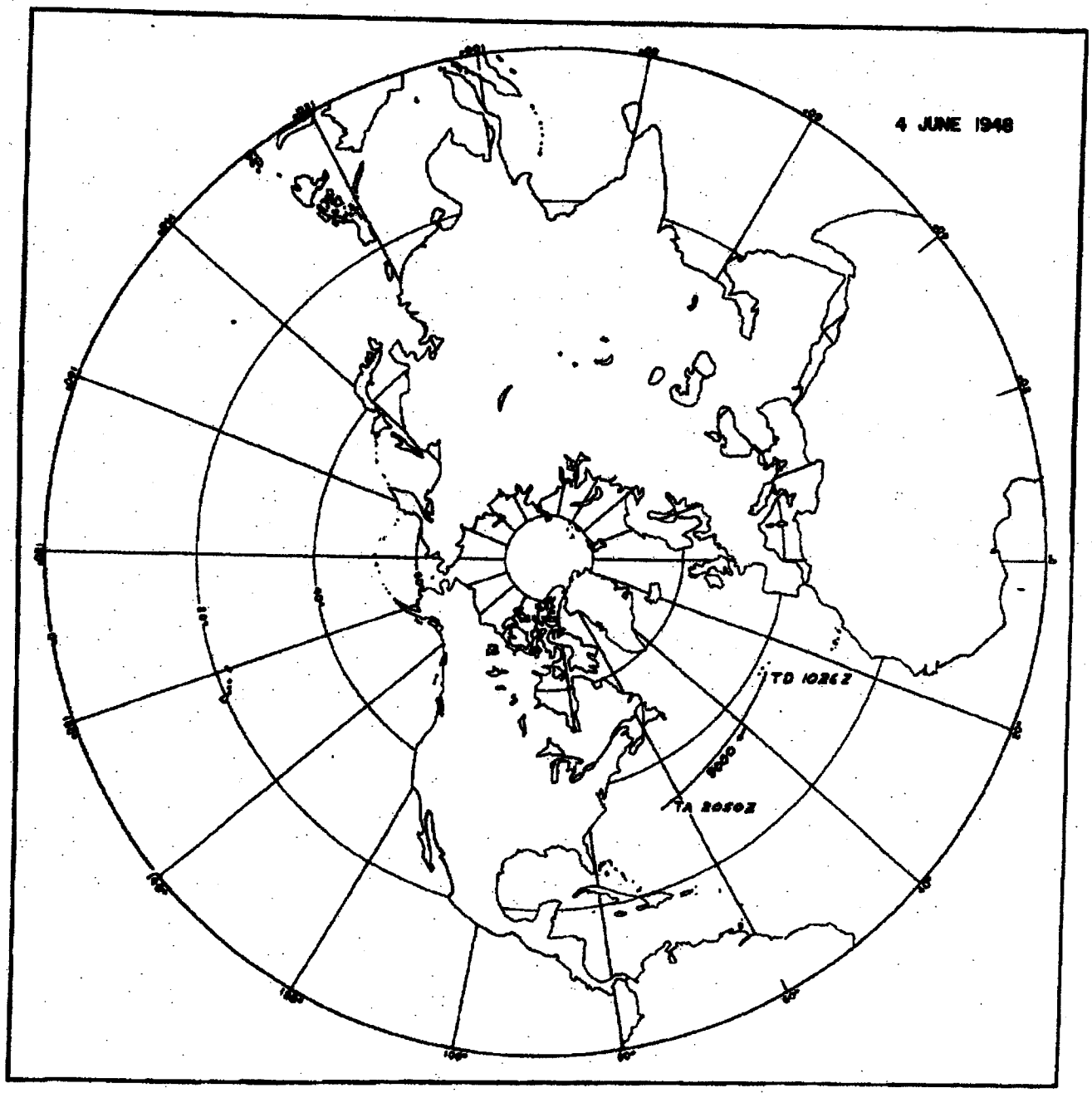

30 MAY 1948
TD 1915Z
TA0715Z
TD0615Z
TA2130Z

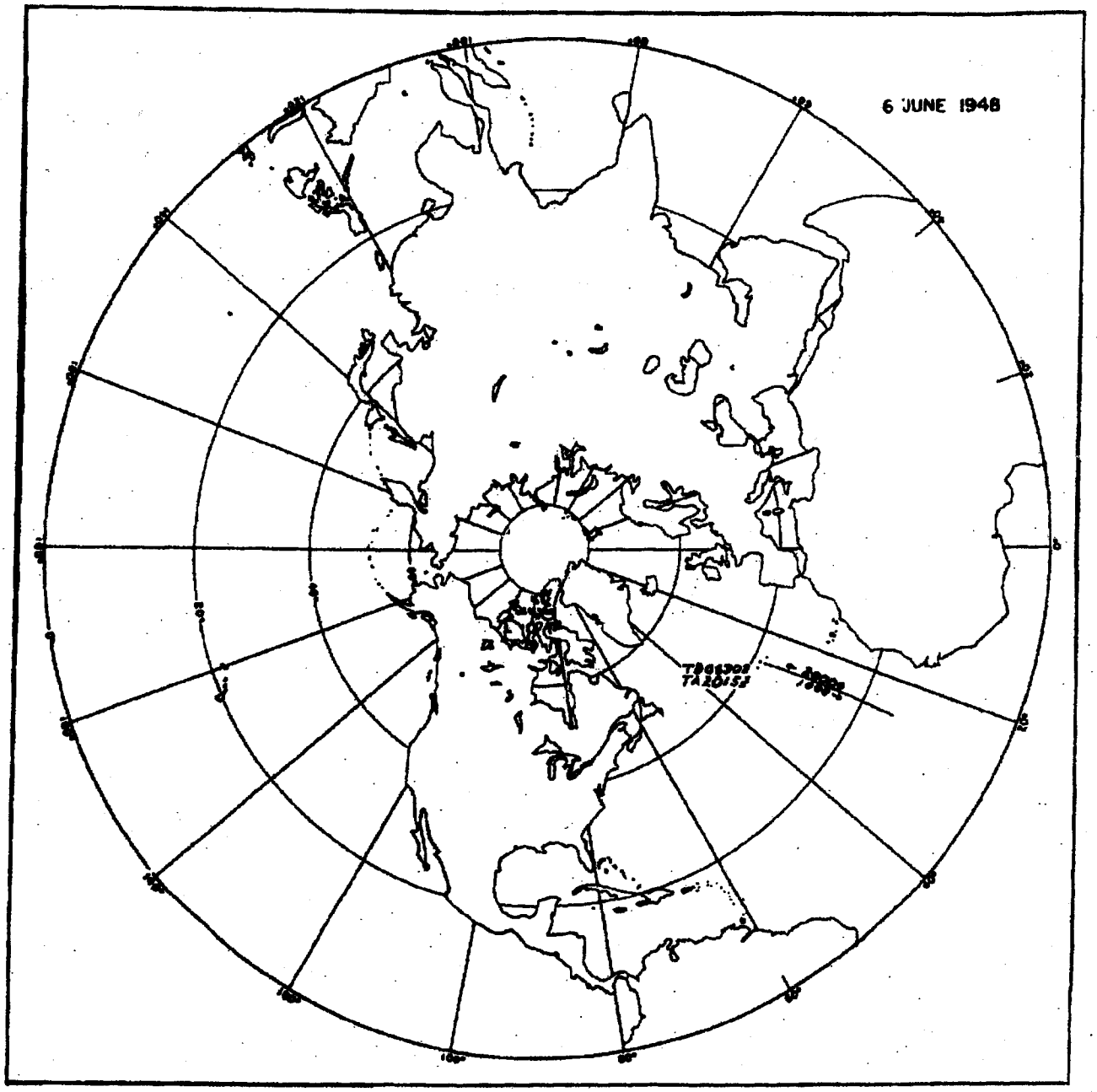

31 MAY 1948
TD 0710Z
TA 2150Z
TD 2030Z
TA 1907Z
0445Z
0500Z
TD 2100Z
TA 0530Z


1 JUNE 1948


2 JUNE 1948


3 JUNE 1948
TD 19302
TA 12452


4 JUNE 1948
TD 1026Z
TA 2050Z


6 JUNE 1948