AD A995204

DTIC ACCESSION NUMBER

PHOTOGRAPH THIS SHEET

LEVEL

INVENTORY

Commander Air Task Group 7.4
Operation CASTLE Joint Task Force 7
Final Rpt., July '53 - Jun. '54.

DOCUMENT IDENTIFICATION

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

DISTRIBUTION STATEMENT

ACCESSION FOR	
NTIS	GRA&I ☒
DTIC	TAB ☐
UNANNOUNCED	☐
JUSTIFICATION	
BY	
DISTRIBUTION /	
AVAILABILITY CODES	
DIST	AVAIL AND/OR SPECIAL
A/1	

Released

DISTRIBUTION STAMP

DTIC
SELECTED
JUL 5 1984
D

DATE ACCESSIONED

UNANNOUNCED

DATE RETURNED

84 07 05 013

DATE RECEIVED IN DTIC

REGISTERED OR CERTIFIED NO.

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-DDAC

DTIC FORM 70A DEC 83

DOCUMENT PROCESSING SHEET

PREVIOUS EDITION MAY BE USED UNTIL STOCK IS EXHAUSTED.

FINAL REPORT
OF THE
COMMANDER
AIR TASK GROUP 7.4

OPERATION CASTLE
JOINT TASK FORCE 7

a/9654

51A

DTL019, 330

Classification ([redacted]) ([redacted] to Unclas

By Authority of Jan Review DNA & DOE CN

By CJ Martin Date 7 Apr 84

Statement A
Approved for public release;
Distribution unlimited.

This [illegible]
112 Page(s) No. 51 of
15 Copies A Series

Not accountable to JTAD's

[redacted]

3.36225RD

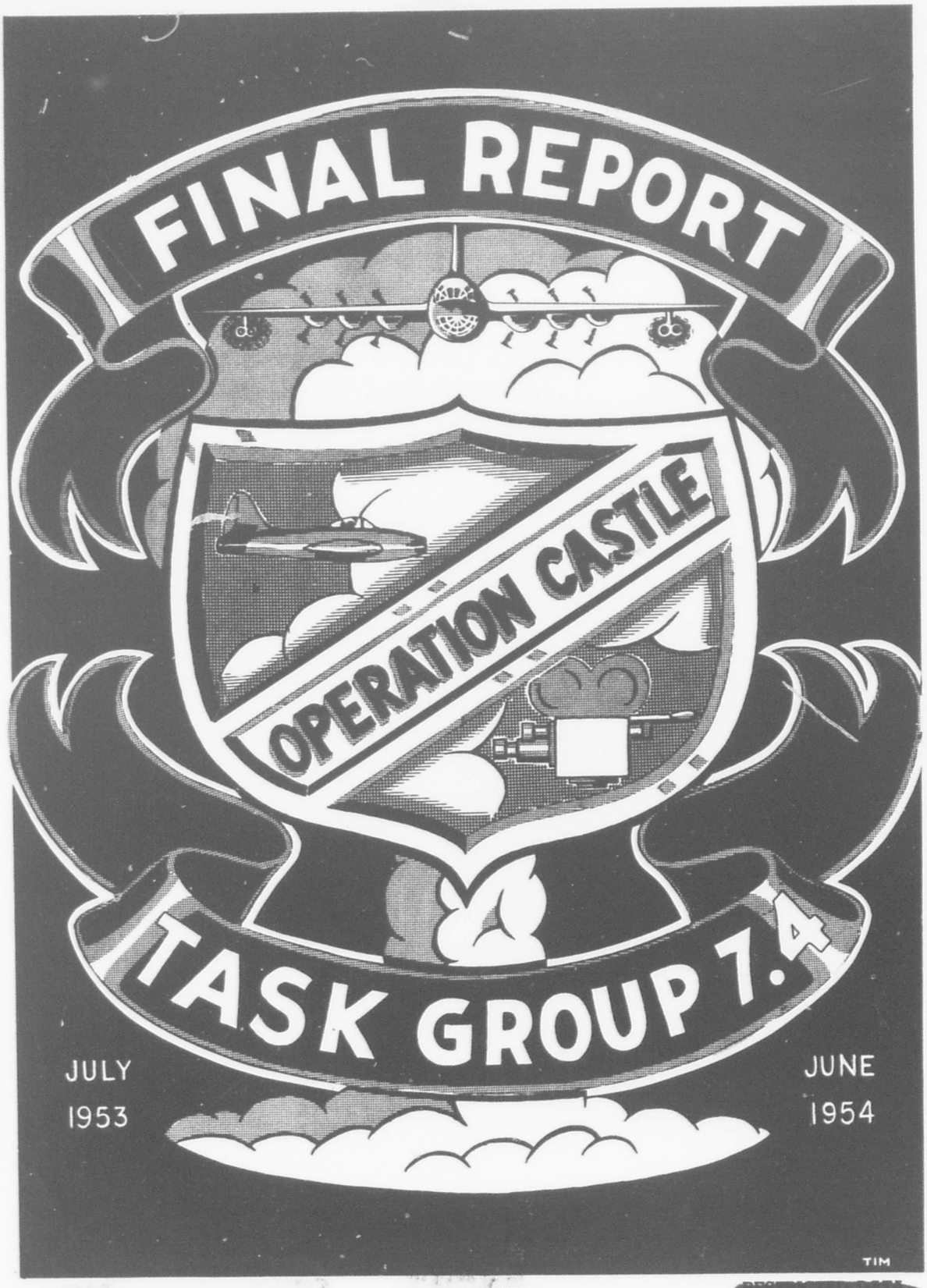
[redacted]

This document is classified SECRET in accordance with the provisions of AFR 205-1, dated 15 December 1953, and contains RESTRICTED DATA as defined in the Atomic Energy Act of 1946.

Dissemination of the information contained in this report may be made only to personnel having an official need for the information. Reproduction of this document in whole or in part is prohibited without prior permission of the office of origin or higher authority.

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

[redacted]


FINAL REPORT
OPERATION CASTLE
TASK GROUP 7.4
JULY
1953
JUNE
1954
TIM

[redacted]

FOREWORD

At the outset of the planning stage of Operation CASTLE, a policy was issued from this office to the effect that all units and activities of Air Task Group 7.4 would cooperate in the preparation of a detailed narrative history of Air Task Group participation. Accordingly, a series of month by month accounts of the procedures and the reasoning leading to their adoption, the problems and solutions and the operational concepts of this organization was prepared. The narrative for each month is fully supported by appropriate documents containing background material or describing factors behind policy determinations and by photographs depicting all important stages of each of the numerous functions pursued by the Air Task Group.

In view of the existence of this voluminous accumulation of facts, it was decided that this Final Report should not be a historical resume but rather should center upon a discussion of areas in which, in later tests, improvement could be effected in the Air Task Group operation or in which increases could be realized in the value of resultant test information made available to the United States Air Force. From the discussion of these topics should stem conclusions and recommendations for action by various agencies concerned with support or direction of future Air Task Group formation, training and execution. The reader may assume that any facet of the operation not specifically mentioned in this Final Report proved eminently satisfactory during CASTLE and therefore is recommended for use in similiar future nuclear tests.

Consequently, those interested in the details of the operation, in the methods and procedures employed, in the numerous considerations involved in the making of various decisions, or in statistical information, beyond that contained in the Chart Section included herein, must refer to the History of Air Task Group 7.4 rather than to this Final Report.

It is not intended that the discussions in this Final Report be construed as criticism of any agency directly involved in or supporting CASTLE. The magnificent support rendered to Air Task Group 7.4 by every agency contacted and the superb cooperation of every lateral or parent participating organization are fully appreciated and acknowledged as prime determinants in the successful accomplishment of the assigned mission by the Air Task Group.

Nonetheless, where, in the opinion of this Headquarters, room for improvement appeared, the facts have been stated bluntly in the sincere hope that the guidance thus positively offered will assist planners and executors toward greater efficiency, economy and mission success in Air Force participation in nuclear tests to come.

Howell M. Estes, Jr.

HOWELL M. ESTES, JR.
BRIGADIER GENERAL UNITED STATES AIR FORCE

[redacted]

[redacted]

CONTENTS

[redacted]

[redacted]

STATISTICAL DATA

Personnel

Operations

Materiel

Security

Comptroller

[redacted]

MISSION AND ORGANIZATION

Operation CASTLE was the Department of Defense - Atomic Energy Commission (AEC) program for the conduct of six nuclear test detonations at the Pacific Proving Ground in the spring of 1954. Responsibility for the execution of this complex scientific test program was centered in Joint Task Force SEVEN, which contained five task groups consisting of Scientific, Army, Navy, Air Force and AEC Facilities elements.

The United States Air Force contributed the vital air capability which, in combination with the many special diversified functions and skills furnished by the other task participants, achieved notable success in completing a project of the utmost importance to this nation.

Air Task Group 7.4 Provisional, was established as the Air Force component of Joint Task Force SEVEN to provide air support for Operation CASTLE. From this broad concept of the air objective, the mission of the Air Task Group was evolved as a four-fold task consisting of three primary aerial functions and one major integrating support function, as follows:

1. Nuclear test sampling.
2. Nuclear test effects.
3. Nuclear test technical and documentary photography.
4. Specialized support activities and facilities required for successful achievement of the primary aerial objectives.

Nuclear test sampling was the task of locating and obtaining, for radiochemical analysis, the best possible representative samples of radioactive particles available throughout the nuclear cloud which ensued from each detonation. For this purpose, 15 F-84G fighter-type samplers and two featherweight B-36H bomber-type samplers were employed, in conjunction with an RB-36 aircraft from which a scientific team exercised control and direction of the sampling operation.

The nuclear test effects program was conducted to determine the relative safety with which current operational types of delivery aircraft could withstand hazards associated with detonations of weapons in the range of multi-megaton yield. A B-36D and B-47 aircraft were used for this purpose. These aircraft were positioned in space at points for which the anticipated levels of thermal radiation, the shock wave overpressure and the related gusts previously had been calculated. Special instrumentation on the aircraft measured the actual input levels and recorded the resultant skin temperature rises, together with structural stresses and deflections on various portions of the aircraft.

Nuclear test photography preserved on still and motion picture film the sequence of important events as they took place on Operation CASTLE. This same means was employed to record essential scientific and technical data to be used in the post-mission analysis of phenomena associated with each test detonation. Three modified C-54 aircraft performed the primary mission of documentary and nuclear cloud growth and measurement photography. The RB-36 sampler control aircraft assisted in the documentary portion of the filming task. Strategic Air Command B-50 aircraft, after completing their indirect bomb damage assessment mission, took pictures of the crater created by the nuclear detonation on selected occasions.

Successful achievement of the primary aerial objectives depended upon some cohesive force to weld the many facets of the air mission into a single, concerted effort. This integrating element was furnished by an extensive system of support activities, services and facilities, to which every echelon contributed in accordance with the special capabilities which its task components were selected to provide. The support system included logistics for ground and air operations; communications; flight safety; maintenance control; radiological safety; personnel and aircraft decontamination; personnel dosimetry and ground and airborne radiation instrumentation; air base operations and airlift support; indirect bomb damage assessment; search and rescue; and weather reporting, weather reconnaissance and weather forecasting services.

Air Task Group 7.4 consisted of a Test Aircraft, a Test Services and a Test Support Unit, under supervision and direction of the Commander, Air Task Group 7.4, who was assigned from the Strategic Air Command by Headquarters, U. S. Air Force. (See organizational chart.)

Command of the Test Aircraft Unit was exercised by the Commander of the 4926th Test Squadron (Sampling) of the Air Force Special Weapons Center (AFSWC), Air Research and Development Command. The 4926th personnel supervised the radiological safety, decontamination, and the dosimetry and radiation instrumentation tasks, in addition to furnishing the 15 F-84 aircraft for cloud sampling. The Strategic Air Command (SAC) furnished and supported the RB-36 control aircraft, the two featherweight B-36H sampling aircraft and the three B-50

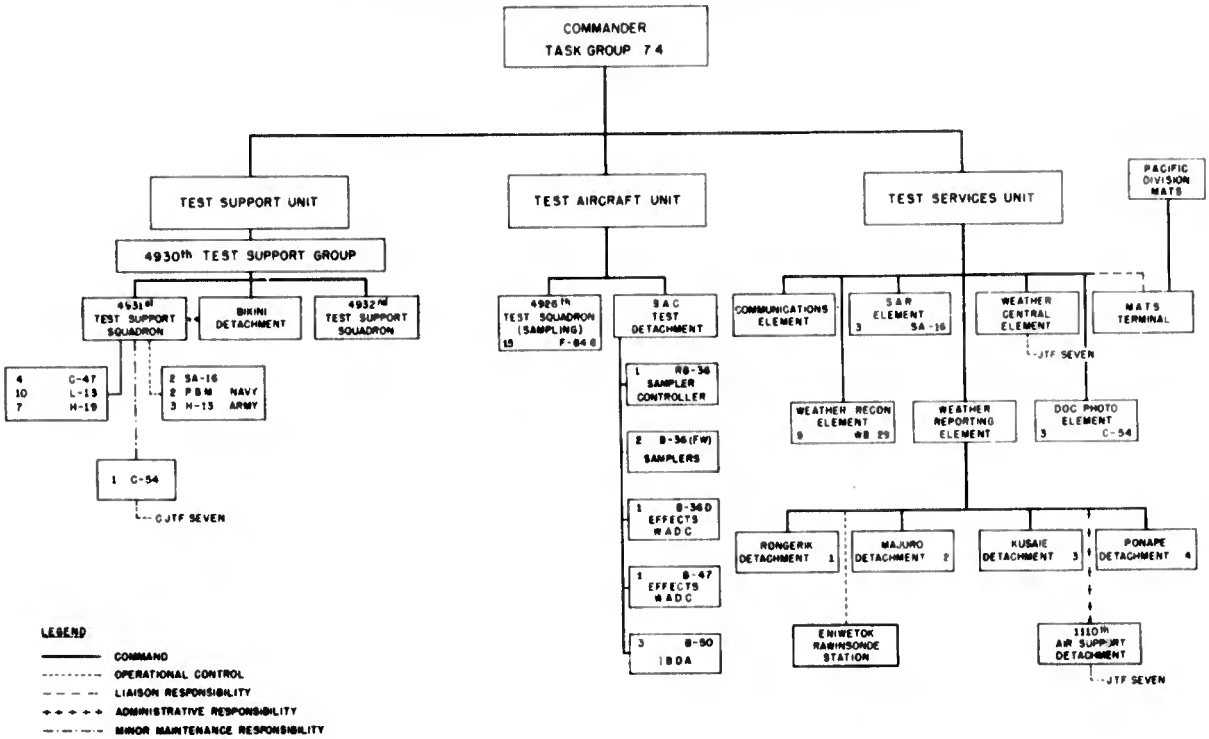
indirect bomb damage assessment aircraft. A SAC crew flew the B-36D effects aircraft which was assigned to the Wright Air Development Center (WADC). WADC provided the B-47 effects aircraft and its crew. The control RB-36 was utilized by a scientific and control team consisting of a representative from the Los Alamos Scientific Laboratory, the Director of Operations, Headquarters, Air Task Group 7.4, the Chief, Human Factors Division, Headquarters, AFSWC, and a Senior Airborne Controller from the Test Aircraft Unit.

The Test Services Unit was commanded by an Air Force officer of the Military Air Transport Service (MATS). This unit performed the primary air photographic mission; conducted weather and typhoon reconnaissance and post-mission nuclear cloud tracking functions, using nine WB-29 aircraft; established, operated and maintained four weather reporting stations on outlying islands in the Pacific area; manned and operated the Joint Task Force Weather Central; provided airways and air communications services, including point-to-point and air-ground communications and navigational aid facilities; furnished search and rescue facilities, consisting of three SA-16 aircraft and personnel; and operated air terminal facilities for normal MATS transport operations on ENIWETOK ISLAND. Personnel and equipment of the Test Services Unit were supplied by MATS, except for the 1110th Air Support Detachment of Headquarters Command, U. S. Air Force, which was attached to the unit for certain logistical support.

The Test Support Unit was manned, equipped and commanded by AFSWC. Its primary areas of responsibility included the operation of all air base facilities and services on ENIWETOK and BIKINI ISLANDS; administrative and proficiency flying for all rated personnel of Joint Task Force SEVEN and its task groups; inter-atoll and inter-island airlift, employing four C-47, ten L-13, seven H-19, two SA-16 and two PBM aircraft; and the airborne relay of VHF communications between the BIKINI operational area and the ENIWETOK Air Operations Center (AOC) during actual missions, utilizing a C-47 aircraft.

In addition to its normal staff functions, Headquarters Task Group 7.4 provided supervisory personnel for the ENIWETOK AOC which was manned by personnel from the Air Defense Command and the Air Training Command; a senior air controller who supervised the operation of back-up control facilities aboard a Navy control destroyer during actual missions; and senior air controllers to supervise and control all air operations in the target area from the Combat Information Center (CIC) aboard the Command Ship, the USS ESTES. Staff members of the headquarters directed the operation of the Task Group aircraft maintenance control system and the flying safety program for CASTLE. During each test detonation, the Commander, Task Group 7.4, personally directed the operation of all aircraft in the target area by means of radar and air-ground communication facilities in the Combat Information Center aboard the USS ESTES.

ORGANIZATION OF TASK GROUP 7.4



KEY PERSONNEL

BRIGADIER GENERAL HOWELL M. ESTES, JR., USAF, COMMANDER

COLONEL EARL W. KESLING, USAF, DEPUTY COMMANDER

COLONEL HERSCHEL D. MAHON, USAF, CHIEF OF STAFF

COLONEL PAUL H. FACKLER, USAF, OPERATIONS

COLONEL RAY M. HAWLEY, USAF, MATERIEL

LT COLONEL BIRDENE E. FORREST, USAF, PERSONNEL

LT COLONEL WILLIAM R. HANNA, USAF, SECURITY

MAJOR HAROLD R. MEADOWS, USAF, COMPTROLLER

COLONEL JAMES F. STARKLEY, USAF, TEST SUPPORT UNIT

LT COLONEL JAMES A. WATKINS, USAF, TEST AIRCRAFT UNIT

LT COLONEL MAHLON B. HAMMOND, USAF, TEST SERVICES UNIT

DISCUSSION

ASSIGNMENT OF AND ORGANIZATION FOR OVERSEAS TEST RESPONSIBILITIES

INTRODUCTION

For each of the overseas nuclear tests prior to Operation IVY, the Air Task Group was formed by selecting personnel and organizations from various commands throughout the Air Force. The Headquarters of the Air Task Group, after activation, operated to all intents and purposes directly from Headquarters, USAF. In Operation IVY, this procedure was modified to some extent in that the Air Force Special Weapons Command was given certain responsibilities in assisting in the formation of the Headquarters of the Air Task Group and in providing necessary support to the Headquarters after activation. Essentially, however, the Air Task Group Headquarters in IVY was required to obtain the majority of its major decisions regarding logistical support, Air Task Group manning and strength from Headquarters, USAF.

Since no firm program of future overseas nuclear tests had been announced, the numerous major disadvantages resulting from thus forming the organization which would fulfill USAF responsibilities in nuclear tests were accepted as unavoidable. Briefly these disadvantages may be stated as follows:

1. No continuity existed from test to test.
2. No agency was responsible for planning for more economical and more efficient Air Task Group operations in succeeding tests.
3. Arrangements for logistical support had to be made through other than established command channels, thus creating arguments concerning supply priorities, supply requirements and supply transport.
4. The Headquarters of the Air Task Group, being activated only shortly before the operational period, had relatively little opportunity to become thoroughly acquainted with the scope and details of the various problems faced and, consequently, planning for the operation could not be expected to be realistically based on the true operational requirements nor could this planning be anticipated to produce optimum results in terms of efficiency and economy.
5. Preparation for each test required a certain degree of disruption in every major air command in order to obtain capable personnel for the Headquarters and for the various units. Consequently the mission of each major command suffered to some extent to provide the resources necessary to carry out Air Force responsibilities in the test.

The Air Task Group Commander for Operation CASTLE was appointed in October 1952 on the assumption that the operational period of CASTLE would occur in the spring or fall of 1953. The Commander participated in Operation IVY as an observer and discussed at length with the Commander of Air Task Group 132.4 the above major deficiencies as well as many of a minor nature. It is important to note that by this time an announcement had been made by the Joint Chiefs of Staff that overseas nuclear tests would continue in the future for at least the next five years and that in order to provide for continuous planning for these tests, the Joint Chiefs of Staff had established the Headquarters of the Joint Task Force as a permanent organization. In view of this new concept concerning overseas testing, the Air Task Group Commander designee discussed the disadvantages mentioned above with the Commander, Air Force Special Weapons Center; the Vice Commander, Strategic Air Command; the Director and Chief of the Test Division, Los Alamos Scientific Laboratories; the Commander, Joint Task Force 132 and members of the Atomic Energy Commission. As a result of these discussions, the Commander designee decided to recommend to Headquarters, USAF that the responsibility for forming and training the entire Air Task Group for Operation CASTLE should be placed under a major air command with other major air commands providing support as required. In order to convert this decision into action the Commander designee prepared a proposed electrical message to be transmitted by Headquarters, USAF to all major air commands announcing this policy and the major details under which it would be effected. This message was hand carried by the Commander designee through the headquarters of each major air command and that of the Joint Task Force for coordination and then to Headquarters, USAF for approval and publication. This message was issued in December 1952, placing these responsibilities under Headquarters, Air Research and Development Command. Headquarters, Air Research and Development Command subsequently issued directives delegating these responsibilities to the Air Force Special Weapons Center.

During this same period other Air Force

agencies had acted upon the announcement of the Joint Chiefs of Staff mentioned above. Headquarters, Air Force Special Weapons Center had requested the activation of a squadron to be charged with the task of providing a manned nuclear cloud sampling effort in continental as well as overseas tests. This squadron was activated in early 1953.

It is to be seen, therefore, that the history of Air Force participation in overseas nuclear testing has undergone a slow but sure evolution toward some type of permanent unit to discharge Air Force responsibilities for these tests.

NUCLEAR TEST ORGANIZATION CONSIDERATIONS

The air operations of the Air Task Group in nuclear tests are not similar to any normal Air Force operations. Regardless of any simplified statement of the mission, the actual task is to obtain, through airborne effort, within the maximum performance characteristics of the aircraft assigned, the maximum quantity and quality of measurement data required and desired by the Scientific Task Group in order that proper and thorough scientific evaluation of test results may be undertaken. Any failures in obtaining these data could result in, at the least, serious degradation of the value of scientific conclusions regarding subjects of vital economic and defensive importance to the United States.

Accordingly, it is essential that procedures for air operations be found which, while permitting reasonable safety for crew and aircraft, envisage the placement of aircraft at the exact times, locations and altitudes in the specific configuration and manner calculated to meet scientific needs to the maximum. To accomplish this requires:

1. Many long hours of consultation with numerous scientific personnel to determine exactly what data are desired and specifically where and how they should be obtained. This requirement cannot be minimized and is not fulfilled in a period of a few short weeks.

2. The adoption of an attitude within the Headquarters, Air Task Group of complete flexibility in order to meet the continuous major and minor changes which must and do occur as new or changed scientific requirements arise throughout the operation. Any concept of operating along set, fixed lines conceived early in the planning stage of the program dooms the air effort to the collection of only mediocre data at best.

3. A philosophical approach throughout the Air Task Group which recognizes the intense value to the Nation of the data obtained on these tests and therefore accepts the fact that finely calculated risks must continually be taken. This demands a detailed, searching Flying Safety investigation of every planned maneuver to determine the limit of risk to be taken, followed by minute crew briefing and indoctrination in safety procedures thus developed. The imperative need for such an approach is not apparent to those unfamiliar with nuclear test operations.

CONCLUSIONS

1. A thorough and detailed understanding of scientific requirements, gained by intimate association with the Scientific Programs, is absolutely essential to successful accomplishment of the Air Task Group mission.

2. An attitude of complete flexibility and of willingness to accept studied, calculated risks is imperative if the maximum quantity and quality of scientific data are to be obtained within the operating characteristics of assigned aircraft.

3. An Air Task Group formed of individuals not possessing nuclear test experience background is not apt to understand the scope and meaning of the above two conclusions and therefore is not likely to obtain quantities and qualities of scientific data commensurate with maximum resources available.

THE AIR TASK GROUP ORGANIZATION IN CASTLE

The Air Task Group organization in CASTLE went a long way toward satisfying the conclusions in the preceding section of this discussion as a consequence of two major factors. These were:

1. Since the Commander, Air Force Special Weapons Center had, for the first time, full and complete responsibility for the formation and training of the entire Air Task

Group, he was enabled to assign to the Headquarters a strong complement of individuals who possessed extensive background in nuclear test operations. These individuals, including the Deputy Commander and the Director of Operations, had participated in many previous test operations and were thoroughly familiar with scientific test program requirements through frequent intimate contact with various scientific program directors over a period of years.

2. The Commander of the Air Task Group, having been appointed in October 1952, having participated in Operation IVY as an observer, and having spent several days of each month from November 1952 to August 1953 at Headquarters, Air Force Special Weapons Center and at the Los Alamos Scientific Laboratories, received almost a full year of indoctrination in scientific requirements prior to the formation of the Headquarters in August 1953. This fortuitous circumstance was caused, as mentioned previously, by the original scheduling of the operational period of CASTLE in mid-1953 and the subsequent delay of this date for almost eight months.

In spite of these advantages which accrued to Air Task Group 7.4, several deficiencies, which later affected the operation of both the Air Task Group and Air Force Special Weapons Center, were encountered in the formation of the Headquarters as follows:

1. Following the conclusion of Operation IVY, Headquarters, Air Task Group 132.4 was disbanded and the personnel scattered throughout various organizations of the USAF. Only a relatively small nucleus remained at Air Force Special Weapons Center. Continuity of planning from the end of IVY to the activation of Headquarters, Air Task Group 7.4 was, therefore, to a certain extent, lost.

2. The individuals on the staff of Headquarters, Air Force Special Weapons Center who carried out the basic planning for the Air Task Group in Operation CASTLE could not be assigned to Headquarters Air Task Group 7.4, and consequently loss of continuity occurred between initial planning and detailed planning on the formation of Headquarters Air Task Group 7.4. Further, since the planners in Headquarters, Air Task Group 7.4 were frequently unfamiliar with the initial basic planning background, they were hampered in preparing new plans required by program changes.

3. In addition to the loss of continuity experienced by this means of basic planning, was the further difficulty that several of the staff members engaged in this planning were not experienced in previous nuclear test operations. Consequently, vital points were frequently not emphasized in the planning and occasional instances of unrealistic planning occurred.

4. In order to form Headquarters, Air Task Group 7.4 it was necessary for the Commander, Air Force Special Weapons Center to withdraw individuals from various organizations throughout the Center, thus disrupting those activities to a measurable extent.

CONCLUSIONS

1. Air Task Group 7.4 benefited greatly from the assignment in the Headquarters of a large complement of individuals who thoroughly understood the scientific requirements with which air operations would be faced.

2. The disbandment of Air Task Group Headquarters immediately following IVY, and its subsequent reactivation during CASTLE, led to discontinuity, duplication and, to a certain extent, lack of realism in planning.

3. The selection of capable individuals to man Headquarters, Air Task Group 7.4 caused measurable disruption in other activities being pursued by the Air Force Special Weapons Center.

FUTURE AIR TASK GROUP FORMATION

In order to retain the advantages while eliminating the deficiencies in the formation of the Air Task Group, as mentioned in the preceding section of this Final Report, a joint study was conducted by Headquarters Air Force Special Weapons Center and Headquarters, Air Task Group 7.4 throughout Operation CASTLE. All of the numerous disadvantageous conditions mentioned in the preceding sections of the instant discussion were considered in this study. On completion, this study indicated that:

1. Within personnel spaces currently allocated to Air Force Special Weapons Center, including those for the overseas test

function, a reorganization of Air Force Special Weapons Center could be undertaken which would permit the establishment of a unit charged with conducting all test responsibilities now under the purview of the Air Force Special Weapons Center.

2. The reorganized unit thus established could plan and execute both continental and overseas tests while at the same time continuing to direct and operate all other Air Force Special Weapons Center test activities. The responsibility to direct these additional test activities, related though not directly associated with nuclear test operations, in this reorganized unit would be mutually beneficial to both test programs.

3. For continental and overseas tests, this reorganized unit could man, equip and operate the Headquarters of the Air Task Group, the Headquarters of the Test Aircraft Unit, the Nuclear Cloud Sampling Effort, the Headquarters of the Test Support Unit and all Air Base support effort furnished in CASTLE.

4. Other required Air Task Group activities provided in CASTLE and comprising services of the Military Air Transport Service (MATS), could not and should not be provided by this unit.

5. The Commander of this reorganized unit would be admirably suited to command the Air Task Group in continental and overseas tests.

6. The new organization could accept and economically direct additional test missions such as the Photographic and Aircraft Effects missions with the assignment of additional personnel and equipment.

The experience of Air Task Group 7.4 in CASTLE was that if conclusions of this joint study were translated into action:

1. Great improvement in efficiency of Air Force participation in all nuclear test operations could be anticipated.

2. No additional spaces beyond those currently allocated to Air Force Special Weapons Center and the nuclear test function would be required.

3. The numerous disadvantages of organizing the Air Task Group in the fashion of past operations would be eliminated.

It would appear that a question might arise in the mind of the reader as to whether or not personnel assigned to a reorganized unit such as is suggested by the joint study mentioned above and proved feasible, efficient and economical in CASTLE, could be properly utilized in the period between tests. It should be pointed out here, therefore, that personnel so assigned would be continuously utilized at all times in the planning and direction of activities under the control of the reorganized unit. Overseas nuclear tests are expected to occur on the order of every year and one-half to two years. Between these overseas tests numerous continental tests will occur. The planning for overseas tests would be continuous and would overlap the planning and execution of continental tests. Interference would not occur between continental and overseas testing since scientific resources permit the execution of only one test series at a time.

CONCLUSIONS

1. It is entirely feasible to reorganize a major unit presently assigned to the Air Force Special Weapons Center, utilizing spaces currently allocated to Air Force Special Weapons Center for the overseas nuclear test function and to assign to this unit the responsibility for all test activities currently under the purview of Air Force Special Weapons Center.

2. Such a unit could plan and execute both continental and overseas Air Force nuclear test participation more economically and more efficiently than has been the case in the past.

3. Normal MATS services should not be a part of such a reorganized unit and would be furnished for each overseas test as in the past.

4. This unit would possess the capability of accepting additional test responsibilities with added personnel and equipment.

5. The Commander of this unit should command the Air Task Group in continental and overseas tests.

6. The many difficulties experienced throughout the USAF in the past in organizing an Air Task Group to fulfill Air Force responsibilities in overseas nuclear tests would be solved more economically and efficiently through the provision of such a permanent unit at the Air Force Special Weapons Center.

SAMPLING MISSION

INTRODUCTION

Sampling mission requirements for Operation CASTLE, as outlined by the Los Alamos Scientific Laboratory (LASL), indicated a requirement for six radiochemical samples for each of the thermonuclear detonations as well as a need for high altitude samples above 50,000 feet. A sample consists of a predetermined amount of radioactive material collected on seven to eight square feet of special filter paper. These sampling requirements were met by using 15 F-84G samplers (12 F-84 aircraft per mission, each aircraft capable of obtaining one-half a sample) and two B-36H high altitude samplers (two B-36H aircraft per mission, each capable of obtaining a whole sample). The use of manned sampler aircraft for CASTLE was dictated since experience has shown that the most effective method presently available for collecting particulate and gaseous radioactive samples following atomic and thermonuclear detonations is to direct piloted aircraft into the atomic cloud.

The cloud sampling system involves the use of a Control Aircraft (an RB-36 on CASTLE) in which the Scientific Director and the Sampler Controller ride, and the sampling aircraft which penetrate the atomic cloud. The sampler pilot, under the visual/radar guidance of the Sampler Controller, penetrates the mushroom cloud until his radiological instruments reveal an area of high radioactive intensity. He then activates his sampling devices. When he has accumulated a predetermined level of radioactive sample he departs the cloud and returns to base where the samples are removed and processed.

The cloud resulting from the detonation of a thermonuclear device in the higher megaton yield range (10 to 15 megatons) reaches tremendous proportions. The initial cloud rise is approximately 1,000 feet per second so that the remnant of the fire ball passes through the 40,000 foot altitude level within 40 to 45 seconds. This cloud then pushes through the tropopause, slowing down, but still reaching heights of 120,000 to 150,000 feet in the order of minutes. As the cloud passes through the tropopause it tends to flatten out and take on the characteristic mushroom appearance, the width of the cloud growing to approximately 150 to 200 miles across. The base of this mushroom portion extends below the tropopause down to 45 to 48 thousand feet, mean sea level (MSL). The main column or stem which varies from 10 to 20 miles in diameter subtends this mushroom base. In the early stages, the stem extends to sea level, but later, as it drifts off with the wind it has an altitude base of 18 to 20 thousand feet and pours out muddy rain for one to two hours. Because of the tremendous convective forces set up by the extreme changes in temperature and the many tons of water and materiel carried to altitude by detonation, severe turbulence is created in the main column or stem and at the base of the mushroom portion of the cloud. This turbulent condition will persist for one and one-half to two hours. Also, for one to two hours after detonation, there are extremely high levels of radiation in and near the cloud, a considerable portion of which is soft gamma emitted from radioactive particles with very short halflives.

The objective of sampling is to obtain a homogeneous representative portion of the radioactive particles existing within the cloud for radiochemical analysis. There exists a divergence of scientific opinion as to where or in what areas of the cloud these homogeneous representative samples are to be found. The most accepted hypothesis is that these areas are in the base portion of the main mushroom cloud extending between levels of 50 to 60 thousand feet MSL. That is, just above and below the tropopause level. The procedures used with manned samplers in attempting to obtain sample homogeneity varies as a function of time after detonation. For instance, because of the high radiation levels and turbulence that exist, penetrations of the cloud are not made earlier than two hours after detonation and even then, the type of penetration must be one which gives the pilot a ready exit route. These early penetrations are nothing more than tangential passes at the edges of the mushroom base. For later sampling, three and one-half to five hours after detonation, the aircraft are directed through the center portion of the mushroom base as radiation and turbulence intensities have fallen off to acceptable levels. The cloud in the Pacific area usually drifts northeastward with the upper air currents at an average rate of 30 knots, extending the range to home base as each hour passes. This fact, coupled with particle dispersal, dictates that the sampling operation be completed within six hours after detonation.

The cloud dimensions and after effects can be scaled down slightly with lesser megaton yields but not to such an extent as to alter the sampling problems and procedures as briefly outlined herein.

SAMPLING AND CONTROL AIRCRAFT

Initial experience in sampling clouds from large yield thermonuclear devices was gained in the detonation of the MIKE device during Operation IVY. Because of the limited altitude capabilities of the sampling aircraft used in IVY, considerable argument arose among the scientists as to whether the samples had been obtained from the upper stem or from the lower cloud. Argument also arose as to whether or not samples obtained from the cloud base actually contained representative fission products. Many scientists believed that truly representative samples could be obtained only in the 55 to 60 thousand foot levels. Based on the IVY sampling experience and on these arguments, therefore, scientific requirements for CASTLE sampling were stated as mentioned in the introduction to this discussion.

Investigations were undertaken, following IVY, by the Air Force Special Weapons Center (AFSWC) of all aircraft types in the USAF inventory as well as those scheduled for production prior to CASTLE in order to select samplers for CASTLE which would meet these requirements. The first step was to list the specifications which should be met by an adequate sampling aircraft. These specifications, jointly worked out by AFSWC and LASL and later proved accurate during CASTLE can be stated as follows:

1. Be multiplace to enable one person to fly while another operates the sampling devices and radiological instruments and acts as a sampling director.
2. Be multiengine for long range overwater flying safety.
3. Maximum altitude capability (60,000 feet) to obtain quality samples.
4. Minimum endurance of five hours to allow sufficient time in the cloud area to collect a full sample.
5. Speed of .84 Mach to prevent overexposure of crew to radioactivity.
6. Be structurally clean to facilitate decontamination.
7. Capable of obtaining a full sample per aircraft to assure accuracy of sample. (Seven square feet of particulate sample and 1,000 cubic feet of gaseous sample per bottle under pressure.)

Aircraft examined against these criteria included the B-36H (Featherweight), B-57, B-47, B-66, B-52, F-84 and English Canberra. It was determined that the Canberra best met all criteria, closely followed by the B-57B. Efforts to obtain these aircraft were unsuccessful, however, due to nonavailability of the Canberra and to production difficulties with the B-57. Consequently, a compromise was made in selecting the F-84G's used during IVY for lower altitude samples and two B-36H's (Featherweight) for sampling above 50,000 feet.

Although satisfactory samples were obtained from each detonation during CASTLE, it was obvious that this compromise selection of aircraft resulted in inefficient, uneconomical operation and did not produce results which even approached the optimum.

Disadvantages observed were:

1. The F-84 lacked the desired altitude capability.
2. The F-84 pilots were severely taxed to fly their aircraft at critical altitudes during IFR conditions experienced in the nuclear cloud and operate and monitor the numerous sampling and radiation instruments simultaneously.
3. The F-84 is single engine and is not desirable for long overwater flights.
4. The F-84 required a complex radar control system to provide the necessary navigation direction.
5. The F-84 is extremely limited in range in a sampling configuration unless the operation is considerably expanded in size and expense by the employment of in-flight refueling.
6. The B-36H did not fully meet the desired altitude requirements.
7. The B-36H had a lower airspeed than desired.
8. The B-36H with its large number of aircrew exposed more personnel to radiation than is desired.
9. The B-36H presented a major decontamination problem.
10. The B-36H is an expensive aircraft to modify, operate and maintain.
11. The three B-36 and 15 F-84 aircraft took up a considerable portion of the critically small amount of available ramp space.

The above conditions led to the initiation by Air Task Group 7.4, early in the CASTLE operation, of a study to determine what action could be taken to produce an efficient manned sampler. Since previous studies, mentioned above, had indicated that the B-57 might be admirably suited to this purpose, this further study centered about this aircraft. Information obtained from LASL, University of California Research Laboratory (UCRL), Task Group 7.1 and AFSWC on sampler characteristics, and from Air Force Flight Test Center (AFFTC) on B-57 tests, was incorporated with Air Task Group 7.4 experience gained during CASTLE operations. It appeared that the B-57B air-

craft would satisfy all desired requirements, except altitude, provided the following modifications were made:

1. Removable bomb bay tank be designed to increase range.
2. Adequate oil capacity be provided to meet extended range.
3. Aircraft be "featherweighted" to improve maximum altitude capability.
4. Particulate and gaseous sampling devices be designed and installed.

Nine B-57B aircraft in the above configuration would supplant 15 F-84G and two B-36H samplers and one RB-36H control aircraft. In addition, samples of higher quality would be obtained while at the same time permitting a far more economical operation in terms of dollar costs for modification, fuel and lubricants, aircraft spares, ramp space, and personnel costs for maintenance and operation. In operation on a sampling mission, one of these aircraft would be used at the outset as an airborne monitoring station to provide continuity to the sampling and then would obtain the final sample prior to returning to base. Each aircraft would have a "sampler director" aboard thus eliminating the need for a control aircraft. To improve capability to a desired 60,000 feet, these aircraft could later be supplanted by B-57's with engines developing greater thrust as soon as such aircraft became available. Thus equipped, AFSWC could meet all future requirements in both continental and overseas tests in an effective, economical manner without the loan of aircraft from other USAF agencies.

CONCLUSIONS

1. The F-84G proved to be an inadequate sampling aircraft for large yield detonations because of inherent range, endurance, and altitude limitations. These deficiences were magnified due to the single place configuration which taxed the pilot to fly at critical altitudes on instruments and operate sampling and radiation measurement devices within the nuclear cloud.
2. The Featherweight B-36 proved to be a reasonably adequate sampling aircraft in terms of altitude capability. It proved to be an unnecessarily expensive and complex aircraft to modify, operate, maintain and decontaminate.
3. A study of B-57B characteristics indicates that this aircraft most nearly meets the optimum aircraft requirements with certain modifications. These modifications are the installation of bomb bay fuel tanks, increase oil capacity, "featherweighting", and providing particulate and gaseous sampling devices.
4. The desired sampling altitude capability of 60,000 feet could be realized by redesign of the B-57 airframe to accept an engine of greater thrust.
5. In terms of dollar costs per sample obtained, nine B-57B aircraft will produce far more economical and higher quality samples than were obtained through the use of 15 F-84, two B-36 samplers and the RB-36 control aircraft.

UNMANNED SAMPLING DEVICES

It is to be noted that so far in this discussion, we have considered the criteria and problems associated with manned sampling vehicles. Since this is the best method presently available of obtaining samples, scientists have been forced to accept the limitation thus imposed.

Actually, scientific studies would be measurably improved if sampling vehicles were available which would:

1. Take samples of approximately the same size as does the F-84G.
2. Obtain these samples at any time from immediately following detonation to approximately H plus five hours.
3. Select samples at any altitude from the cloud base up to 100,000 to 125,000 feet.

Obviously, for the reasons explained in the introduction to this discussion, a manned vehicle could not be utilized to meet these objectives. Some type of missile or series of missiles possessing the following characteristics would be required:

1. Capable of guidance from a surface and/or airborne station.
2. Sufficient stability to withstand, without guidance upset, the tremendous gust velocities experienced in the nuclear cloud in the period immediately following detonation.
3. Recoverability of samples and vehicles through landing, using arresting gear or other means, on an airstrip of not more than 5,000 feet or through a water landing at a specifically selected spot.
4. Altitude characteristics permitting sampling at least to 125,000 feet.
5. Ability to withstand high temp-

eratures found in the cloud immediately following detonation.

6. Sufficient endurance to permit a radius of 500 nautical miles, maneuver for ten to fifteen minutes in the cloud and maneuver for landing on return.

During CASTLE, Air Task Group 7.4 instigated a study of this subject in order to develop basic specifications for such an eventual vehicle. It was not possible to go beyond the material included in this discussion because of the following:

1. Sufficient time to conduct a thorough study could not be taken from the assigned mission.

2. Specialists in missile design, guidance and other related subjects were not available.

3. Answers to various pertinent questions concerning cloud temperatures, gust velocities and radiation levels were not known even in approximation.

Further study of this subject by a competent agency may lead to the development of a vehicle, or adaptation of already planned missiles, the use of which would result in optimum efficiency and economy in the sampling operation.

CONCLUSIONS

1. Scientific knowledge would be greatly increased if radioactive samples could be obtained at any desired time following a detonation and at altitudes from cloud base up to 125,000 feet.

2. It is entirely possible that a study of the use of guided missiles might provide a sampling vehicle of optimum efficiency and economy.

EFFECTS AIRCRAFT MISSION

INTRODUCTION

Coincident with the early development of atomic devices for use as aerial bombardment weapons, there arose the problem of determining the relative safety of the delivery aircraft from the effects of such detonations. Since the yield of stockpile weapons and devices under development has increased in large increments during the last few years, the problem has become more critical, thus requiring considerable effort to be directed toward devising techniques of delivery which would assure the safety of the drop aircraft. Over the last several years, Wright Air Development Center (WADC) has pursued a program of research aimed at accurate prediction of the delivery capability of current tactical aircraft, as well as determination of structural design criteria to be applied in the design of future aircraft to enhance their delivery capability. This program has included contracts with universities and research organizations for basic investigations in the response of aircraft to the thermal radiation, the shock wave overpressure, and the related gust resulting from atomic or thermonuclear detonations. In several series of development tests, as another phase of this program, WADC has flown instrumented combat aircraft types in the vicinity of nuclear bursts to obtain experimental data with which to test and improve the theories being developed.

The scientific requirements of the aircraft effects project in Operation CASTLE were to fly instrumented aircraft at positions in space at which calculated levels of thermal radiation, gust velocity, and overpressure might be experienced, to measure the actual input levels, and to measure the resultant skin temperature rises and structural stresses and deflections on various portions of the aircraft.

In preparation for Operation IVY, the Aircraft Laboratory, WADC, had extensively instrumented B-36D #2653 and B-47 #0037 to measure thermal and shock inputs and aircraft responses. Both aircraft had been employed in pursuit of the WADC program on Operation IVY in the MIKE and KING Shots, and with some modifications in instrumentation, the B-36D had been utilized in the EFFECTS shot of Operation UPSHOT/KNOTHOLE. These aircraft were again available in essentially the required configuration for Operation CASTLE, and were assigned. WADC accomplished certain additions and modifications to the instrumentation installation at depots and through the use of contractors before the aircraft departed for the forward area.

EFFECTS AIRCRAFT POSITIONING

Representatives of Air Task Group 7.4 attended several meetings with Los Alamos Scientific Laboratory and WADC representatives, both in the Zone of Interior and in the forward area, at which the effects aircraft participation was planned and values of positioning parameters to be employed were discussed. In particular, they participated in the positioning conferences for each shot, at which the preliminary results of previous shots were reviewed, and the philosophy for positioning the effects aircraft for the test exposure was decided upon. In these meetings there had been extensive discussion of the yields on which the effects aircraft would be positioned on each shot. Since most of the detonations were to be experimental devices, the yield to be expected of any one of them was subject to considerable uncertainty. This uncertainty in yield prediction had a strong effect on the positioning philosophy employed. The stated objective of the aircraft effects project was to position the aircraft to receive as near one hundred percent of the allowable thermal effects and gust tail load as was consistent with safety, in order to obtain data more significant than that which had been collected in the past. Obviously, if the aircraft were positioned on a yield much higher than that likely to be attained, this objective could not be fulfilled. For example, on MIKE Shot of Operation IVY the conservatisms in yield prediction were so great that the effects aircraft were positioned so far out from Ground Zero that the results obtained were of little interest. Conversely, it was inappropriate to consider positioning on the basis of a yield which might very well be exceeded, since the effects experienced in this case might damage the components of the instrumentation installations so that none of the results of the exposure would be recorded in interpretable form, and might cancel subsequent participation in the shot series because of a lack of facilities in the forward area for repair and recalibration of the instrumentation installa-

tion. Therefore it was important to select a value of yield for positioning for which the calculated risk of damage to the instrumentation was acceptably small, and the probability of receiving significant levels of effects was large.

Since the CASTLE series was concerned with the determination of the optimum thermonuclear stockpile weapon for the current period, there was considerable interest on the part of both the Strategic Air Command (SAC) and the Air Force Special Weapons Center (AFSWC) to demonstrate the drop capability of delivery aircraft with such a weapon, by flying simulated delivery positions with respect to the planned detonations. Such a demonstration would be a desirable culmination of any weapon delivery system development, but in this case it was considered especially important since the long-range research program has not progressed far enough to provide either proved theoretical techniques or experimental data at significant levels of weapons effects from which the actual delivery capability of current tactical aircraft can be determined. In the face of the rapid strides taken in weapon development over the past few years, if one were to restrict delivery aircraft exposures to the levels of effects for which operational aircraft have been exposed in past test series, or to levels appropriate to the degree of confidence engendered by the theoretical techniques, delivery of currently available weapons would require employment of techniques which improve safety of delivery at the expense of delivery reliability and accuracy and operational simplicity.

Unfortunately such a demonstration of delivery capability is not compatible with the basic scientific objectives, but requires a different philosophical approach to programming the test participations. On the one hand the scientific requirements can be met most easily by a program of parametric variation, while on the other hand demonstration of delivery capability should consist of exposing the aircraft only in combinations of altitude, airspeed, gross weight, etc., which are natural to the operational configuration of the drop aircraft at the target. There had been no provision made in the organization of the schedule of Department of Defense (DOD) programs to be conducted during the CASTLE series for such a demonstration test.

The original thermal instrumentation on the B-36 had been designed for the aircraft surfaces finished in the production fashion; i.e., aluminum lacquer on the magnesium skin and the aluminum skin bare. However, for multi-megaton detonations, determination of the burst time and shock arrival time positions which can be tolerated by a B-36 prepared in this manner indicates that the thermal effect is so predominant that the aircraft safely positioned for thermal effects on the critical portions of the aircraft will experience insignificant gust tail loads. As a corollary, the multi-megaton delivery capability of a B-36 prepared in this manner is limited by thermal effects. Fortunately this limitation is no real obstacle, since the thermal tolerance of the critical areas can be improved by simple techniques such as the use of white paint to increase surface reflectivity. By the use of white paint the thermal tolerance can be improved to the point that the aircraft can be positioned on the basis of tail load, and similarly, in delivery the limit capability is defined by gust effects. Therefore, both SAC and AFSWC were interested in seeing the critical portions of the test aircraft painted with white paint: first, to demonstrate the protective characteristics of white paint; and second, to allow the aircraft to be positoned to receive large tail loads. Initial attempts to arrange this were impeded by the conflict between the long-range research philosophy and the operational demonstration philosophy, since Project 6.2 personnel believed that painting the instrumented surfaces of the aircraft would compromise the accomplishment of the test program, in that the effects of non-uniform and unknown thicknesses of white paint would make it impossible to correlate data from point to point. However, when the importance of the information with respect to delivery was appreciated, and when it was realized that high gust tail loads in the vicinity of high yield weapon bursts could not be attained without thermal protection, the decision was made to paint the critical portions of the aircraft with white paint for the test series.

The low and non-operational altitude selected for the B-36 on most of the shots of the series was based on concern for the mechanical condition of the aircraft. The attitude of the project personnel was that they did not desire to chance compromising future participation of the B-36 by straining the engines any more than necessary, except in the final shots of the series.

As a result of these exposures the aircraft repeatedly experienced minor damage to non-structural components such as the bomb-bay doors. Unfortunately most of the damage suffered by the aircraft was of little or no operational significance, since it was caused by the high overpressure to which the aircraft was thus exposed. Had the aircraft been simulating an operational config-

uration for a multi-megaton delivery, it would have been flying at an altitude of 40,000 feet at normal rated power airspeed. The overpressure which would have been encountered in such a simulation would have been considerably less than the overpressure to which the effects aircraft was exposed. At operational altitudes the delivery capability of the B-36 is defined by gust and thermal effects, not by overpressure.

CONCLUSIONS

1. Although preliminary results indicate that the aircraft effects program on Operation CASTLE was eminently successful in obtaining valuable data for use in the long-range research program being conducted by WADC, these preliminary results indicate only by implication the delivery capabilities of tactical aircraft for weapons in the yield range of the devices tested on CASTLE.

2. There is a need for a program within the Air Force directed toward demonstration of operational aircraft weapon delivery capabilities, as opposed to long-range research in the aircraft effects problem.

PHOTOGRAPHIC MISSION

INTRODUCTION

The Air Task Group 7.4 photographic mission for Operation CASTLE consisted of providing documentary photographic coverage of all phases of the operation, providing sequence photography of each cloud to assist in determining its growth, obtaining required crater photographs, and obtaining required mosaics for mapping purposes. Three specially modified C-54 aircraft accomplished the major portion of the photographic mission. The RB-36 control aircraft assisted in accomplishing the cloud measurement photography and the three B-50's used for indirect bomb damage assessment (IBDA) accomplished the crater photography. Details of the photographic mission are covered in the July, September and February installments of the Air Task Group 7.4 history. Major points concerning photographic mission planning and modification of photographic aircraft, which are pertinent to future test operations, are discussed below.

PHOTOGRAPHIC MISSION PLANNING

Scientific Task Group 7.1 was charged with establishing photographic requirements through coordination with concerned Atomic Energy Commission and Department of Defense agencies. Task Group 7.1 was further charged, through Lookout Mountain Laboratory, with providing technical personnel to plan for and accomplish the technical portion of the photographic mission. Air Task Group 7.4 was charged with providing aircraft and crews necessary to accomplish the photographic requirements and with planning for and accomplishing the operational portion of the photographic mission. This dual responsibility of Task Groups 7.1 and 7.4 in planning for and accomplishing the photographic mission required close and continuous coordination. During the early planning phase of the operation, as an economy measure, both task groups agreed to use aircraft assigned for the accomplishment of other missions to also accomplish, as a dual mission, as much of the photographic requirement as possible. This resulted in selection of the RB-36 airborne control aircraft to accomplish the high altitude part of the cloud measurement photographic requirement and selection of the IBDA B-50's to accomplish crater photography. It was then determined that the balance of the photographic mission could be accomplished with three C-54 aircraft.

Prior to each detonation, it was necessary for Task Group 7.1 to recompute the desired H-hour positions in space for photographic aircraft. These computations were complex and had to be based both upon safety factors and positions desired for mission accomplishment. While these computations were taking place, Air Task Group 7.4 was, of necessity, planning the full operational details of the mission. In several cases, final positioning information on photographic aircraft was not received from Task Group 7.1 soon enough to allow its proper inclusion in the operational plan.

CONCLUSIONS

1. Effective, coordinated planning by Task Groups 7.1 and 7.4 during the early planning phase of the operation resulted in the elimination of unnecessary aircraft by assigning to other primary mission aircraft a secondary photographic mission. This represented a substantial economy in the conduct of the operation.

2. Operational planning was adversely affected during the operation by late submission of exact photographic aircraft positioning requirements by Task Group 7.1.

MODIFICATION OF PHOTOGRAPHIC AIRCRAFT

In determining the type aircraft that should be used for the primary mission of photography, the following factors were considered:

1. Space needed for installation of cameras.
2. Size of opening required for efficient camera utilization.
3. Desired altitudes from which photos were to be taken.
4. Endurance required in order for

the aircraft to reach the photographic area, remain in that area for a sufficient time to accomplish the mission, and to return to home base.

5. Safety and economy of operation.

The C-54 type aircraft meets all the requirements established above; however, since C-47's had been used in past continental tests, they were considered for the overseas test. It was found that the C-47 type aircraft was not suitable because its cargo door opening was too small, the range was too short, it could not furnish as stable a platform at 12 to 14 thousand feet as the C-54, and the cargo compartment was not large enough to accommodate all the photographic equipment. In comparing the two types of aircraft, it was determined that the C-54 was not only more suitable for overseas tests but would also be more suitable than the C-47 for continental tests.

The Military Air Transport Service (MATS) was responsible for furnishing C-54 type aircraft to be utilized as primary photographic aircraft. Since the MATS aircraft that were used for Operation IVY were demodified at the end of that operation, it was necessary to completely modify three more for CASTLE. The modification was accomplished so that the structures supporting photographic equipment could be removed to make the aircraft suitable for other purposes in an emergency. These modifications included:

1. A burble fence on the exterior of each aircraft to minimize turbulent air flow into the open door camera positions.

2. Installation of A-28 Gyro stabilized camera mounts.

3. Camera racks and power outlets for cameras, with extensive wiring to these outlets.

4. Additional oxygen outlets.

The modification was accomplished by the San Bernardino Air Materiel Area Depot under the technical direction of Lookout Mountain Laboratory and required 60 days for completion. Since the aircraft were needed for two weeks in October 1953 for a continental rehearsal, it was necessary that MATS make them available to the Depot in August 1953. They could have been returned to the transport system in November 1953 for use until required in the forward area in January 1954 but this was not recommended as a result of past experience which indicated that extensive damage occurred to the wiring modifications in transport use. Consequently, they were lost to MATS from August 1953 until the completion of the operation in May 1954, a period of 10 months. Had the aircraft not been demodified at the end of IVY, the expense of remodifying could have been eliminated and the aircraft could have been utilized most profitably in UPSHOT-KNOTHOLE. Since the aircraft were used by the Air Task Group two weeks in October 1953 and for the operation from 1 February until 15 May 1954, they were not being utilized for six of the 10 months during which they were lost to MATS. Had they still been modified from Operation IVY and had they been assigned to an organization that could have utilized them in their modified condition, the three months they were idle between Air Task Group missions and the 60 days required for modification would not have been wasted.

CONCLUSIONS

1. Demodifying photographic aircraft at the conclusion of an operation and then modifying them again for the next operation is not economical utilization of aircraft and funds.

2. The most suitable aircraft for accomplishing the photo mission in both overseas and continental tests is the C-54 type aircraft.

3. The C-54's modified for the photographic mission were not properly utilized during the period November 1953 - January 1954, due to their being assigned to an organization which could not use them in their modified status.

COMMUNICATIONS

INTRODUCTION

The communications tasks on Operation CASTLE were:

1. To provide land based communications links to enable Air Task Group 7.4 to maintain contact with its outlying logistical, weather and administrative support agencies.
2. To provide the land based air-ground radio channels necessary for control and safety of the test aircraft.
3. To furnish the land based aids to aerial navigation.
4. To provide and monitor the task group communications security program.

The planning and supervision of these tasks were the direct responsibility of Headquarters, Air Task Group 7.4 as was also the necessary coordination with Joint Task Force SEVEN Headquarters, other task groups, and major air commands. The execution of these tasks was primarily a function of the Communications Element of the Test Services Unit which was provided by the Airways and Air Communications Service (AACS). Certain minor support was furnished by the Test Support Unit, provided by the Air Force Special Weapons Center (AFSWC). All elements of Air Task Group 7.4 furnished personnel to provide organizational and field maintenance on organic electronic equipment.

The over-all communications requirements of Air Task Group 7.4 for Operation CASTLE were fulfilled in a satisfactory manner. The problems and weaknesses were mainly caused by the lack of early long range and detailed joint planning for facilities, by deficiencies in the initial engineering and installation work accomplished by the AACS, and by the fact that the Communications Element Commander did not have the opportunity or the authority to insure that his element would be prepared to fulfill its mission by the scheduled date. Although these initially created an unexpected workload during the period immediately preceding the first scheduled detonation and did hamper efficient communications to an extent during the operational period, the over-all quality of service rendered was unquestionably adequate.

JOINT PLANNING FOR COMMUNICATIONS FACILITIES

The high frequency radio terminations on ENIWETOK ISLAND necessary to provide the circuits for point-to-point and air-to-ground communications were in many respects not satisfactory. This was not because of faulty or insufficient equipment of the proper types, but because of the layout of the physical plant utilized. High frequency receiving antennas were located in an area where the density of vehicular traffic was greater than at any other point on the island. The noise level of receivers was unduly high. The transmitting antenna farm, shared jointly with the Signal Corps, was over-crowded to the extent that not one antenna was so located as to be out of the radiation pattern of several adjoining antennas. Beat frequencies and harmonics were created and at times caused interference at the receiver station located at the opposite end of the island. The Joint Relay Center was situated more than a mile from the AACS Communications Center. The multiplex gear in the Communications Center, being so widely separated from the SAMPSON synchronous equipment, created a host of difficulties involving the "sync" pulse and bias. Operating and message handling procedures were complicated by having two widely separated Communications Centers, one Air Force and one Signal Corps.

The basic reason for the technical difficulties was the necessity for utilizing a communications plant in the Pacific Proving Ground that existed almost solely as a result of GREENHOUSE and IVY. The over-all communications scheme for CASTLE never became an entity. It wasn't planned - it just grew. Each succeeding test, involving devices of higher and higher yield, called for more and more point-to-point communications links as the various elements of the Joint Task Force were forced to separate over wider expanses of the Pacific Ocean. Yet, the actual physical plant used for communications remained relatively the same. Each task group continued to plan for its own requirments and there was no concerted effort to plan for joint use of facilities.

These deficiencies were recognized before the completion of the CASTLE operational phase and corrective action was initiated. The communications personnel of Joint Task Force SEVEN met at PARRY ISLAND on 12 April 1954, to discuss current problems and to establish criteria for requirements for future operations. Recommenda-

tions for future requirements were completed on 1 May 1954, and incorporated the following:

1. An off-island joint transmitter site.
2. A joint communications center for all three participating services, the civilian scientists and the contractors.
3. A joint receiver site to be located where the transmitters now are located on ENIWETOK ISLAND.
4. Extensive use of single sideband equipment.

A cursory glance indicates that action on these four contemplated changes would eliminate the difficulties discussed above.

CONCLUSIONS

1. The physical plant available to Joint Task Force SEVEN for communications has not kept pace with increased requirements.
2. Present actions underway to improve communications facilities will eliminate the difficulties that were encountered.
3. There has not been provision for complete joint use of communications facilities by all participating military and scientific agencies.

AIRWAYS AND AIR COMMUNICATIONS SERVICE PLANNING AND ENGINEERING

The task of providing land based communications, air-ground radio, and aids to aerial navigation was a responsibility of the AACS and their detailed missions were received in the form of an air operations plan from Air Task Group 7.4. Due to the long lead time required to plan for and obtain equipment, this air operations plan was received by the AACS at a later date than was desired. Even so, it is believed that AACS had more than adequate experience and technical knowledge to translate the plan into rapid and firm actions to meet the operational deadlines.

In preparation for CASTLE, the installation and maintenance personnel of AACS were unacceptably late in completing the communications requirements. Thirty days before the first shot was scheduled, not one facility was completely or satisfactorily installed. The fundamental principles of good electronic engineering practices had not been observed. Each of the circuit terminations had to be re-engineered and reinstalled. This was accomplished only by the complete cooperation of all the AACS activities in the Pacific area. This thirty-day delay seriously interfered with the intensive training program that had been planned. The circuits could not be turned over to operating personnel for rehearsals, operator indoctrination, and general refinement. Maximum operational efficiency was not attained until after the first detonation had occurred.

One reason for this deficiency was that no one in AACS was in a position to monitor the planning for and accomplishment of the work being done for Air Task Group 7.4. There was little, if any, direct liaison between Joint Task Force SEVEN and AACS. During IVY, AACS had a liaison officer assigned to the Office of the Assistant Chief of Staff, J-5, Joint Task Force 132. This officer assisted both his own headquarters and Air Task Group 132.4 immeasurably. In addition, he served as monitor and provided continuity of experience and background for the evolvement of the Air Force communications requirements from the planning stage through the installation phase and on into the operational period. During CASTLE, there was no such officer to furnish continuity. Consequently the plans never were translated into working installation specifications and drawings.

Another reason for the deficiency was the late assignment of the officer who was to command the Communications Element. His assignment was made just three months prior to the operational period and he had limited opportunity to become acquainted with the planning background or with the intricacies of joint communications. Also, he did not have the opportunity to review the technical qualifications of the personnel authorized for his organization. The Communications Element Commander did not have control over the Installation and Maintenance Team and thus could not take appropriate action to meet the installation deadlines.

CONCLUSIONS

1. The AACS has a major task in providing communications services to the Air Task Group.
2. During the planning, engineering,

and installation phases for communications, close coordination did not exist between Headquarters, AACS, Joint Task Force SEVEN, the five task groups, and the operating units within AACS.

3. The AACS Communications Element Commander was not designated in time to be thoroughly indoctrinated, or to visit the Pacific Proving Ground to become personally acquainted with the progress of installations engineering and the status of equipment.

4. The AACS Communications Element Commander did not have the necessary control of the installation and maintenance personnel to insure that equipment was installed as scheduled.

RADIOTELEPHONE AND RADIOTELETYPE COMMUNICATIONS ABOARD A COMMAND SHIP

It was a responsibility of Air Task Group 7.4 to furnish detailed weather information to the Joint Task Force SEVEN Commander aboard the Command Ship, a Navy AGC, and to relay necessary aircraft control information back and forth between the Air Operations Center (AOC) on ENIWETOK ISLAND and the Combat Information Center (CIC) aboard the Command Ship. To accomplish this, Air Task Group 7.4 had three high frequency radio-telephone channels and one multiplex radioteletype circuit installed aboard this ship. In addition to these circuits, the Headquarters, Joint Task Force SEVEN, and each of the task groups had high frequency terminals installed, all of which were either teletype or voice. Since the type of vessel used was designed primarily for CW in the high freqency band, it was not capable of accommodating the required number of teletype and voice circuits. This was because of the lack of terminal facilities and the overlapping antenna pattern. The end result was interference between these circuits to the extent that weather information could not be passed over the assigned circuit. It was necessary to use the circuits intended for aircraft control traffic. This practice was not satisfactory in that the control circuits between the AOC and CIC were not capable of handling the volume of traffic required.

CONCLUSIONS

1. The Command Ship did not furnish adequate facilities for terminating high frequency radiotelephone and radiotelegraph circuits.

2. The high frequency antennas installed and used on the Command Ship caused mutual interference between circuits. This resulted in excessive circuit outage time.

NAVIGATION AIDS

To provide navigational assistance for air operations, it was necessary to establish aids at various locations. On ENIWETOK ISLAND, there was LORAN, GCA, RACON, VHF/DF and a low frequency radio homing beacon. There was a RACON and a homer on MAN ISLAND in the BIKINI ATOLL, a homer at RONGERIK ATOLL, and homers aboard the Control Destroyer and the USS CURTISS.

In regard to those aids which were land based, there were two problems. The LORAN Master Station could not monitor the WAKE ISLAND rate because of interference. Consequently, the master station had to transmit a blinking signal over 50 percent of the time. This interference was caused by the proximity of the LORAN Station operated by the Coast Guard and the high frequency transmitting antennas used by the Air Force and the Signal Corps. This problem could be solved by moving the high frequency transmitters to an off-island site, as discussed earlier.

The other problem was concerned with the radio homing beacon and the radar beacon (RACON) at BIKINI ATOLL. These were installed on the island of NAN for attended usage. However, the after effects of high megaton detonations on the atoll rendered both these aids practically useless. It was impossible to man these facilities during the detonations and the residual radioactive contamination on the island after detonations precluded personnel from providing necessary periodic maintenance. Anticipating the possibility of the loss of land based aids, the USS CURTISS had been equipped with a radio homing beacon. This USS CURTIS Beacon was used on all shots because the homer on NAN failed as a result of each BIKINI detonation.

CONCLUSION

1. The ENIWETOK LORAN Station was unsatisfactory as a navigation aid because of interference from high frequency transmitting antennas.

2. The RACON must be a land based, fixed position installation. The one installed on BIKINI ATOLL was unsatisfactory because it was not designed for unattended service and it was not adequately protected from the effects of the detonations.

3. The requirement for a low frequency radio homing beacon in the vicinity of BIKINI was successfully fulfilled by utilizing a homer placed aboard a Navy vessel.

THE AIR CONTROL SYSTEM

INTRODUCTION

The air control system operated by Air Task Group 7.4 included control of all air operations, except air defense which was a Navy responsibility. Primary components of the system were the control agency and Task Group Command Post in the Command Ship Combat Information Center (CIC), the ENIWETOK Air Operations Center (AOC), the Control Destroyer Combat Information Center, and the Control RB-36 aircraft. The Command Ship CIC exercised over-all control jurisdiction and, in addition, directly operated control activities in the BIKINI area. Agencies concerned with aircraft control in the ENIWETOK area operated under direct control of the ENIWETOK AOC. The Control Destroyer was positioned to extend radar and control coverage as required by each test event. The RB-36 control aircraft provided scientific direction and close control of sampling aircraft operating in the immediate cloud area.

Complete details of the air control operation are covered in the February and May installments of the Air Task Group 7.4 history. Major points concerning the general control system, the Command Ship CIC, and the AOC, which are not standard and are pertinent to future operations, are summarized below:

THE GENERAL CONTROL SYSTEM

Integration of all units concerned with aircraft control into one centrally directed and coordinated system was recognized as essential during the planning and training stage of Operation CASTLE. The inherent hazards of the operation as well as those of constant overwater operations, with extremely limited emergency landing facilities, demanded the adoption of a system of control which would provide continuous position observation and plot of each airborne aircraft by electronic means. This system allowed positive control instructions to be passed to pilots at all times. It was apparent that only through complete integration of the widely dispersed control elements could continuous and positive control be achieved. During the overseas unit training phase, this integration was eventually brought into being, but only after several incidents which could have led to serious accidents.

These difficulties were principally encountered in the coordination of the various activities concerned with aircraft control in the area of ENIWETOK ATOLL. The activities included the Control Tower, GCA, Air Route Traffic Control, Approach Control, Air and Sea Search and Rescue Control, and Air Operations Center Control. They were equipped and manned by the Military Air Transport Service, Air Force Special Weapons Center, and Air Defense Command personnel. All of these units arrived in the forward area at approximately the same time and immediately prior to arrival of the operational air units. Although Command Post Exercise type training of these control units was initiated at the earliest possible date in order to weld them into an effective control team, the air units were ready to commence unit training at approximately the same time. Thus, although positive control was vital to planned unit air training, as well as to safety, it was not available.

As mentioned in the Communications portion of this report, delays in installation of various items of communications equipment seriously hampered the operation of various control agencies; but of even greater importance were the following inadequacies in the methods of operation of the control system:

1. Failure of each control element to pass control of aircraft to other control elements in a sufficiently positive manner.
2. Failure of each control element to pass necessary information on aircraft under its control to other concerned control elements.
3. Failure of each control element to request assistance from other control elements before becoming saturated by control load.
4. Failure of each control element to transmit instructions and information to other control elements in an intelligible and standard manner.

Solution of these problems was effected by:

1. Elimination of conventional grid systems for exchanging aircraft positioning information by the control agencies and substitution of a simple numerical system to be used as standard procedure for pilots and all control agencies. This system consisted of six numbered positions corresponding to fixed geographical positions. Position one was take

off, position two was AOC-CIC control change-over point, position three was arrival at H-hour position in the operational area, position four was leaving operational area, position five was CIC-AOC control change-over point and position six was landing.

2. Provision in each control agency of aircraft status and control boards designed to display to the view of all controllers, at all times, up-to-date positioning information in the above numerical system on each aircraft airborne.

3. Subordination of all ENIWETOK ATOLL control agencies to the sole direction of a Senior Controller in the AOC. Airways and Air Communications Service (AACS), Search and Rescue (SAR) control facilities and the Naval Liaison Section were physically positioned in the AOC Control Room. Complete coordination of control facilities was affected by designating the senior duty controller as the representative of the Air Task Group Commander, with authority to make operational decisions affecting the control of all aircraft within the Pacific Proving Ground.

4. Intensive training of the control agencies as a system in all standard operating procedures.

Thus, although the inadequacies in system-training of the control agencies seriously interfered with the scheduled overseas air unit training, these solutions proved extremely effective by the time of the first operational event on 1 March 1954.

CONCLUSIONS

1. For an operation similar to CASTLE, integration of all elements concerned with aircraft control into one centrally directed and coordinated control system was essential to mission success and to safety. Such a system was developed and utilized by Air Task Group 7.4.

2. Control elements in the ENIWETOK area were not in position sufficiently in advance of the arrival of air units to permit adequate system-training and therefore were not adequately trained, at the time the air units arrived, to provide required aircraft control for the scheduled overseas training.

3. In atomic test aircraft control procedures, the simple numerical system of stating aircraft positions was superior to conventional grid systems.

THE COMMAND SHIP COMBAT INFORMATION CENTER

As a result of the control equipment deficiencies experienced during Operation IVY and the CASTLE rehearsal at San Diego, several unusual modifications were made to equip the Command Ship adequately as both the supervisory agency of the CASTLE Air Control System and as the Air Task Group 7.4 Command Post for operational periods. These modifications included relocation of VHF antennas to provide effective radiation patterns, and installation of individual IFF slave boxes and communications selector switches at each control console. In addition, the CIC was rewired and a total of seven Plan Position Indicator (PPI) Scopes and a URD-2 VHF/DF unit were installed. Superior work was performed by the 11th Naval District in accomplishing these modifications. These modifications, combined with expert electronic maintenance aboard ship, resulted in satisfactory CIC communications, radar and IFF facilities during the entire operation.

CONCLUSION

The modifications made in the CIC of the USS ESTES resulted in the elimination of communications and control equipment deficiencies experienced during previous tests and provided Air Task Group 7.4 with an effective supervisory control agency and command post.

THE AIR OPERATIONS CENTER

The ENIWETOK AOC was not radar equipped, but maintained a scope control capability through installation of an improvised Identification Friend or Foe (IFF) interrogator system with two PPI Scopes. The IFF System proved reasonably effective in con-

trolling aircraft in the ENIWETOK area. It was particularly effective in assisting GCA and Approach Control in the instrument landing of jet fighters during periods of heavy shower activity when radar control alone was impossible. It also permitted positive control of all aircraft within a 150 mile radius of ENIWETOK, regardless of weather conditions, when IFF equipment in both aircraft and the AOC was operating satisfactorily. The primary disadvantages of this system, as compared with a combined radar-IFF control system, were its inability to track aircraft without installed IFF, its inability to track aircraft with inoperative IFF and its inability to track any aircraft when the IFF interrogator in the AOC was inoperative. It was necessary to control transient aircraft by dead reckoning, since they were not IFF equipped. It was impossible to control emergency SAR intercepts positively when the aircraft in distress was not IFF equipped. Although no aircraft were lost as a result of these deficiencies in the control system, adequate safety of flight operations was not guaranteed by the IFF control system alone. Since the AOC was not radar, as well as IFF, equipped, it was necessary to abort several missions either because the IFF interrogator in the AOC was inoperative or because IFF equipment in individual aircraft failed. During the event conducted in the ENIWETOK ATOLL area, it was necessary to use the Command Ship solely for control purposes since the AOC, although located only a short distance from ground zero, was not radar equipped and therefore did not have sufficient scopes or the positive control capability required to conduct the control operation. It was necessary for the Navy Task Group to establish an Air Defense Control Section in the AOC to assure proper coordination of Navy Task Group air defense operations and Air Task Group aircraft control operations. Since the AOC was not radar equipped, it was further necessary for the Navy Task Group to maintain a destroyer in the ENIWETOK area to control ENIWETOK air defense operations. The AN/FPS-3 - AN/FPS-6 is a standard USAF Ground Control Intercept (GCI) radar combination, providing full radar and IFF control capability, including height finding. This installation could be adequately housed in the present ENIWETOK Air Operations Center. Its operation and maintenance would require approximately 25 people above that required for CASTLE AOC operations.

CONCLUSIONS

1. Effective, economical mission accomplishment and safety of flight operations in the ENIWETOK area were not adequately guaranteed by the AOC IFF control system.
2. A combination radar-IFF control system does exist in the AN/FPS-3 and AN/FPS-6 radars which, if installed in the AOC, would greatly increase effective, economical mission accomplishment and safety of flight operations in the ENIWETOK area.

SEARCH AND RESCUE

INTRODUCTION

The 78th Air Rescue Squadron (ARS), KWAJALEIN, M.I., was designated to provide aircraft, aircrews and Search and Rescue (SAR) controllers to the Air Task Group for Operation CASTLE. This squadron had been originally scheduled for deactivation on 1 January 1954. However, the deactivation was delayed until the end of the fourth quarter of fiscal year 1954 in order to provide SAR for Operation CASTLE at ENIWETOK. This was to be the sole mission of the squadron during this extension.

Due to circumstances beyond the control of Headquarters, Air Rescue Service, the squadron was required to continue SAR coverage for the KWAJALEIN area as well as fulfill the Air Task Group SAR requirements in the ENIWETOK-BIKINI area. The extension of the normal mission and addition of the new mission caused many problems in the procurement of additional aircraft, aircrews and equipment. Aircraft were rotated between KWAJALEIN and ENIWETOK with most of the maintenance being performed at KWAJALEIN, thus dividing the organization into two units.

OPERATIONAL PROBLEMS

In order to perform its mission, the 78th Air Rescue Squadron had to procure additional aircraft, crews, SAR control personnel and equipment to augment the existing squadron capabilities. This required additional security clearances, training, corrosion control of aircraft, and modification of PP-1 kits and electronic equipment. Components of the Mark 10 IFF Interrogator Transponder in most of the SA-16's were not operational until immediately prior to the operational phase of CASTLE. This seriously hampered training in the proper use of vital equipment.

When the 78th ARS was given the responsibility of SAR for ENIWETOK in addition to KWAJALEIN, it necessitated the designation of a commander for the new unit at ENIWETOK. It was decided that the Commander of the 78th ARS at KWAJALEIN would serve as commander of both units. To fulfill the responsibilities of both positions required the commander to answer to two headquarters, his permanent organization, the 11th Air Rescue Group, Hickam AFB, T. H., and his temporary organization, the Test Services Unit, Air Task Group 7.4, ENIWETOK, M. I. After being so designated, it was found that he was frequently needed at both locations at the same time. This fact was disconcerting to his superiors, his subordinates, and himself, and the only solution was to appoint another commander for the element at ENIWETOK. This was done and the Commander, 78th ARS returned to KWAJALEIN.

The divided responsibilities assigned to the squadron resulted in dividing the efforts of the entire squadron. They were burdened with SAR responsibility for two separate areas with only five SA-16 aircraft. The Air Task Group required three aircraft in commission at ENIWETOK on all shot and rehearsal days. Because of the uncertainty of shot dates caused by weather conditions, this required three aircraft at ENIWETOK almost constantly, leaving only two at KWAJALEIN for supporting the mission there. During certain periods, because of in-commission status and division of responsibility with so few aircraft, the KWAJALEIN area was virtually without SAR capability had it been required.

It had been established that only minor maintenance would be performed at ENIWETOK, which meant the aircraft and aircrews had to be rotated between KWAJALEIN and ENIWETOK for the accomplishment of major maintenance requirements. This rotation caused additional flying hours on the aircraft and was not conducive to first class maintenance at all times, even though the aircraft at ENIWETOK were eventually in commission when needed.

No major items of supply were maintained at ENIWETOK for SA-16's thus leaving aircraft out of commission for parts for excessive periods when malfunctions occurred at that base. All obstacles were overcome but more thought in the pre-planning and use of SAR facilities was desirable.

CONCLUSIONS

1. Divided responsibility resulted in only partial effort being extended to each responsibility. In fulfilling the requirements of Air Task Group 7.4, the SAR Element

Commander could not effectively perform his remaining mission.

2. It was impractical for a unit as small as the 78th Air Rescue Squadron to be divided in both organization and responsibility. This method of operation caused weakness in both the structure and effectiveness of the organization. An inadequate number of aircraft had been furnished the squadron to fully meet mission requirements for both responsibilities.

SUPPLY PRE-POSITIONING VERSUS FLYAWAY KITS

INTRODUCTION

An average of approximately 70 USAF aircraft, consisting of nine different types, participated in Operation CASTLE. Three types of these aircraft were permanently assigned to ENIWETOK and presented no particular problem. The remaining six types were furnished by the various major commands and operated only for a period of four months in the forward area. The aircraft furnished by the Strategic Air Command (SAC) and the Wright Air Development Center (WADC) were logistically supported in the forward area by the use of the SAC flyaway kit system, with a considerable portion of the supplies being transported to ENIWETOK in participating aircraft. The Search and Rescue aircraft and Documentary Photographic aircraft, furnished by the Military Air Transport Service (MATS), were supported in a similar manner from Air Force base supply stocks at Hickam AFB through a service stock operated at KWAJALEIN. The nine weather reconnaissance aircraft and 15 F-84 sampler aircraft supplied by MATS and ARDC, respectively, were supported through the ENIWETOK Air Force Base supply on the basis of requirements lists developed by these units and submitted to the Air Task Group Headquarters during the planning phase of the operation. Upon receipt of these requirements lists at Air Task Group Headquarters, they were forwarded to the Air Task Group Liaison Officer at the Sacramento Air Materiel Area (SMAMA), who placed the requirements in supply channels for shipment to the Base Supply Officer at ENIWETOK.

REQUIREMENTS LISTS

The requirements list submitted by the ARDC unit for the support of the 15 F-84 sampler aircraft was based on consumption tables (tables II and tables XVI) developed by Headquarters, Air Materiel Command (AMC) for this type of aircraft. Headquarters, AMC tables are developed from world wide consumption data and do not reflect the variables in consumption of aircraft spares brought about by the age of aircraft, type and length of missions flown, altitudes, climatic conditions, etc. These tables are designed to support a given number of aircraft for a specific period of time. The use of these tables to support a smaller number of aircraft for a shorter or longer period of time, requires the manual adjustment of quantities of each line item. Units using this method of computing requirements are prone to add additional quantities of each line item to be sure that adequate quantities are available in the event that they experience unusual consumption rates on a specific item. This fact is particularly true in the category of high dollar cost or critical items in short supply which the unit has had difficulty in procuring at its home station. Data compiled during the operational phase by the ENIWETOK Air Force Base Supply Officer shows that consumption was experienced in less than ten percent of the line items originally requested to support these 15 F-84 aircraft. In addition, 398 line items were requisitioned from the ENIWETOK Air Force Base Supply Officer in support of these aircraft which had not been ordered in the original requirements list. The requirements list submitted for support of the nine WB-29 aircraft was based on the same list submitted for Operation IVY but did not appear to have been corrected to reflect the actual consumption experienced during that operation. For example, consumption was experienced in only 28 percent of the line items contained in the original requirements list submitted to this Headquarters. Also, during the operational phase, 199 additional line items were requisitioned through the ENIWETOK Air Force Base Supply Officer which were not included in the original requirements list. The ENIWETOK Air Force Base supply records also show that 38 of the additional line items requisitioned by these two units after arrival in the forward area were on an aircraft out of commission for parts (AOCP) basis.

CONCLUSIONS

1. Sufficient information was not available in all cases upon which to base adequate requirements lists for the support of operational aircraft.

2. In those instances where information was available from prior tests, adequate consideration was not given to actual consumption experienced during the previous operation.

PRE-POSITIONING OF SUPPLIES VERSUS SUPPORT BY FLYAWAY KIT

During Operation CASTLE, certain units supported their aircraft in the forward area by pre-positioning supplies. This involved the stockpiling of critical aircraft spares in the forward area to await the arrival of the unit which ordered these items and the development of a possible requirement. This method placed critical items in a relatively long pipe line thereby rendering them unavailable for consumption during this shipping process. The depots preparing these items for shipment must utilize expensive containers, packing, crating and preserving materials for surface movement of small quantities of each line item to the forward area. In many cases, the cost of individual packaging of small quantities of expendable items exceeds the cost of the item itself. Upon receipt of the items by the Base Supply Officer in the forward area, they must be processed through receiving, unpackaged, identified and picked up on the accountable records and placed on the shelf in a warehouse, thereby consuming critically short storage space. Upon completion of the operational phase, the items then become excess in the forward area. In order to identify these excesses, the Base Supply Officer must screen thousands of stock record cards. The expensive and time consuming process of preparing these excesses for surface transportation back to the zone of interior (ZI) and to the appropriate zonal depot must be repeated. This method of supply support for a relatively short operational period, inevitably results in unwarranted priority demands being placed on an already over-burdened supply system and in the disruption of the normal flow of supplies of all units.

The method of pre-positioning of supplies for an operation of this nature, has the following disadvantages:

1. Critical aircraft spares are placed in a long pipeline and in storage for as long as two to four months prior to actual requirement.
2. Expensive packing and crating methods must be employed to prepare items for surface movement to destination.
3. Upon arrival of items in the forward area, they must be unpackaged, identified, accounted for and warehoused.
4. Critical storage space is required to store these pre-positioned items until the units ordering them arrive and develop a requirement.
5. Items not consumed during the operation become excess to the requirements of the Base Supply Officer and necessitate an excess disposition program.
6. The return of these excess items requires the expensive process of packing and crating for return surface movement to the appropriate zonal depots in the ZI.

Units using the flyaway kit system requisitioned their spares from the Base Supply Officer at their home station and assembled them into a kit just prior to departure for the forward area. The kits consisted of specially constructed bomb bay bins or boxes for the transporting of aircraft spare parts aboard the unit aircraft or aboard the same vessel transporting the aircraft to the forward area. A minimum of packing and crating is required to move aircraft spares in this manner and results in a savings in transportation costs and in utilization of critical Military Sea Transport Service (MSTS) and MATS facilities. Accountability for the items involved rests with unit supply officers and all items remain in possession of the units during the operational phase. Issues are made direct to maintenance personnel from the kits on an exchange basis which facilitates maintenance operations. The kits are compact and do not require special storage space such as critical warehouses. Upon completion of the operation, the kits, including reparable or unused serviceable items, accompany the units to their home stations in the same manner as they were transported to the forward area.

Units utilizing the flyaway kit system must exercise greater supply discipline since they must support themselves throughout the operation from their own resources. They cannot afford to hoard critical items or requisition excess quantities since they will be burdened with handling and transporting these excesses to and from the forward area. They must maintain accurate records of the consumption of aircraft spares and keep this data current in order to sustain themselves during the operation. This incentive discourages wasteful maintenance practices and encourages true supply discipline in its strictest sense.

A comparison between the above system and the pre-positioning method discloses that the flyaway kit method of supporting the operation of aircraft at remote locations outside the ZI for temporary periods, offers the following advantages:

1. Careful consideration is given the requirements of the unit, resulting in the quantities requisitioned approximating actual requirements.
2. Expensive packing and crating for surface transportation is eliminated.
3. Savings in transportation are realized by using unit aircraft to transport

aircraft spares to the forward area.

4. Accountability is simplified and items are available continuously for use by the unit from time of departure until return to home station.

5. Issues are made direct to maintenance personnel on an exchange basis, thereby facilitating maintenance activities.

6. Requirements for costly construction of additional supply warehousing for temporary utilization are eliminated.

CONCLUSION

The flyaway kit system is the most economical and efficient method of providing supply support for the operation of large numbers of various types of aircraft at ENIWETOK ISLAND for relatively short periods of time.

CONSTRUCTION REQUIREMENTS

INTRODUCTION

During Operation IVY, Air Task Group 132.4 was located at KWAJALEIN ATOLL rather than with the remainder of the Joint Task Force on ENIWETOK ATOLL. Experience during IVY proved that Air Task Group efficiency and economy could be greatly improved if the air base on ENIWETOK ISLAND could be made to support the Air Task Group operation. Studies conducted by Air Task Group 132.4 indicated that this was feasible provided certain improvements in the air base facilities were effected. Headquarters, Joint Task Force therefore decided that the Air Task Group would be located at ENIWETOK for CASTLE. To permit this, a construction plan was prepared and submitted to the Atomic Energy Commission (AEC) for funding.

EFFECTS OF CONSTRUCTION ON AIR TASK GROUP OPERATION

In early February 1953, Headquarters, Joint Task Force sent a survey party to ENIWETOK to consider, among other subjets, the construction requirements submitted by Air Task Group 132.4 during IVY. This team, which included an Air Installations representative from Headquarters, USAF, recommended construction projects as follows:

1. Repave the eastern 3,850 feet of the runway using two-inch plant mix with emulsified asphalt.
2. Build up the runway shoulder to match the new pavement and apply dust palliative.
3. Construct a turn-around area with nine-inch coral base and a two inch plant mix surface.
4. Improve all of the parking aprons by scarifying and adding approximately one and one-half inches of crushed coral plus a dust palliative.
5. Extend the west over-run to the runway by approximately 125 feet.
6. Construct a concrete decontamination pad with an access apron similar to the adjacent apron.
7. Minor rehabilitation to the airfield lighting system.
8. Rehabilitate the POL storage area, pump house and piping.

Just prior to the activation of Air Task Group 7.4 the Commander and the Director of Materiel visited ENIWETOK to examine construction plans and to insure that these plans covered all requirements. Following this survey, changes in and/or additions to the construction program were recommended to Headquarters, Joint Task Force SEVEN as follows:

1. The movement to ENIWETOK of the 20 prefabs at KWAJALEIN that were erected for the use of Air Task Group 132.4 during Operation IVY.
2. Construction of 11 additional prefabs for use by the various maintenance activities.
3. Stabilization of an area of approximately 20,000 square feet to be used for outside bulk storage of large Air Force supply items.
4. Erection of two large supply warehouses.
5. Widening of the existing taxiways to permit operation of B-36 type aircraft.
6. Surfacing of the hangar floor, building 118, with concrete.
7. Rejuvenation and shoring of building 135 to allow occupancy on both floors.
8. Construction of an annex on building 90 to satisfy space requirements for the Air Task Group Headquarters.
9. Erection of a parachute repacking facility.
10. Laying of a two-inch coral surface, bound with asphalt on taxiways.

The above deviations from the original program resulted from three major factors:

1. Addition of aircraft to the program in types and numbers not originally contemplated.
2. Lack of qualified air installations advice in the preparation of the initial construction requirements.
3. Representatives from materiel, operations and installations who were thoroughly familiar with the problems associated with the operation of an air task group, in atomic test operations, were not included in the February 1953 survey party.

These further improvements were, however, approved by Headquarters, Joint Task Force SEVEN and added to the program. Deadlines for completion of this pro-

gram, based upon the order in which various facilities would be required in the build up for the operation, were established as follows:

1. Supply warehouse space: 1 November 1935.

2. All other buildings for operational use: 1 December 1953.

3. All airfield improvements: 1 January 1954.

Funds were released for this construction and work was commenced by the AEC contractor in September 1953. The 4930th Test Support Group, stationed in the forward area, monitored the progress of the work for Air Task Group 7.4, forwarding weekly reports to the Air Task Group Headquarters.

In November 1953, when the Commander and staff heads of Air Task Group 7.4 visited ENIWETOK, the construction program was found to be considerably behind schedule. Further, certain construction projects, though partially complete, were found to be unsatisfactory. These were stabilization of the runway shoulders and clearance of the approach end of the runway. Since the operational period was rapidly approaching and various high priority projects had yet to be completed, a meeting was held with the AEC contractors in the forward area to establish new priorities and new completion deadlines. These changes were approved by the Commander, Joint Task Force SEVEN and work was begun in accordance with the new schedule.

On arrival of the advance echelon of Headquarters, Air Task Group 7.4 in the forward area on 3 January 1954, it was discovered that work had been delayed even on this new schedule. Once again a meeting was held with the AEC contractor and the priorities and deadlines further rearranged.

These delays and failures to meet construction deadlines resulted in considerable interference with planned forward area operational training:

1. Various prefabricated buildings intended to house technical supplies, engineering and operations offices and instrumentation facilities, scheduled for completion 1 December 1953, were not available for occupancy in many cases until after using agencies were in the forward area.

2. As mentioned in the Communications portion of this report, the delay in erection of various communications facilities seriously hampered training. In several cases, this situation was occasioned by delay in completion of construction.

3. Electrical power requirements in numerous supply and maintenance buildings were not satisfied until February 1954. Although the using agencies had occupied the buildings concerned, necessary work could not be undertaken because of the lack of power.

4. Various airfield improvement projects on the aircraft parking aprons, scheduled for completion 1 January 1954, were not completed until February 1954, after operational air units were in place. This increased an already difficult parking and ground handling problem.

Prior to the conclusion of CASTLE, Headquarters, Joint Task Force SEVEN, realizing the effects of construction delays on CASTLE buildup and early operational training, requested the submission of a listing of all construction work deemed necessary to successful operation of the Air Task Group in REDWING. A thorough study was undertaken by the Materiel Directorate of Headquarters, Air Task Group 7.4 and a plan was formulated listing construction items as "urgent", "required" and "desirable." Those in the first category were items which, if not completed, would definitely impair successful operation or would constitute a positive safety hazard. Those in the second and third categories were first and second priority items which would positively increase efficiency or which would replace structures anticipated to have deteriorated beyond economical use by the commencement of REDWING. This study was submitted to Headquarters, Joint Task Force SEVEN on 29 March 1954.

CONCLUSIONS

1. Authority to proceed with required construction was not given to the AEC contractor in sufficient time to permit completion prior to the arrival of operational units.

2. Construction delays seriously hampered the early phases of planned overseas air operational training.

3. The failure to include operations, materiel and installations personnel thoroughly familiar with intended operations on site survey teams resulted in construction programs which failed to meet operational needs.

4. Failure to include a qualified Air Installations Officer within the Air Task Group organizational structure hindered the development of proper construction plans and the supervision of the execution of the details of these plans.

5. Construction plans submitted to Headquarters, Joint Task Force SEVEN by Air Task Group 7.4 in March 1954 will provide at ENIWETOK ISLAND all essential facilities for any future Air Task Group operation similar to CASTLE.

SUBMISSION OF REQUIREMENTS BY PARTICIPATING UNITS OF THE AIR TASK GROUP

Upon activation of the Air Task Group in July 1953, there being no Air Installations Officer assigned to the Materiel Directorate, the task of planning and supervising the construction program was placed with the Staff Maintenance Officer as an added duty.

As the participating units of the Air Task Group were assigned, each headquarters was requested to submit specific requirements for electrical power, partitioning, etc., to Headquarters, Air Task Group 7.4 for approval and submission to the AEC contractor through Headquarters, Joint Task Force SEVEN.

In several instances, the users of buildings did not make known their full requirements until arrival in the forward area. Additional work benches, electrical power outlets, air conditioning and dehumidification requirements were requested in late January 1954, only one month before the first operation. This planning error created considerable additional effort for the AEC contractor in last minute procurement of equipment and interferred with aircraft maintenance programs.

CONCLUSION

Requirements of the participating units of the Air Task Group for modification and/or alteration of facilities were not computed and submitted to the Headquarters of the Air Task Group in sufficient time for consolidation during the early portion of the planning phase of the operation.

AIRCRAFT MODIFICATION

INTRODUCTION

The modification requirements for aircraft participating in Operation CASTLE were originally established in early June 1953. The requirements called for the following capabilities:

1. Particulate and gaseous sampling of the nuclear cloud at the highest possible altitude.
2. Control of all the sampler aircraft during the actual cloud sampling operation.
3. The securing of technical and documentary photography.
4. Measurement of the effects of the detonation.

MODIFICATION OF AIRCRAFT

The initial assignment of the mission from higher headquarters for the conduct of Operation CASTLE did not clearly define the responsibilities for modification of aircraft. By agreement with the agencies concerned the Air Task Group made these responsibility assignments:

1. Lookout Mountain Laboratory would be responsible for the modification of the technical and documentary photographic aircraft.
2. The Air Force Special Weapons Center (AFSWC) would be responsible for the modification of the sampling and control aircraft.
3. The Wright Air Development Center (WADC) would be responsible for the modification of the effects aircraft.
4. The Director of Materiel, Air Force Special Weapons Center, was designated as the office of primary interest in monitoring the over-all modification program to insure that completion dates were met.

The aircraft to be modified under the responsibilities outlined above were as follows:

1. Fifteen F-84 aircraft were selected as primary samplers from the Air Research and Development Command (ARDC).
2. Two B-36H aircraft were selected as high altitude samplers and were secured on a loan basis from the Strategic Air Command (SAC). (See the sampling mission portion of this report for items considered in selecting the types of aircraft for sampling).
3. An RB-36H was selected as primary control aircraft on a loan basis from SAC.
4. Three C-54 aircraft were selected as photographic aircraft on a loan basis from the Military Air Transport Service (MATS).
5. A B-47 and B-36D were selected as effects aircraft from ARDC.

Numerous meetings were held with representatives of the Atomic Energy Commission, AFOAT-1, AFSWC, Lookout Mountain Laboratory, WADC and the Air Task Group to determine the modifications that would be required. The modifications were determined as follows:

1. F-84 Samplers: Modification of the F-84 aircraft was to consist of replacement of the internal wing wiring to the tip tank air samplers; replacement of all external AN electrical connectors with cadmium or gold-plated contacts; the installation of a newly developed gas sampler called the "double squeegee" in ten of the F-84 aircraft, with the five remaining F-84 aircraft to retain the original snap sampling type of equipment as used in Operation IVY; and the installation of a new type cockpit gamma intensity rate meter in place of the one previously used.
2. The B-36H Samplers: Modification of the B-36H aircraft for use as samplers was to consist of the installation of a particulate cockpit filter in the crew compartment pressurization system for crew protection, installation of the double squeegee and the installation of a particulate sampling device later called the LABB-6. One of the cloud samplers was selected as a backup for the primary control aircraft and the following additional equipment was installed: an AN/ART-13 low frequency homer; an additional AN/ARC-3 VHF radio; an AN/APS-23 radar with an upward looking antenna in the forward gun turret compartment for control of F-84 samplers at high altitudes; and AN/UPX-7 IFF equipment to be used in conjunction with the two installed radars to provide individual aircraft identification.
3. RB-36H Control: Modification of the RB-36H aircraft for use as the primary control aircraft consisted of the installation of an AN/ART-13 low frequency homer, coded keyer and associated antenna; installation of an AN/ARC-3 VHF radio with four control boxes to provide added VHF fre-

quencies; installation of the APS-23 with upward looking antenna in the forward upper gun turret compartment to control samplers at high altitudes; installation of the AN/UPX-7 IFF equipment in conjunction with the two installed radars to provide individual aircraft identification; installation of the AN/APN-9 LORAN navigational aid; and the installation of an A-28 stabilized camera mount for cloud photography.

4. C-54 Documentary Photography: The modification of the C-54's as technical and documentary photographic aircraft consisted of the installation of various special type camera mounts, extensive electrical outlets with associated wiring and additional oxygen outlets.

5. B-36D and B-47 Effects Aircraft: These aircraft were modified to measure thermal, gust and blast responses resulting from the detonation of a nuclear device. This modification program was under contract to and accomplished by the University of Dayton.

Representatives of AMC, WADC, AEC, AFOAT-1 and AFSWC met at the Mobile Air Materiel Area Depot on 4 August 1953, to discuss the above modification requirements and to set forth a clear program of action for their accomplishment. It was brought out in this meeting that the double squeegee installation on the F-84's was only in the service testing stage; however, AFOAT-1 assured the other conferees that the test would be successful and that the necessary component parts would be available at the depot in sufficient time to allow their programmed modification. Further, it was learned that the B-36 high altitude sampling device (LABB-6) was only in the design stage; however, as in the case of the double squeegee, Wright Air Development Center gave assurance that the device would be developed in sufficient time to preclude aircraft modification delays. Time phasing of the modifications was determined in accordance with depot capabilities and aircrew training requirements, and the following schedule was established:

1. The Ogden Air Materiel Area Depot would complete modification on the F-84's on 14 September 1953.

2. The San Antonio Air Materiel Area Depot would complete the modification on the three B-36's (two samplers, one control) on 5 October 1953.

3. The San Bernardino Air Materiel Area Depot would complete the modification on the C-54's on 15 October 1953.

4. The University of Dayton would complete the instrumentation on the B-47 on 5 October 1953.

5. The University of Dayton and the San Antonio Air Materiel Area Depot would complete the modification on the B36D on 5 October 1953.

On staff visits to the various depots to monitor the modification programs, it was determined that the modification of the C-54 aircraft was proceeding on schedule; however, it was learned that delays affecting other aircraft were being caused by component parts being delivered late to the depots. It was also learned that various outside agencies interested in the modifications were contacting the depot direct and making changes in requirements and modifications without coordinating with AFSWC. This caused a great deal of confusion in that design changes and changes in requirements were seriously delaying the modification and would result in completion dates not being met.

Specific examples of the reasons for delays were:

1. The service testing of the double squeegee prototype in the F-84 aircraft indicated that the motor and pump drive shaft were failing in one-sixth of the required operating time due to overheating in the effort. To obtain a fix on this deficiency a series of teletypes and telephone calls were exchanged between the various interested agencies. By the time a fix was obtained the modification program had been delayed approximately three months.

2. The delays in design and fabrication of the LABB-6 resulted in this device being unavailable for installation until 15 December 1953. This was 40 days after the modification should have been completed. Therefore, it was necessary to contact AMC and establish a crash program in order to accomplish the modification and a major inspection prior to the scheduled departure of the aircraft to the forward area on 28 January 1954.

The design, redesign, procurement, fabrication and requirements changes resulted in actual completion dates as follows:

1. The F-84 sampler aircraft were completed 22 December 1953 (a delay of 99 days), six days prior to their scheduled shipment overseas.

2. The B-36H high altitude samplers were completed approximately 25 January 1954, (a delay of 112 days), three days prior to their scheduled departure for overseas.

3. The B-47 was completed on 24 January 1954 (a delay of 111 days).

4. The B-36D effects aircraft was completed on 20 January 1954 (a delay of 107 days).

The unacceptably late completion dates of the modifications disrupted the entire continental portion of the aircrew training program. Constant revisions and improvisations had to be accomplished. Aircrews were training on aircraft not equipped with the technical instruments they would be required to operate in the forward area. In some cases aircraft had to be borrowed from other commands to maintain mission proficiency. After arrival in the forward area the aircrews were involved in basic procedures of mission accomplishment rather than working on refining these techniques to a high degree of proficiency. This involved a greater number of flying hours than originally planned and caused the consumption rate on supplies and spares to be much higher than anticipated.

CONCLUSIONS

1. Changes in modification requirements, designs and redesigns resulted in the depots receiving contracted items too late to meet scheduled completion dates.
2. It was impossible to monitor the modification program and to meet operational training commitments because outside agencies changed modification requirements and completion dates by direct liaison with the depots without coordination with this headquarters.

ESTABLISHMENT AND SUPPORT OF THE WEATHER ISLANDS

INTRODUCTION

After scientific and technical preparations are completed for a test detonation at the Pacific Proving Ground, the order to fire or to delay execution depends upon the latest available weather data. To provide this critical information for Operation CASTLE, reports from aerial reconnaissance and from four Air Task Group 7.4 land based weather stations were combined with information from outlying permanently based stations. The land based weather reporting stations were operated on the Pacific islands of RONGERIK, MAJURO, PONAPE and KUSAIE. RONGERIK was newly established for CASTLE; the others were reactivated sites which were used to support the earlier GREENHOUSE and IVY operations. Each was selected because of its geographical location in relation to the test area and its consequent value for increasing the forecasting capabilities of the Joint Task Force. Analysis of past experience, as confirmed more recently during CASTLE, dictates a necessity for sharp revision of the procedures followed heretofore in reestablishing the isolated weather reporting stations and in planning for their logistical support. These changes are imperative if the stations are to approach the operational efficiency which the nature of an overseas test demands.

ESTABLISHMENT OF WEATHER REPORTING CAMP SITES

MAJURO, PONAPE, and KUSAIE weather reporting sites were established on inhabited islands which contained an installation of the Trust Territories, Department of the Interior. However, during intervals between operations, each weather facility was completely evacuated and the unoccupied buildings and structures deteriorated rapidly from the dampness and other adverse effects of the Pacific climate. Thus, extensive rehabilitation has always been necessary in the reactivation of these weather sites for each succeeding test program. RONGERIK was uninhabited, and the facilities which it now contains were erected for Operation CASTLE. Both the renovation program and the new construction were performed by weather reporting technicians because construction-engineering personnel were not made available for these purposes. In addition, the material available for use in construction was exceedingly limited. These deficiencies, coupled with a haphazard layout and construction of facilities on pre-existing camp sites, created impediments to performance of the weather mission which, if eliminated, would have permitted mission performance with less effort and greater efficiency. Because of restrictive time factors and the nature of the mission, desired basic changes in the operational status of the outlying weather sites could not be effected during Operation CASTLE. However, a definite requirement exists for careful planning and construction prior to using the weather sites for future operations.

Several inspections conducted at the sites by members of the Air Task Group revealed the following:

1. Prefabricated buildings apparently were erected at any convenient open space, regardless of their distance from related activities.
2. In many instances, the buildings were erected without first preparing any type of footing or foundation.
3. Most of the buildings had plywood floors which would not support floor loads required for kitchen equipment and storage of supplies.
4. Primitive latrine facilities or the complete lack thereof.
5. No shelter for critical equipment, such as walk-in type refrigerators.
6. No concrete pad foundations or shelter for gasoline driven electrical generators.
7. No shelter or storage space of any kind for the large stocks of sensitive meterological supplies and equipment required to sustain the operation of the weather island detachment for five months.
8. No shelter for day room or recreational activities of any nature.

CONCLUSIONS

1. The placement of buildings and technical activities on the weather islands was not properly planned for efficient performance of on-site functions.

2. The living and working conditions at the camp sites impeded efficient operations. Many of the buildings were deteriorated, facilities were poor and there was an almost complete lack of storage space.

3. Initial construction and/or rehabilitation had been left to unqualified personnel, which resulted in poor construction and in a waste of manpower, special skills and materials.

4. The climatic conditions existing at the weather reporting sites resulted in excessive deterioration of expensive equipment and unnecessary imposition upon personnel of work loads unrelated to primary duties.

LOGISTICAL SUPPORT OF THE WEATHER ISLANDS

Logistical support for the weather islands was provided by Air Task Group 7.4 on the basis of equipment lists which the parent weather organization prepared and submitted for each island detachment. Equipment used by each weather island during Operation IVY was placed in storage at Hickam AFB, T. H., for use on CASTLE. As lists of required supply items were received in the Air Task Group Headquarters, the inventory of available assets in storage at Hickam was checked against requirements, and those items not on hand were requisitioned through Air Force supply channels. Because the complete procurement support responsibility for the weather detachments was performed by the Air Task Group, the parent weather organization did not screen requirements, prior to preparing requisitions, with the care which otherwise might have been exercised.

As the Air Weather Service had no responsibility for the equipment stored at Hickam AFB during the interm period between IVY and CASTLE, there was little incentive to insure proper corrosion control or to inspect the equipment frequently during the storage period. Much of this materiel required extensive rehabilitation before it could be reused. A considerable quantity of the items had deteriorated so seriously as to require replacement from Air Force stocks. Most of the equipment in storage was not uncrated and inspected by the using detachment until it arrived at the weather island site. Consequently, there were several equipment breakdowns during the first weeks of operation.

CONCLUSIONS

1. A more realistic supply requirements list would have been prepared had the parent weather organization been responsible for procurement.

2. On-site operations would have been performed more efficiently if the weather detachments had conducted a careful inspection of all items of organizational equipment prior to departure for the forward area.

3. Expensive weather island equipment, placed in unattended storage between operations, tends to deteriorate rapidly.

FLIGHT SAFETY

INTRODUCTION

The complex mission of the Air Task Group and the geography of ENIWETOK ISLAND posed the major problems encountered by the Flight Safety Division on Operation CASTLE. Since no two weapons tests are uniform in their requirements, few permanent rules can be drawn to apply to succeeding operations. Those principles of foresight, planning and supervision, which are always essential to flying safety, were fully applied throughout the operation.

The Air Task Group operated from an island in the Pacific Ocean which was two and one-half miles long and one-half mile wide at its widest point. It contained approximately 300 acres, of which only 40 were established as aircraft parking areas. It had one runway, 6800 feet long and 150 feet wide, partially supported by a limited taxiway system. Many problems were generated by these space limitations and by the physical configuration of the island.

COMPLEXITY OF FLIGHT SAFETY IN THE TASK GROUP MISSION

To accomplish the Air Task Group mission, several types of aircraft were acquired from various major air commands. In standardizing the operating procedures for these aircraft, a major problem was encountered since each command had individual standing operating procedures in which the crews were already indoctrinated. Flight patterns, instrument let-down procedures, ground handling of aircraft and special requirements in conducting the tests had to be standardized in each of the units. This required retraining of all the crews and the establishment of an efficient supervisory program. Standardized procedures were published and were subsequently emphasized at each briefing and each accident prevention meeting. Supervisors at all levels were required to assure strict compliance with all operating directives and to monitor all missions, both actual and simulated. Through this close supervision and retraining, the entire Air Task Group was brought to a high level of standardization.

The F-84 sampler aircraft posed a major flight safety problem in that it had a relatively small fuel capacity and was a single engine aircraft which was required to operate almost wholly over water. The difficulties in coping with this type of aircraft on overseas nuclear tests are fully discussed in the Sampling Mission portion of this report.

The objective of the effects program was to obtain measurement data of detonation effects on the B-36 and B-47 aircraft. In order to obtain usable data, the aircraft had to be positioned relatively close to ground zero and this meant the Air Task Group Commander had to assume certain calculated risks. However, in assuming these risks, flight safety was constantly considered and there was little possibility of the aircraft being structurally damaged. To minimize damage it was necessary to establish, for each aircraft and for each mission, specific abort criteria which were chiefly concerned with:

1. Communications failure.
2. Failure of positioning radar.
3. Positioning in error plus or minus three seconds at "H" Hour.
4. Partial or complete failure of various aircraft control and power systems.

In addition, the Commander, Air Task Group 7.4 personally supervised the control and tracking of these aircraft on each mission.

CONCLUSIONS

1. It was necessary to place great emphasis on the standardization of all operating procedures and to demand strict compliance with these procedures in order to effect safe operations.

2. It was necessary to devote specific attention to the planned positioning and subsequent control of each effects mission aircraft on each mission if reasonable crew and aircraft safety were to be expected.

FLIGHT SAFETY PROBLEMS DUE TO THE PHYSICAL LAYOUT OF ENIWETOK

As well as being limited in size, all

operational aircraft parking areas on ENIWETOK ISLAND were of compacted coral which had been stabilized but had no bound surface coat. The maintenance problems thus generated are discussed fully in the portion of this report on construction requirements. Aircraft and ground handling equipment caused constant deterioration of all parking areas. As a result, the north parking ramps were little more than oiled gravel areas upon completion of the operation. This condition was a constant hazard to jet engines, to propellers, and to outer surfaces of the aircraft. To preclude excessive damage, all aircraft were towed to engine starting areas which were of asphaltic concrete surface. This increased the workload but reduced damage.

More than 80 aircraft were stationed on ENIWETOK ISLAND for participation in Operation CASTLE. Between shots, many additional aircraft in transient status were on the island. This large number of aircraft on such a small island saturated the parking areas necessitating the violation of USAF clearance standards in parking aircraft. However, in order to reduce the possibility of any taxi accident, all aircraft on the north parking ramps were towed from their parking positions to their designated start engine position. It was mandatory that wingwalkers and taxi-signalmen be used at any time an aircraft was being moved, either by towing or by taxiing. All parking areas and taxiways were clearly marked and emphasis was placed upon supervision to insure compliance with all established policies.

Movement of aircraft on the ground was further endangered by the lack of taxiways which caused considerable use of the runway as a taxiway. Mission scheduling had to be closely coordinated and monitored in order to preclude scheduling taxi activity on the runway during take-offs or landings. A daily take-off scheduling form was utilized to effect this coordination.

CONCLUSIONS

1. Loose gravel, caused by deterioration of the poorly surfaced parking ramps, was a constant hazard to all aircraft and increased the workload of all units in ground handling activities.

2. It was necessary to violate USAF clearance standards because of the large number of aircraft and the limited parking and taxi area.

PERSONNEL MANNING AND AUGMENTATION

INTRODUCTION

During Operation CASTLE, personnel matters were routine except in two problem areas. The first problem area concerned the use of civilian mechanics rather than military maintenance personnel to maintain the single B-47 assigned to Air Task Group 7.4. The second problem area involved the augmentation of Army Task Group organizations with Air Force personnel.

CIVILIAN MANNING FOR B-47 EFFECTS AIRCRAFT

Prior to establishing the Air Task Group in the forward area, the Air Task Group Headquarters was unsuccessful in its attempt to obtain military maintenance personnel for the B-47 Effects aircraft to be used during Operation CASTLE. This lack of military personnel necessitated the assignment of Wright Air Development Center (WADC) civilian aircraft technicians to provide B-47 maintenance. Military personnel were assigned to maintain 81 Air Task Group aircraft while the single B-47 was maintained by civilian personnel. Mission requirements of Operation CASTLE necessitated many overtime hours of work, including Saturdays and Sundays, by all maintenance personnel. The civilian personnel were paid overtime for work exceeding forty hours per week and, in addition, received $5.00 per day per diem. $20,000 was authorized for overtime work alone.

CONCLUSION

The expense involved in overtime pay and per diem, when using civilian personnel for maintaining only one aircraft in the forward area, is not economical use of government funds.

PERSONNEL AUGMENTATION

In the initial planning for CASTLE undertaken by Air Task Group 132.4 and sponsored later by other agencies, certain agreements were made concerning augmentation of the Army Task Group on ENIWETOK by Air Force personnel for the operational phase of CASTLE. Augmentation of Navy forces on KWAJALEIN by Air Task Group 132.4 formed a partial basis for these plans for CASTLE. Since these agreements had already been effected by the time Headquarters, Air Task Group 7.4 was formed, further planning was concerned only with the strengths involved in augmentation.

In the original planning for augmentation, it was determined that the Air Force would augment the Army in the following functions:

1. Chaplain activities.
2. General medical services.
3. Laundry service.
4. Messing facilities.
5. Ordnance.
6. Post exchange facilities.
7. Postal facilities.
8. Finance office.
9. Military Police duties.
10. Supply.
11. BOQ orderlies.

Based upon the functions listed above, the Army determined that they would require an augmentation of over 200 personnel from the Air Force. Since this appeared to be an excessive number of people, a meeting was held between Headquarters, Air Task Group 7.4 and Headquarters, Army Task Group 7.2 to discuss the problem. During the meeting each function was thoroughly discussed and it was established that all these personnel were not required, but that 3 officers and 178 airmen would be sufficient. This was agreed to by the Commander, Army Task Group 7.2 as a firm figure.

The principle of augmentation during CASTLE seems to have little logical justification. During Operation IVY, where the principle of augmentation began, the situation was quite different. The Navy forces at KWAJALEIN were not assigned to Operation IVY but had other missions for which they were responsible. Therefore, it was reasonable for Air Task Group 132.4 to augment the Navy forces in the various support functions so that the Navy Forces at KWAJA-

LEIN could continue to accomplish their assigned mission without disruption. During Operation CASTLE, the Air Force and Army Task Groups on ENIWETOK had as their sole mission the support of CASTLE, and therefore, no need could be seen for one service to augment the other.

In actual practice during CASTLE, augmentation created the following difficulties:

1. The Air Task Group was unable to plan for and requisition specific personnel to fill Army Task Group augmentation requirements with the same effectiveness with which it planned its normal manning program. The reason was that the Air Task Group was able to compute its normal manning requirements considerably in advance of receiving Army Task Group augmentation requirements. The late receipt of augmentation requirements, coupled with the time required to accurately convert the requirements into specific Air Force job descriptions, resulted in the late submission of requisitions for the necessary personnel. Consequently, many of the requisitions had to be filled with airmen in higher skill levels and unrelated fields, resulting in the malassignment of many airmen to Army augmentation duties.

2. Augmentation proved inconsistent with accepted management practices in that Air Force personnel assigned to these duties were working for two commanders at the same time, the Army supervisor of the function to which they were assigned and their Air Force Squadron Commander to whom they were responsible during off-duty hours.

3. In spite of strenuous indoctrination efforts, it was difficult for the basic airmen to understand why, being in the Air Force and stationed with an Air Force organization they should be assigned duties with the Army. As a result, the relationship of these airmen with the Army enlisted personnel with whom they worked was not as desired in all cases.

4. An airman qualified in a particular career field of the Air Force could not, in all instances, perform the same duties in the Army because of the differences in procedures, nomenclature, cataloging, etc. This was particularly evident in the functions of supply and vehicle maintenance and resulted in on-the-job training in Army methods.

5. Since the Army was responsible for the supervision of augmentation functions, the Commander, Air Task Group 7.4 had no opportunity to inspect these functions to determine whether the number of Air Force personnel requested represented the true needs of an economically operated activity.

In addition to the above difficulties, the following specific examples are furnished to further indicate the fallacies of augmentation:

1. The Air Force furnished Air Police to the Army Military Police Section because the Army felt that difficulties would be encountered if Military Police attempted to apprehend airmen. It was their belief that Air Police should be available to handle airmen and Military Police to handle Army enlisted men. This headquarters does not feel that servicemen object to being apprehended by the police of one service any more than from another service nor was any such feeling evidenced in the occasional arrests which occurred. A comparable situation exists on Zone of the Interior bases where units of another service are tenants on the bases. Where bases of various services are located near a large civilian community, joint police action is employed for patrol of the civilian community. This is not the case on an island such as ENIWETOK, where no civilian community problem exists. The major purpose in assigning Military Police to the forward area is to provide security guards at numerous restricted locations and to effect required security surveys and patrols. This function has been assigned to the Army Task Group. A request for Air Police augmentation on the basis of the minor task of disciplinary control does not meet with either logic or experience in establishing justification.

2. Since the Army had the responsibility of caring for all BOQ's on the island, the Air Force was required to augment with BOQ orderlies. These Air Force personnel were then assigned to work in Air Force BOQ's but were under the supervision of the Army. It would appear that a more logical solution would be to assign responsibility for upkeep of Air Force BOQ's to the Air Task Group.

During the operation, this headquarters contacted Headquarters, Task Group 7.2 to propose what was believed to be a solution to the augmentation problem. It was suggested that the functions for which the Air Force and Army are individually responsible be clearly defined. Once these responsibilities have been established, each service would then be required to furnish necessary personnel to carry out their responsibilities without assistance from the other service. Since the Air Force is the prime user of the POL facility, that function should be assigned to the Air Force and not to the Army. Likewise, the Air Force should have the re-

sponsibility for structural fire fighting since they have the larger share of the buildings and already have the responsibility for crash fire fighting. Each service should be responsible for maintaining their own BOQ's and since the consolidated mess is a responsibility of the Army, the Air Force should furnish KP's on a pro rata basis but should not be required to furnish cooks and bakers. In addition to these functions just listed, the Air Force and Army should be responsible for those other functions they operated during CASTLE.

The above proposal was accepted by the Army Task Group in conference and subsequently the proposal was reduced to writing and forwarded by Air Task Group 7.4 to the Commander of the Joint Task Force for his approval. This proposal has now been promulgated in the Joint Task Force Operations Order covering the interim period.

CONCLUSIONS

1. Personnel augmentation was undesirable during Operation CASTLE in that it magnified malassignment and morale problems in addition to complicating personnel planning.

2. The principle of augmentation cannot be justified when the services involved are at the same location for the sole purpose of supporting the same operation.

3. There are no standard planning factors for determination of the number of personnel the Air Force should furnish to the Army for operation of any particular function. This results in disagreements as to the number of personnel required, and efficient utilization of Air Force personnel cannot be assured.

4. A solution to the augmentation problem would be to define specifically those functions for which each service is to be solely responsible. Once responsibilities have been established each service would then be required to furnish necessary personnel to carry out its responsibilities without assistance from another service.

FUNDING

INTRODUCTION

Funding for Operation CASTLE was derived from two major sources:

1. Normal service operating expenses financed by the services.
2. Extra expenses financed from funds available to the Task Force Commander.

The funding guides for the division of these expenses were originally based on the methods used in Operation IVY; however, directives issued from Headquarters, Joint Task Force SEVEN during the planning and buildup phase of Operation CASTLE were contrary to those issued for Operation IVY and caused confusion and misunderstandings. Examples of the inconsistencies are detailed in the following discussion.

INCONSISTENCIES IN FUNDING RESPONSIBILITY

Broad policies of funding and mission responsibilities for participating commands in Operation CASTLE were outlined by the Department of Defense in a Memorandum from Mr. W. J. McNeil, Comptroller, subject: "Assumptions for Operating Expenses of Atomic Weapons Tests", dated 9 March 1953. Headquarters, USAF issued further instructions that each command required to participate in support of Air Task Group 7.4, at the call of the Commander, Air Research and Development Command (ARDC), would finance such support from its own financial resources within the scope of the McNeil memorandum. Joint Task Force SEVEN in JTF SEVEN Operation Order 1-53 provided that Joint Task Force SEVEN operations during the period covered by that Operations Order would be funded in the same manner as during Operation IVY.

The McNeil memorandum was issued with the understanding that it was not all inclusive but was an outline of the distinction between normal operating expenses, which were to be financed by the services, and the extra expenses, which were to be financed out of funds made available to the Joint Task Force Commander. Based on the McNeil memorandum, no difficulties were anticipated by Air Force Special Weapons Center (AFSWC) in funding for Operation CASTLE as the AFSWC budget provided for the movement of personnel of Headquarters, Air Task Group 7.4 to and from the forward area in the same manner as during Operation IVY. It was assumed that this was the only expense to be borne by AFSWC. There were, however, three major reversals of policy which created confusion in funding responsibilities:

1. A requirement was placed on the Air Defense Command (ADC) and the Strategic Air Command (SAC) for each to furnish eight F-84 pilots to train in sampling operations with the 4926th Test Squadron (Sampling) at Kirtland Air Force Base and for further temporary duty in the forward area for Operation CASTLE. Joint Task Force SEVEN stated that "expenses of training personnel to take part in atomic tests are the responsibility of the Services to which personnel belong." This meant that ADC and SAC would be required to fund for the TDY of their personnel. These commands requested funds for this TDY as they had not received specific assignment of responsibilities early enough to include the requirements in their fiscal year 1954 budget estimates. Air Task Group 7.4 requested funds from Joint Task Force SEVEN who in turn requested Headquarters, USAF to help resolve the question. Headquarters, USAF acknowledged that the funding for the TDY was the responsibility of the Air Force and directed Headquarters, ARDC to fund for the TDY. Later the TDY orders were changed by Headquarters, USAF to assign the pilots PCS to AFSWC. This settled the problem of funding for the TDY but brought up the question of the "first Task Force duty station" for these personnel. Joint Task Force SEVEN had previously stated that "first Task Force duty stations for the Air Task Group will be the overseas duty station, i.e., ENIWETOK, BIKINI, etc." The fighter pilots were assigned to the 4926th Test Squadron (Sampling), an organization of AFSWC, located at Kirtland AFB, the same location as Headquarters, Air Task Group 7.4. Joint Task Force SEVEN decided that the first Task Force duty station of the 4926th was ENIWETOK. This meant that JTF SEVEN funds would move the personnel of Headquarters, Air Task Group 7.4 to ENIWETOK and return, and AFSWC would fund for the 4926th movement. This was the first reversal of the policies which had been followed in Operation IVY.

2. The requirement placed on Air Task Group 7.4 to conduct a zone of interior (ZI) rehearsal during October 1953,

brought about another reversal of policy. Since the funding responsibilities were not clear, a letter was sent to Joint Task Force SEVEN requesting information on the possibility of the charges being placed against ARDC (AFSWC). This information was needed as the ARDC (AFSWC) budget did not include funds for this purpose. Joint Task Force SEVEN advised that all travel, temporary duty and transportation in connection with the rehearsal must be borne by the participating air commands. This determination was made by the Director of the Budget, USAF, and concurred in by the Office of the Secretary of Defense. A short time later, this decision was reversed by Headquarters USAF and Joint Task Force SEVEN notified Air Task Group 7.4 that commands would not bear all the costs and that Headquarters USAF was preparing a funding procedure for the rehearsal. The message from Headquarters USAF establishing this funding procedure rescinded all previous instructions and stated that each command required to participate in support of Air Task Group 7.4, at the call of the Commander, ARDC, would finance such support from its own financial resources within the scope of the McNeil memorandum in the same manner as in past years. Contrary to information contained in a previous communication from Headquarters, USAF, no provision was made in the approved ARDC (AFSWC) annual financial plan for centralized funding. Accordingly, the Commander, ARDC was not required to provide funds in connection with total Air Force participation in the ZI rehearsal, but was required to fund for AFSWC participation.

3. During Operation IVY, supplies and equipment were issued by the Army and Navy units to the Air Task Group and reimbursement therefor was effected with funds made available by the Joint Task Force. For Operation CASTLE, Joint Task Force SEVEN issued Administrative Order No. 2-53, which stated briefly that housekeeping equipment and supplies, special purpose vehicle spare parts common to both Army and Air Force, and other items of common supply would be furnished by Task Group 7.2 to Task Group 7.4 on a reimbursable basis. Joint Task Force SEVEN ruled that funds from Joint Task Force SEVEN would not be used for such reimbursement. Reimbursement for this purpose had to be assumed by ARDC (AFSWC), contrary to the policy followed in Operation IVY, which was to have served as a funding guide for Operation CASTLE.

These reversals of the policy which was established in the initial instructions for Operation CASTLE caused confusion and misunderstanding of the funding responsibilities on the part of personnel of Air Task Group 7.4 and AFSWC, and required many telephone calls, messages, and visits to resolve the problems as they arose. This procedure was not conducive to efficient operations and caused delays in procurement of services and materiel.

CONCLUSIONS

1. The McNeil memorandum outlined, in broad terms, division of funding between the Services and the Task Force.

2. Principles of funding were assumed to be on the same general basis as were followed during Operation IVY until the first reversal of policy was made by Joint Task Force SEVEN. USAF did not anticipate these changes and therefore explicit instructions were not issued to cover all funding problems. USAF was placed in the position of resolving each problem as it arose.

3. Major Air Commands participating in the operation did not receive specific funding information early enough to include fund requirements for CASTLE in their Fiscal Year 1954 budgets.

4. Decisions which had to be obtained, when a change was made in the funding concept, created serious delays in the procurement of important services and materiel for the support of Operation CASTLE.

PERSONNEL SECURITY

INTRODUCTION

The security mission of Air Task Group 7.4 was to establish a training and indoctrination program to insure that all personnel assigned to the Air Task Group developed a keen sense of individual responsibility for the protection of classified information.

In accomplishing this security mission three areas of difficulty were encountered. These areas were:

1. Security directives.
2. General processing of security clearances.
3. Security qualifications of assignees.

SECURITY DIRECTIVES

The security directives of Joint Task Force SEVEN were not received until four months after the Air Task Group Headquarters had been organized. The late receipt of these directives prevented the full completion of the security training program until a later date than desirable. Tentative Air Task Group memoranda had been drafted but could not be published and distributed to the units of the Air Task Group until the Joint Task Force directives had been received and studied. As a result, when the training was started it was necessary to accelerate the program in order to insure completion prior to departure for the forward area.

These same security directives defined the exact security clearances required for access to certain areas in the Pacific Proving Ground and also for critical Air Force Specialty Codes. The late date at which this information was received hampered the orderly processing of proper types of clearances.

CONCLUSION

Security directives were not received from the Joint Task Force in time to permit early establishment of security training within the Air Task Group or to process some of the applications for "Q" clearances.

GENERAL PROCESSING OF SECURITY CLEARANCES

During the early planning and build-up phase, the Air Task Group Security Office found it impossible to obtain the job assignments of all personnel being assigned to units within the Air Task Group. This information was needed to insure that the individuals would possess the correct clearance for the duties assigned. In addition, personnel, after being processed for a certain type clearance, were reassigned to other jobs or other places of duty requiring a higher type clearance. This reassignment necessitated a completely new set of clearance forms to be processed. In many cases, where the new requirement involved a "Q" type clearance, the time was too short for completion of investigations prior to the operational need. For instance, 10 helicopter pilots were assigned and their requests for clearance forms were received on 28 November 1953. A complete background investigation would have run well past the starting date of the project's operational period. This required that an emergency type "Q" clearance be granted these pilots. Had the Assistant Chief of Staff, E-2, Task Group 7.5, not agreed to permit pilots possessing an interim or final top secret clearance to fly over and land at operational areas requiring a "Q" clearance, these pilots would have been useless to the Air Task Group. This would have seriously curtailed the airlift available to the Scientific Task Group. As another example, it had been determined that all personnel stationed at or visiting BIKINI during the operational period would have to possess a top secret or "Q" clearance. Again, these assignees were not identified early enough for the clearance processing action to be completed prior to the operational period of the project. As a result, it was necessary to assign personnel in accordance with their current security clearance rather than their job qualifications.

CONCLUSION

The late receipt of personnel job assignment information, the random shifting of personnel into positions requiring a higher type of clearance, and the late assignment of personnel to Air Task Group 7.4 made it impossible to insure that personnel had the proper clearance at the beginning of the operational period of CASTLE.

SECURITY QUALIFICATIONS OF ASSIGNEES

A review of the records of individuals assigned to units of Air Task Group 7.4 indicated that parent organizations did not, in all cases, assign the highest caliber personnel to this classified project. The determination of a good security risk is based primarily on the following:

1. That the individual is mentally and emotionally stable.
2. That the individual possess the integrity, discretion and responsibility essential for the security of classified information.
3. That the reputation and records of the individual reveal no information that indicates personal unreliability or any degree of disloyalty to the United States.

As examples of malassignment, one airman was assigned while still under investigation for grand larceny and another airman's records indicated a General Court Martial conviction for desertion. This type of assignment resulted in rejection and return of such personnel to the Zone of Interior for security reasons.

CONCLUSION

Necessary emphasis was not placed on security requirements in the assignment of personnel to the Air Task Group.

RECOMMENDATIONS

ASSIGNMENT OF AND ORGANIZATION FOR OVERSEAS TEST RESPONSIBILITIES

ASSIGNMENT OF AND ORGANIZATION FOR OVERSEAS TEST RESPONSIBILITIES

1. Utilizing spaces currently authorized, **Headquarters, Air Force Special Weapons Center should prepare for approval by the Commander, Air Research and Development Command, a proposed reorganization plan of a major unit of Air Force Special Weapons Center,** this reorganized unit to be charged with the conduct of all test activities under the purview of Air Force Special Weapons Center, including those of continental and overseas nuclear tests.

2. In order to fulfill Air Force responsibility in nuclear test operations more economically and more efficiently, **the Commander, Air Research and Development Command should approve the establishment at Air Force Special Weapons Center of a permanent, dual purpose test organization as mentioned in the preceding recommendation.**

3. In order to insure that the Commander of the Air Task Group in overseas nuclear test operations is thoroughly familiar with the details of scientific requirements, **Headquarters, USAF should approve in principle the employment of the Commander of the permanent organization recommended above as Air Task Group Commander in overseas nuclear test operations.**

SAMPLING MISSION

SAMPLING MISSION

To provide an adequate, economical nuclear cloud sampling aircraft, **Headquarters, USAF should program nine B-57B's to fulfill the manned sampling requirements for overseas and continental nuclear tests. Further, the B-57B should be considered the permanent manned sampling vehicle.**

2. **Headquarters, Air Force Special Weapons Center should initiate action at the earliest possible date to develop the nine B-57B's recommended above to optimum capability as sampling vehicles and should program their eventual replacement by an equal number of B-57 aircraft equipped with greater thrust in order to increase the aircraft altitude capabilities.**

3. In view of the possibility that unmanned sampler vehicles might prove to be the eventual optimum sampler, **the Air Force Special Weapons Center should initiate a study of this problem at an early date. The study should be pointed at the development of recoverable guided missiles as sampling vehicles penetrating the cloud at five to 15 minutes after detonation at altitudes of 50,000 to 125,000 feet.**

EFFECTS AIRCRAFT MISSION

EFFECTS AIRCRAFT MISSION

1. **The Commander, ARDC should assign to the AFSWC responsibility for proof-testing the weapon delivery capability of delivery aircraft types currently part of, or soon to become part of, the combat force.** This is a logical extension of the current AFSWC responsibility for development of an Air Force thermonuclear weapon delivery capability.

2. Should the responsibility for proof-testing the delivery capability be assigned to the AFSWC, **the Commander, AFSWC should program participation of instrumented operational aircraft in whatever nuclear test programs are scheduled by AEC, with the objective of demonstrating the delivery capabilities of these aircraft in target configurations of altitude, airspeed, gross weight, etc.**

3. **The long-range research program being conducted by WADC should be continued, with its present objective of improving theoretical methods for prediction of atomic and thermonuclear weapon delivery capabilities and developing structural design criteria for future atomic and thermonuclear weapon carriers.**

PHOTOGRAPHIC MISSION

PHOTOGRAPHIC MISSION

1. In order to assure economical utilization of aircraft on future test operations, **the Scientific and Air Task Groups should closely coordinate scientific and aircraft requirements with the objective of assigning dual missions to aircraft whenever possible.**

2. In order to assure effective operational planning during future test operations, **the Scientific Task Group should program its planning so as to provide the Air Task Group with complete aircraft positioning information no later than three days prior to each detonation.**

3. In order to have photographic C-54's readily available for the next nuclear test, **Headquarters, USAF should retain the C-54's used in Operation CASTLE in their modified status.**

4. Since the C-54 type aircraft used for photography in Operation CASTLE are suitable for both overseas and continental tests, **Headquarters USAF should insure that these aircraft are utilized in all future nuclear tests rather than using one type for overseas and another type for continental tests.**

5. To insure that efficient utilization is received from the modified C-54's, **Headquarters, USAF should assign these aircraft to an organization that can make them available, with aircrews and maintenance personnel, for both the overseas and continental testing program, and properly utilize them in their modified status during the interim periods between tests.**

COMMUNICATIONS

COMMUNICATIONS

1. In order to adequately accommodate increased communications requirements, **the Commander of the Joint Task Force should take necessary action to re-engineer the physical plant for communications in the Pacific Proving Ground.**

2. **The AACS should insist on early joint planning conferences to discuss communications requirements and facilities for future overseas operations as soon as the general concepts are known.**

3. To insure that the major engineering and installation agency for Air Force communications facilities has complete information regarding requirements and planning and to assist the Joint Task Force and the Air Task Group on details concerning facilities, engineering, construction, and installation, **the AACS should appoint a liaison officer to the headquarters of the next Joint Task Force as soon as that headquarters has a specific operational mission assigned.** This officer should be the coordinating agent on communications matters between the Joint Task Force, the Air Task Group, the Air Research and Development Command (ARDC) and his own headquarters, and subsequently should be designated as the AACS Communications Element Commander.

4. In the event the liaison officer mentioned in the recommendation immediately above is not to be designated as Commander, AACS Communications Element, then:

a. In order to maintain close control over its own operational units furnishing assistance to the Joint Task Force, **the AACS should select the officer who is to command the AACS Communications Element at least six months in advance of the projected date for manning that element in the forward area.**

b. Upon selection, **the AACS Communications Element Commander should be indoctrinated and briefed on the planning background and the scope of joint communications. He should make a survey trip to the Pacific Proving Ground as part of this indoctrination to learn first hand the status of facilities and equipment.**

5. **The AACS Communications Element Commander should select his personnel and supervise the manning and training of his element.** All personnel assigned to his element should be under his control at least three months prior to the date of arrival of operational units in the Pacific Proving Ground.

6. **The communications installation and maintenance personnel in the Pacific Proving Ground should come under the direct control and supervision of the Communications Element Commander to insure that construction deadlines are met.**

7. If a Command Ship is utilized during the next operation, **the Commander of the Joint Task Force should provide one that is properly refitted and equipped to meet the requirements for extensive high frequency radiotelephone and radioteletype circuits. All circuitry aboard the ship should be rigorously checked operationally prior to the date projected for the first shot.**

8. To eliminate interference with the ENIWETOK LORAN Station, **the Joint Task Force should remove the high frequency transmitters and antennas from ENIWETOK ISLAND.**

9. To insure satisfactory operation of a RACON at BIKINI ATOLL, **the Air Task Group should design the installation for unattended service and the Joint Task Force should provide space for this RACON in the bunker used to house and protect the sequence timing equipment.**

10. To insure the availability of a radio homing beacon immediately subsequent to a detonation, **the Commander of the Joint Task Force should provide a Navy vessel equipped with a satisfactory beacon.**

THE AIR CONTROL SYSTEM

THE AIR CONTROL SYSTEM

1. In order to provide a safe and successful mission, **the Air Task Group Headquarters must insure that all elements concerned with aircraft control are integrated into one centrally directed and coordinated control system.**

2. In order to assure smooth, effective operation of the Air Control System during future Air Task Group overseas operational training periods, **the Air Task Group Headquarters must require all ENIWETOK air control units to begin extensive system-training in the forward area 30 days prior to arrival of test aircraft units. This training should consist primarily of realistic, synthetic problems augmented by actual control of support aircraft already on station at ENIWETOK.**

3. In order to make the system-training outlined above possible, **the Air Task Group Headquarters should take positive action to insure that all control communications are installed and in satisfactory operating condition prior to arrival of the control units.**

4. In order to eliminate excessive time lags in the exchange of information between control agencies, **the Air Task Group Headquarters should prepare control procedures incorporating the use of a simple numerical reporting system rather than a conventional grid reporting system.**

5. To provide adequate CIC control and control communications facilities on future operations, **the Joint Task Force Headquarters should again procure the assignment of the USS ESTES. If the USS ESTES cannot be made available, the ship utilized should be modified to provide the same arrangement of control facilities and control communications as the USS ESTES contained.**

6. To insure effective, economical mission accomplishment, flexibility in mission execution and safety of flight operations in the ENIWETOK area during future atomic test operations, **the Air Task Group should install a dependable radar-IFF combination, such as the AN/FPS-3 and AN/FPS-6, in the AOC.**

7. If there is an Air Defense mission on the next operation, and if it is assigned to the Navy Task Group, **close coordination must be effected by the Air and Navy Task Groups with the view of eliminating control destroyer requirements through joint use of ENIWETOK AOC control facilities.**

SEARCH AND RESCUE

SEARCH AND RESCUE

1. In order to furnish future Air Task Groups with the most efficient supervision of the Task Group SAR facility, **the Commander, Air Rescue Service should furnish a SAR commander directly to the SAR element.** This would place the responsibility of one mission on one individual and provide more effective support of Air Task Group requirements.

2. In order to provide an effective SAR capability, **the Commander, Air Rescue Service, should furnish a SAR Element to the Air Task Group operating base. This element should include complete organizational maintenance, electronic repair, supply, administration and operations capabilities. A minimum of four aircraft should be furnished if a requirement of three in commission continues to exist on the next operation.**

SUPPLY PRE-POSITIONING VERSUS FLYAWAY KITS

SUPPLY PRE-POSITIONING VERSUS FLYAWAY KITS

1. In order to effect better utilization of supplies, transportation and storage during future operations, **the Air Task Group should require all units to provide logistical support for their aircraft by the flyaway kit system.**

2. **Flyaway kits should be assembled at the home station of the organization concerned, transported to the forward area with or in unit aircraft, and unused supplies returned to the home station with the aircraft upon completion of the operation.**

CONSTRUCTION REQUIREMENTS

CONSTRUCTION REQUIREMENTS

1. To provide adequate facilities for Air Task Group operations on ENIWETOK ISLAND for REDWING, **the agencies concerned should approve the construction plan submitted to Headquarters, Joint Task Force SEVEN by Headquarters, Air Task Group 7.4 in March 1954.**

2. To prevent interference between construction and required overseas unit training, **all agencies concerned should take necessary action to insure that approved construction is completed during the interim period prior to the buildup phase of REDWING.**

3. To insure that construction planning is adequate and realistic, **operation, materiel and installations personnel, thoroughly familiar with intended operations, should be included on any site survey teams being sent to the Pacific Proving Ground.**

4. To provide qualified advice for the development of proper construction plans and to supervise the detailed execution of these plans, **Headquarters, AFSWC should assign a qualified Air Installations Officer to the 4930th Test Support Group both for interim and operational periods.**

5. **The Commander, Air Task Group should require all participating units to submit their requirements for modification and/or alteration of facilities early in the planning phase of the operation so that requests can be consolidated, approved and accomplished prior to the arrival of operational units in the forward area.**

AIRCRAFT MODIFICATION

AIRCRAFT MODIFICATION

1. To insure coordination of all agencies concerned in the establishment of requirements and to establish one agency for contacting the depots on modification, **Headquarters, ARDC should assign Headquarters, AFSWC the responsibility for modification of the aircraft which will participate in future overseas tests.**

2. To insure full coordination with the modifying depot, **Headquarters, ARDC should require all outside interested agencies to coordinate with AFSWC on any changes in requirements or modification rather than dealing direct with the modification depot.**

3. Because of the various changes in operational requirements and designs, and the large amount of time lost by the modifying depots in waiting for contracted items to be received, **the Air Task Group should establish a requirements deadline far enough in advance of the time the aircraft are needed for operational training of crews, etc., to give the modifying depots a realistic deadline for completion without having to resort to a crash program at the last minute.**

ESTABLISHMENT AND SUPPORT OF THE WEATHER ISLANDS

ESTABLISHMENT AND SUPPORT OF THE WEATHER ISLANDS

1. In coordination with the Air Weather Service, **the Headquarters of the Joint Task Force should formulate the general weather reporting plan at the earliest possible date in the planning phase of an overseas test operation.**

2. If temporary land based weather reporting stations are to be employed in the weather reporting plan, **the Air Weather Service should:**

a. **Select the sites most suitable for weather observation and forecasting for the contemplated test area.**

b. **Participate, using personnel previously experienced in weather island operations, in a Joint Task Force survey of the sites as soon as possible after selection.**

c. **Prepare a construction and rehabilitation plan pointed at providing each site with adequate operational, living, recreational and storage facilities.**

d. **Obtain the execution of the above construction plans through the use of qualified construction workers prior to occupancy by Air Weather Service personnel.**

3. To insure that weather island packages are complete and arrive at the operating site in a serviceable condition, **these packages should be assembled by the appropriate Air Weather Service unit and transported to the site as TAT equipment.**

4. **Complete responsibility for procurement and disposition of weather island equipment should be assigned to the Air Weather Service.**

5. Upon completion of an overseas test, **weather island equipment should be returned to Air Force stocks rather than be stored awaiting use in a future operation.**

FLIGHT SAFETY

1. To insure safe air operations at the beginning of the overseas operating period, **all standing operating procedures and their related training programs should be established by the Headquarters, Air Task Group and disseminated to the Test Units as early as possible prior to overseas movement** thus allowing ample time for pilot familiarization with test requirements before being subjected to actual operating conditions in the forward area.

2. Since the limited real estate on ENIWETOK ISLAND will always result in crowded aircraft parking conditions, **special emphasis must be placed on the development of adequate parking and taxi plans and constant supervision must be provided.**

3. To discharge the Air Task Group responsibility of insuring safe positioning of aircraft airborne at detonation time, and particularly of the effects mission aircraft, **the Flying Safety Officer must:**

a. **Inform himself thoroughly on the effects to be experienced by each aircraft at the planned detonation time position and compare these with known aircraft structural weaknesses and strengths.**

b. **Insure the early preparation of abort and position control procedures and insist upon thorough crew indoctrination in these safeguards.**

c. **Monitor the post-mission maintenance inspection of each aircraft airborne at detonation time to insure that any surface or structural failures are observed and corrected prior to the next mission.**

4. To minimize the ground hazards existing during CASTLE, **aircraft parking ramp expansion and resurfacing should be completed as outlined in the construction plan submitted to Joint Task Force SEVEN, as mentioned in the portion of this report concerning construction requirements.**

PERSONNEL MANNING AND AUGMENTATION

PERSONNEL MANNING AND AUGMENTATION

1. In order to provide more efficient utilization of government funds, **Headquarters, USAF should insure that adequate military maintenance personnel are available for each aircraft in the forward area so that it will not be necessary to utilize civilians.** This would eliminate the expenditure of funds for civilian overtime pay and per diem.

2. In order to eliminate the difficulties encountered as a result of the principle of augmentation, **Headquarters, Joint Task Force should assign specific support functions to the Air Force and Army, both during the interim and operational periods, and request each service to furnish the necessary personnel to carry out its responsibilities without assistance from another service.** The functions to be assigned should be the same as during Operation CASTLE with the following exceptions:

a. **The Air Force should be assigned the functions of the POL farm and structural fire fighting rather than the Army.**

b. **The Air Force should be required to furnish KP's to the consolidated mess on a pro rata basis.**

c. **Each service should be made responsible for the care of their own BOQ's.**

FUNDING

FUNDING

1. To preclude inconsistencies, confusion, or misunderstandings concerning the responsibility for funding future overseas atomic tests, **Headquarters, USAF should provide funds directly to ARDC for all Air Force units participating in the Operation. ARDC should then issue these funds to AFSWC.**

2. If Headquarters, USAF does not make funds available to ARDC for all Air Force participants, then **specific guidance should be furnished by Headquarters, USAF and Headquarters, Joint Task Force SEVEN early enough to permit participating commands to submit a supplemental budget to USAF to cover their requirements for the operation.**

PERSONNEL SECURITY

PERSONNEL SECURITY

1. To insure timely dissemination of firm security directives and personnel clearance criteria, **the Commander of the Joint Task Force should publish security directives no later than the date the Task Groups are activated.**

2. To preclude unnecessary delays in obtaining the proper types of security clearances, **there should be adequate advance planning by each organization involved in the operation to insure that personnel are assigned to their ultimate job, and job area, in sufficient time to process the appropriate requests for clearances.**

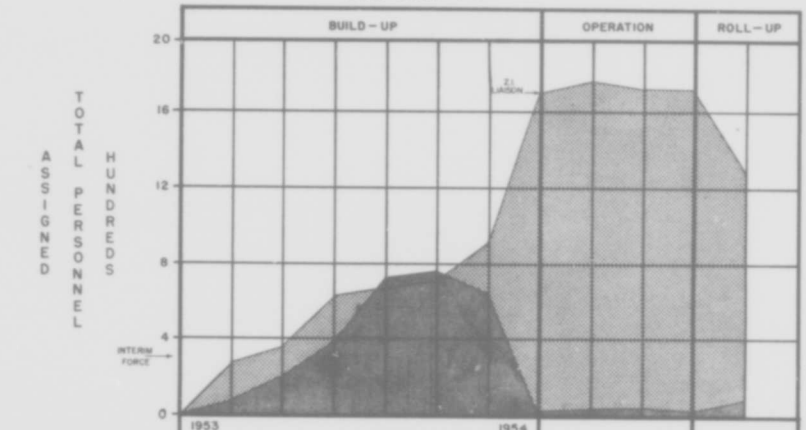
3. In order to preclude the assignment of poor security risks to future highly classified joint projects, **the basic Headquarters, USAF directive allocating participation responsibilities to the various major air commands should direct thorough screening of the personnel records of each individual to be assigned to the project.**

STATISTICAL DATA

PERSONNEL

PERSONNEL SUMMARY

TASK GROUP 7.4



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
PERSONNEL ZONE OF INTERIOR	80	186	392	733	764	637	26	32	39	28	81	
PERSONNEL FORWARD AREA	286	364	620	684	710	922	1697	1753	1718	1713	1283	

SOURCE: UNIT PERS. REPTS.

TASK GROUP 7.4 PERSONNEL BY ACTUAL LOCATION

LOCATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
ENIWETOK	OFF	16	20	28	33	44	97	248	277	276	288	212	
	AMN	210	285	339	423	484	681	1266	1294	1323	1339	994	
BIKINI	OFF	1	1	4	5	0	8	13	12	0	2	1	
	AMN	26	31	31	31	0	42	49	51	0	5	5	
WEATHER ISLANDS	OFF							1	1				
	AMN							86	87	63	59	60	
KWAJALEIN	OFF	2	2	20	15	15	15	0	0	1			
	AMN	31	25	198	177	177	179	34	31	55	20	11	
ZONE OF INTERIOR AND HICKAM AFB	OFF	24	46	101	167	177	126	5	8	15	9	13	
	AMN	56	140	291	566	577	411	21	24	24	19	68	
TOTAL	OFF	43	69	153	220	236	246	267	298	292	299	226	
	AMN	323	481	859	1197	1238	1313	1456	1487	1465	1442	1138	
GRAND TOTAL		366	550	1012	1417	1474	1559	1723	1785	1757	1741	1364	

SOURCE: DAILY STRENGTH REPORTS

PERSONNEL AUTH VS ASGD

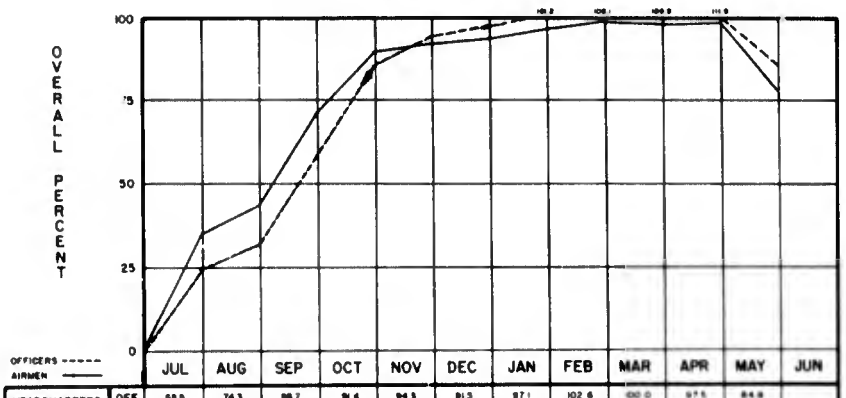
TASK GROUP 7.4

1953–54	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
HEADQUARTERS, TASK GROUP 7.4 — AUTHORIZED OFFICERS 39 AIRMAN 65 (INCLUDES AC&W DETACHMENT)												
OFFICERS ASSIGNED	24	26	30	32	33	32	38	40	39	38	33	
AIRMEN ASSIGNED	56	57	59	59	60	59	61	63	62	61	61	
TEST SUPPORT UNIT — AUTHORIZED OFFICERS 60 AIRMAN 519												
OFFICERS ASSIGNED	19	23	33	40	44	47	49	61	66	63	58	
AIRMAN ASSIGNED	267	341	370	454	484	505	532	540	544	538	510	
TEST AIRCRAFT UNIT — AUTHORIZED OFFICERS 62 AIRMAN 233 (INCLUDES WADC B-47 CREW)												
OFFICERS ASSIGNED	—	20	62	72	73	73	76	93	78	91	76	
AIRMAN ASSIGNED		83	226	226	231	218	230	250	221	250	234	
TEST SERVICES UNIT — AUTHORIZED OFFICERS 106 AIRMAN 646 (INCLUDES DETACHMENT OF 1110TH AIR BASE GP.)												
OFFICERS ASSIGNED	—	—	28	76	86	94	104	104	109	107	59	
AIRMAN ASSIGNED	—	—	208	458	463	531	633	634	636	593	333	

SOURCE UNIT STR RPTS.

MANNING PERCENTAGE

TASK GROUP 7.4

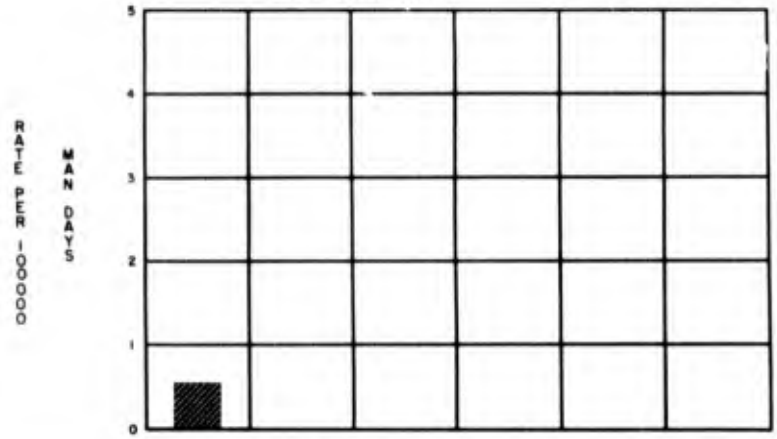


		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
HEADQUARTERS TASK GROUP 7.4	OFF	68.8	74.3	86.7	91.4	94.5	91.5	97.1	102.6	100.0	97.5	84.8	
	AMN	91.8	93.4	96.7	96.7	96.3	97.0	91.8	97.0	95.3	95.1	93.8	
TEST SUPPORT UNIT	OFF	29.5	34.4	49.4	59.7	73.3	78.3	81.7	101.7	110.0	105.0	96.6	
	AMN	49.3	82.8	68.4	83.9	91.6	94.4	99.3	102.8	104.8	103.4	98.2	
TEST AIRCRAFT UNIT	OFF	0	21.8	67.4	126.3	128.0	128.0	129.0	128.0	125.8	146.7	122.5	
	AMN	0	32.2	86.1	96.7	100.0	94.8	99.6	96.7	94.8	107.2	100.4	
TEST SERVICES UNIT	OFF	0	0	51.4	68.8	87.7	96.9	96.0	100.0	103.8	100.9	58.4	
	AMN	0	0	38.8	79.1	82.9	93.4	98.4	102.3	98.8	91.8	51.0	
OVERALL PERCENT	OFF	24.6	32.6	58.5	86.4	95.8	98.4	101.2	108.1	109.9	111.9	85.7	
	AMN	38.5	44.8	71.3	89.6	93.2	94.9	97.2	99.4	97.9	98.5	77.5	

SOURCE DAILY STRENGTH REPORT

GROUND ACCIDENT RATE

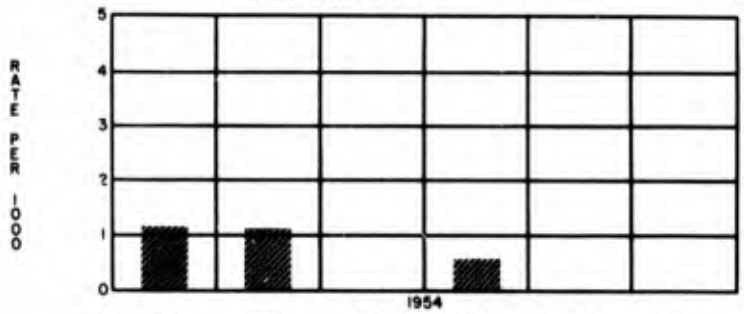
TASK GROUP 7-4



	JAN	FEB	MAR	APR	MAY	JUN
MAN-DAYS AVAILABLE	48813	48527	54298	52,551	23,708	
MAN-DAYS LOST	3	0	0	0	0	
RATE PER 100,000	.61	0	0	0	0	

DISCIPLINARY ACTION RATE

TASK GROUP 7-4

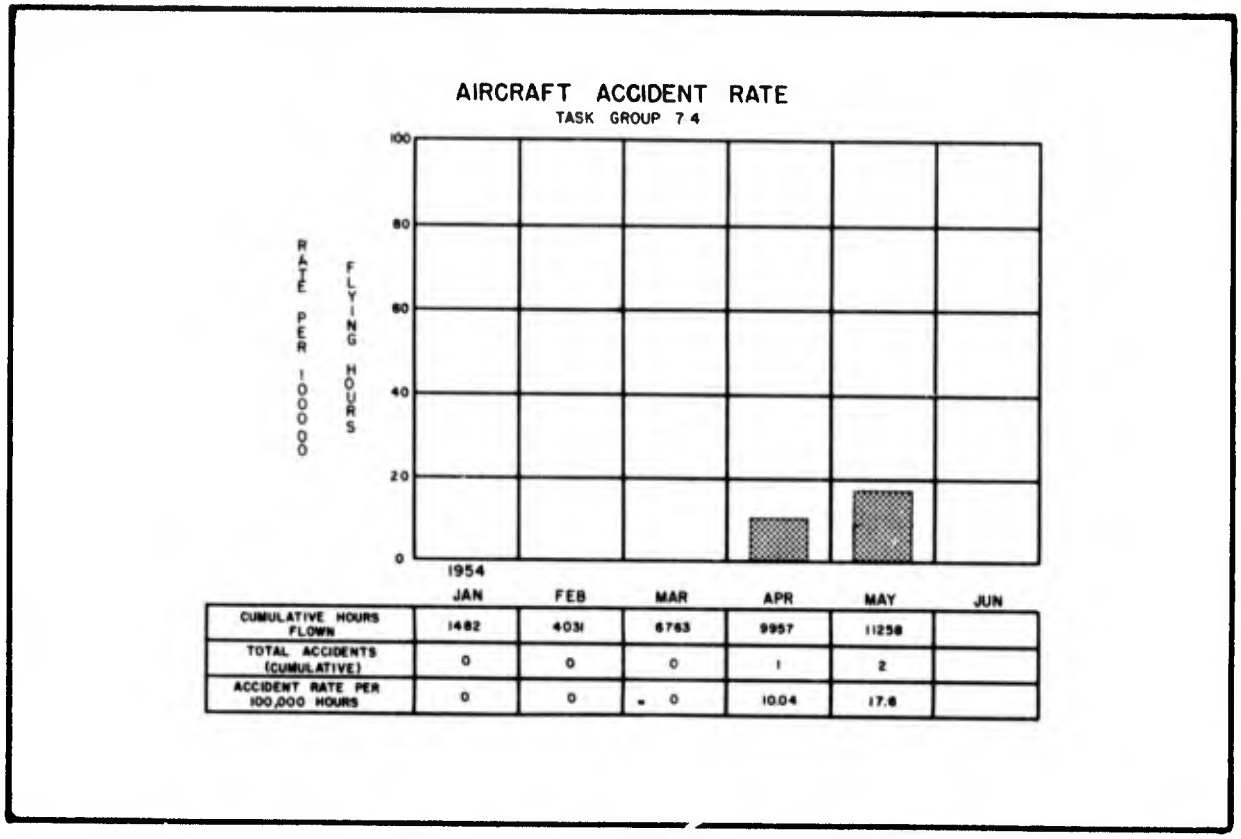


1954

	JAN	FEB	MAR	APR	MAY	JUN
TOTAL DISCIPLINARY ACTION CASES	2	2	—	1	—	
GENERAL COURTS MARTIAL	—	—	—	—	—	
SUMMARY COURTS MARTIAL	1	—	—	—	—	
SPECIAL COURTS MARTIAL	—	—	—	1	—	
ARTICLE 15 UCMJ	1	2	—	—	—	
TOTAL PERSONNEL	1723	1785	1757	1741	1364	
RATE PER 1000	1.16	1.12	0	.57	0	

SOURCE: DEPT OF C/M ACTIV

OPERATIONS



	JAN	FEB	MAR	APR	MAY	JUN
CUMULATIVE HOURS FLOWN	1482	4031	6763	9957	11258	
TOTAL ACCIDENTS (CUMULATIVE)	0	0	0	1	2	
ACCIDENT RATE PER 100,000 HOURS	0	0	0	10.04	17.8	

The accident during April involved an H-19 helicopter which burned and was a complete loss to the Air Force. The cost of this accident to the Air Force was $149,071.00.

The accident during May involved an F-84 Jet Aircraft which received major damage but was reparable. The cost of the damage in this accident was $55,917.00.

MONTHLY HOURS FLOWN

BY TYPE AIRCRAFT
TASK GROUP 7.4

CONFIDENTIAL

ACFT TYPE	1953 JUL	AUG	SEP	OCT	NOV	DEC	1954 JAN	FEB	MAR	APR	MAY	JUN
B-36					32	117	195	85	67	76	50	
B-47							28	27	43	35	17	
C-47	147	151	152	159	159	217	245	287	321	233	120	
C-54							29	213	182	189	55	
F-84G				233	307	350	27	406	326	294	202	
H-13							129	107	114	176	49	
H-19A	172	144	157	159	81	91	150	184	93	122	43	
H-19B				30	136	207	219	152	146	225	93	
L-13	87	142	186	240	210	178	350	375	370	556	138	
SA-16							10	99	201	183	73	
WB-29				81	50	0	100	614	869	1105	461	
TOTAL	406	447	495	902	975	1160	1482	2549	2732	3194	1301	

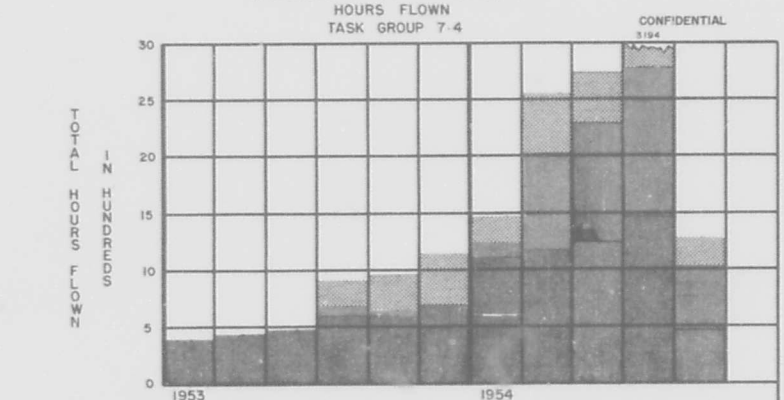
CONFIDENTIAL

SOURCE: UNIT 110A REPTS.
(TO NEAREST FULL HOUR)

SUMMARY OF AIRCRAFT

HOURS FLOWN
TASK GROUP 7.4

CONFIDENTIAL



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
TEST AIRCRAFT UNIT	—	—	—	233	339	467	250	518	436	405	269	
TEST SERVICES UNIT	—	—	—	81	50	—	139	865	1056	1302	547	
TEST SUPPORT UNIT	406	447	495	588	586	693	1093	1166	1240	1487	485	
TASK GROUP TOTAL	406	447	495	902	975	1160	1482	2549	2732	3194	1301	

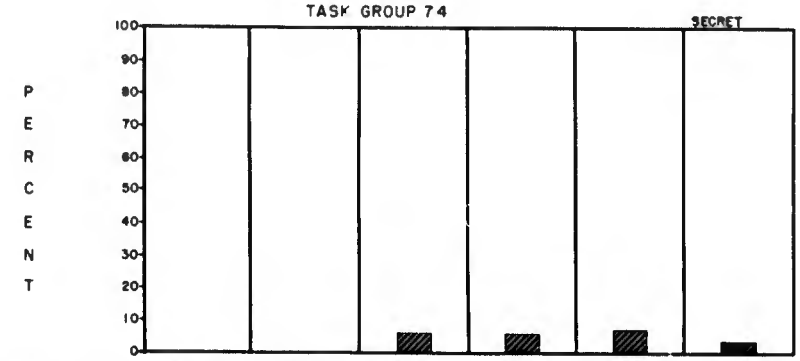
CONFIDENTIAL

SOURCE: UNIT 110A REPTS.

ABORT RATE

TASK GROUP 74

SECRET



AIRCRAFT	BRAVO	ROMEO	KOON	UNION	YANKEE	NECTAR
F-84	14	14	14 / 1	14 / 1	8	14 / 1
B-36	4	4	4 / 1	4	3	4
B-47	1	1	1	1	1 / 1	1
B-50	3	3	3	3 / 1	3 / 1	3
C-54	3	3	3	3	3	3
SA-16	2	2	2	2	2	1
WB-29	5	5	5	5	5	4
PB4Y	1	1	1	1	1	1
P2V	1	1	1	1	1	0
C-47	1	1	1	1	1	0

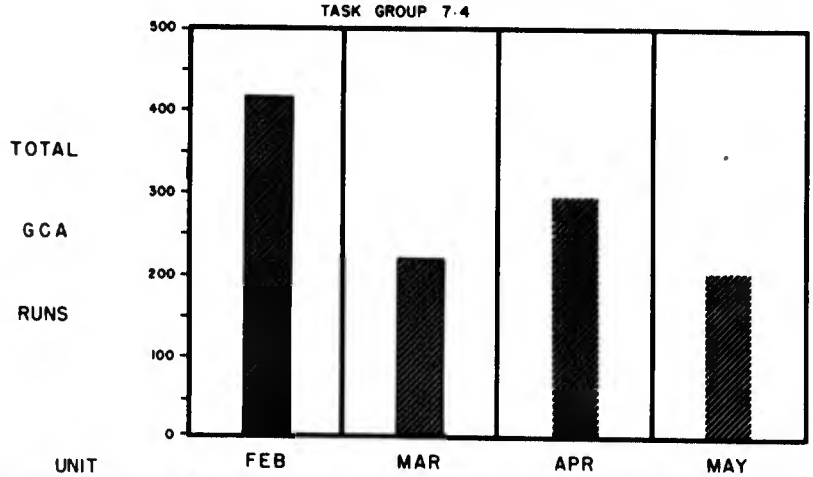
LEGEND: SCHEDULED / ABORTED

SECRET

SOURCE DIRECTOR OF MATERIEL

GCA RUNS

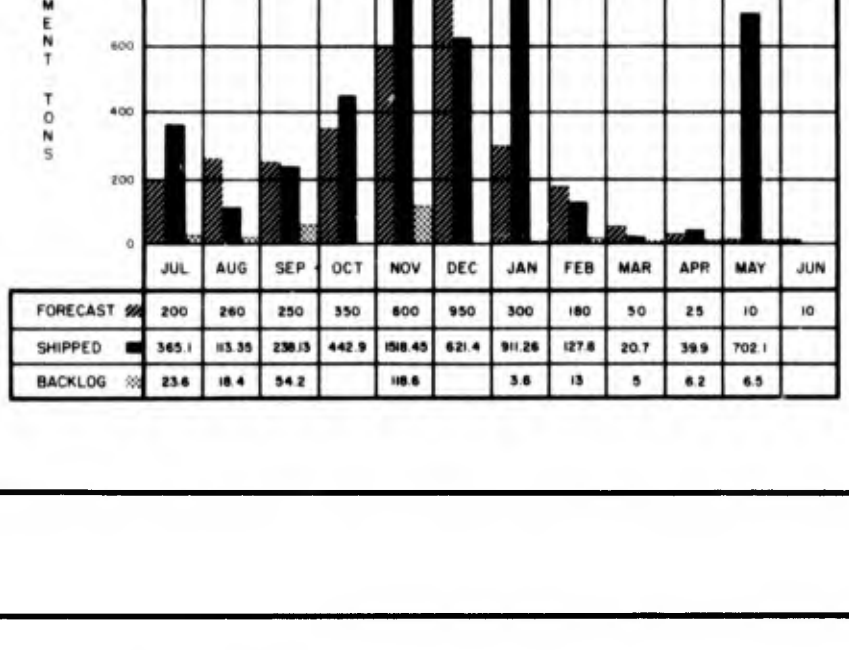
TASK GROUP 7.4



UNIT	FEB	MAR	APR	MAY
TEST AIRCRAFT UNIT	138	58	92	36
TEST SERVICES UNIT	194	116	124	52
TEST SUPPORT UNIT	70	39	39	43
OTHER	12	11	43	76
TOTAL GCA RUNS	414	224	298	207
CUMULATIVE GCA RUNS	414	638	936	1143

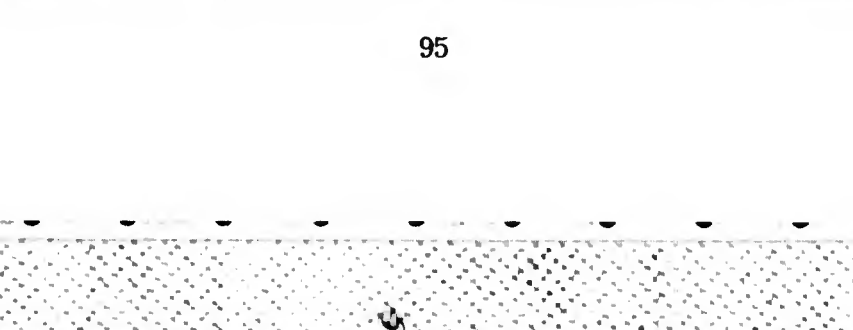
MATERIEL

SHIPMENT TO FORWARD AREA
WATER



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
FORECAST	200	260	250	350	600	950	300	180	50	25	10	10
SHIPPED	365.1	113.35	238.15	442.9	1518.45	621.4	911.26	127.8	20.7	39.9	702.1	
BACKLOG	23.6	18.4	54.2		118.6		3.6	13	5	6.2	6.5	

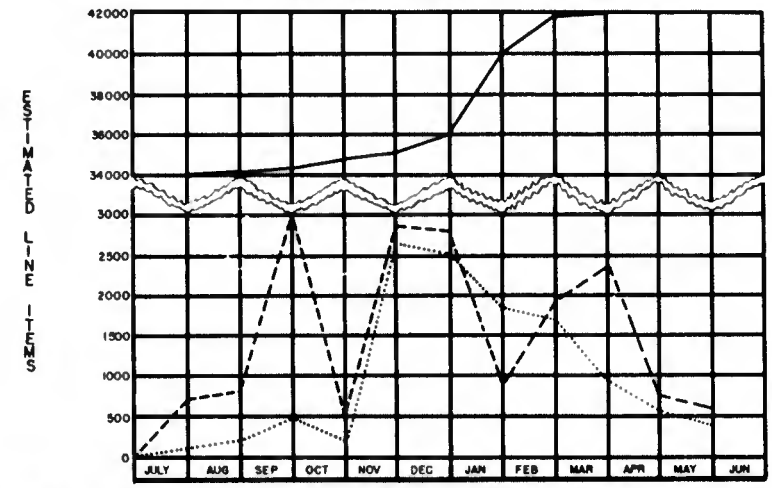
SHIPMENT TO FORWARD AREA
AIR



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
FORECAST	11.0	10.5	9.5	8.4	26.6	33.0	40.0	45.0	38.0	26.2	38.0	
SHIPPED	9.2	2.8	5.7	8.5	14.5	36.6	32.6	59.4	46.6	24.1	17.1	
BACKLOG						5.0			5.7	6.8	4.5	

SOURCE: DEPUTY FOR MATERIEL

SUPPLIES BEING STOCKPILED
IN THE FORWARD AREA

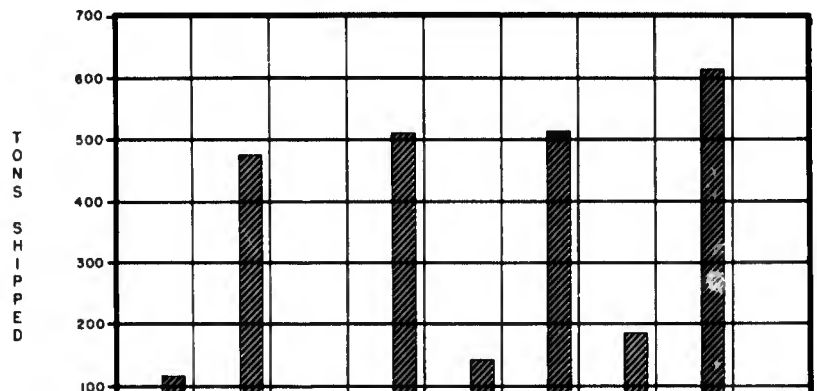


	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
LINE ITEMS ON HAND FORWARD AREA ——	34,000	34,100	34,300	34,800	36,800	37,604	40,104	41,928	42,000	42,000	42,000	
SHIPPED TO FORWARD AREA ·····	100	200	500	200	2604	2500	1828	1,700	950	560	421	
REQUISITIONED TO DATE - - -	700	800	3000	300	2828	2800	900	1,912	2,373	772	873	

SOURCE: DEPUTY FOR MATERIEL

After 1 March 1954, initial action to stockpile supplies in the forward area had been completed. After that date supply action consisted of replacement requisitions for items consumed during the operational phase; therefore, the total number of line items remained static at approximately 42,000.

EXCESS SUPPLIES SHIPPED BY AIR AND WATER
TO ZONE OF INTERIOR



	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
AIR (SHORT TONS)	7	2	5	9	2	7	7	5	0
WATER (TONS)	116.4	475		508.07	140	509.16	185	612	80.6

SOURCE: DIRECTOR OF MATERIEL

The excess supplies that were shipped from the Forward Area to the Zone of Interior were items that had been shipped from Kwajalein to Eniwetok during 1953 and found to be excess to the needs of the Task Group.

CONSUMPTION OF FUEL

BY TYPE AIRCRAFT
TASK GROUP 7.4

CONFIDENTIAL

1953-1954	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
AIRCRAFT	115/145 GRADE GASOLINE											
B-36								99,155	45,190	93,083	59,069	
RB-36								65,545	37,992	51,363	18,825	
C-47	11,425	11,661	12,585	13,500	15,615	23,287	26,045	30,293	32,831	24,539	12,405	
C-54								39,825	44,267	41,699	15,367	
H-19A	6,717	5,525	6,153	6,040	3,241	3,662	6,108	6,428	3,461	4,339	1,246	
H-19B				1,316	3,996	8,269	9,859	6,274	5,567	7,986	2,955	
SA-16								10,321	25,829	21,407	8,912	
WB-29							20,315	222,328	340,443	431,182	185,812	
	80 OCTANE GASOLINE											
H-13								853	927	1,428	422	
L-13	1,141	1,508	1,763	2,449	2,182	1,933	3,733	3,875	3,735	5,853	1,404	
	JP-4 FUEL											
B-47								41,538	66,400	58,500	26,400	
F-84G							2,242	170,578	104,437	142,020	79,051	

COMPUTED IN GALLONS CONFIDENTIAL SOURCE AF 110 REPORTS

CONSUMPTION OF OIL

BY TYPE AIRCRAFT
TASK GROUP 7.4

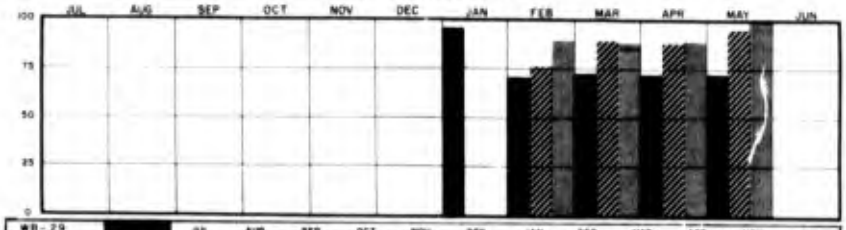
CONFIDENTIAL

1953-1954	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
AIRCRAFT	1100 GRADE											
B-36								3,702	4,472	3,697	2,460	
RB-36								2,264	1,720	1,402	776	
C-47	621	445	581	481	871	1,005	1,068	1,395	1,209	1,262	584	
C-54								1,860	731	1,400	168	
H-19A	364	260	220	339	189	207	366	291	153	234	57	
H-19B			236	156	871	1,246	1,207	759	776	784	269	
SA-16								434	722	942	334	
WB-29								8,595	11,505	14,766	6,105	
H-13								18	16	51	15	
L-13	23	28	47	133	95	68	155	182	144	276	62	
	10/10 GRADE											
B-47								76	83	81	26	
F-84G								481	518	231	191	

COMPUTED IN QUARTS CONFIDENTIAL SOURCE AF 110 REPORTS

AIRCRAFT IN VS OUT OF COMMISSION

TEST SERVICES UNIT



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
WB-29												
HOURS IN COMMISSION							1044	4294	4636	4735	2228	
PERCENT IN COMMISSION							95	71	74	73	74	
TOTAL HOURS OUT							54	1754	1589	1745 *	776	
MAINT & INSPECT								522	853	784	776	
MALFUNCTION							54	794	588	604		
ADCP								638	148	230		
C-54												
HOURS IN COMMISSION								1901	2051	1923	1059	
PERCENT IN COMMISSION								76	91	88	96	
TOTAL HOURS OUT								61	181	237 *	42	
MAINT & INSPECT								63	76	34	42	
MALFUNCTION								4	105	51		
ADCP										60		
SA-16												
HOURS IN COMMISSION								965	1733	1941	975	
PERCENT IN COMMISSION								91	89	90	100	
TOTAL HOURS OUT								98	216	215		
MAINT & INSPECT								98	216	215		
MALFUNCTION												
ADCP												

REMARKS: OPERATIONAL CONTROL OF TASK GROUP 7.4

WB-29 — 1 JAN 54

C-54 & SA-16 — 1 FEB 54

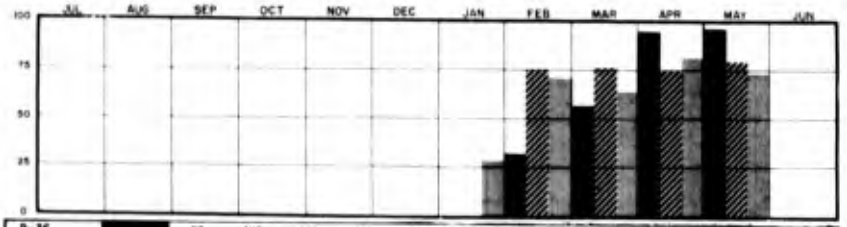
* WB-29 - OUT FOR DECONTAMINATION — 17 HOURS IN APRIL

* C-54 — " " " — 112 HOURS IN APRIL

SOURCE: AF FORMS 110

AIRCRAFT IN VS OUT OF COMMISSION

TEST AIRCRAFT UNIT



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
B-36												
HOURS IN COMMISSION								865	1704	2740	1403	
PERCENT IN COMMISSION								53	57	95	97	
TOTAL HOURS OUT								1735	1272	140	37	
MAINT & INSPECT								399	144		37	
MALFUNCTION								1040	547	44		
ADCP								300	581	96		
B-47												
HOURS IN COMMISSION								504	558	540	288	
PERCENT IN COMMISSION								75	76	75	79	
TOTAL HOURS OUT								168	186		74	
MAINT & INSPECT								100	186	180	74	
MALFUNCTION								68				
ADCP												
F-84												
HOURS IN COMMISSION								104	719	6065	8700	3949
PERCENT IN COMMISSION								29	71	63	81	73
TOTAL HOURS OUT								256	2889	4195	2100 *	451 *
MAINT & INSPECT								48	1063	3098	670	518
MALFUNCTION								184	1342	1077	948	550
ADCP								24	484	22	82	144

REMARKS: OPERATIONAL CONTROL OF TASK GROUP 7.4

F-84 — JAN 54

B-36 & B-47 — 1 FEB 54

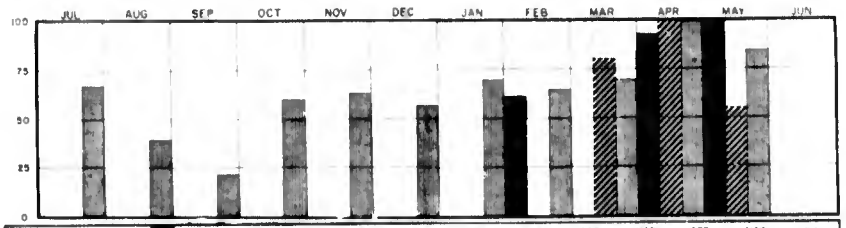
* F-84's OUT FOR DECONTAMINATION - 450 HOURS IN APRIL

459 HOURS IN MAY

SOURCE: AF FORMS 110

AIRCRAFT IN VS OUT OF COMMISSION

TEST SUPPORT UNIT

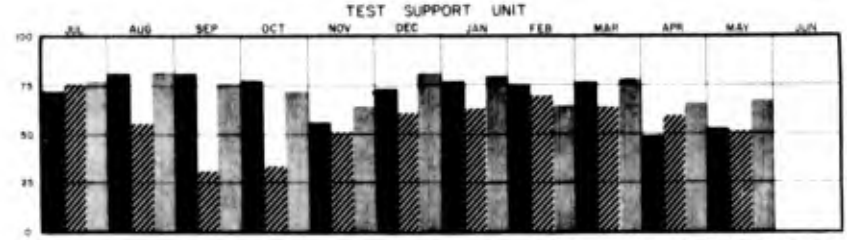


C-54	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
HOURS IN COMMISSION								407	744	672	312	
PERCENT IN COMMISSION								61	100	93	100	
TOTAL HOURS OUT								265		48		
MAINT & INSPECT								265		48		
MALFUNCTION												
AOCP												
SA-16												
HOURS IN COMMISSION									807	1440	418	
PERCENT IN COMMISSION									80	100	54	
TOTAL HOURS OUT									201		350	
MAINT & INSPECT									201		266	
MALFUNCTION												
AOCP											84	
H-13												
HOURS IN COMMISSION	488	864	480	1344	1344	1272	1536	1296	1536	2160	903	
PERCENT IN COMMISSION	67	58	22	60	63	57	69	64	69	100	84	
TOTAL HOURS OUT	744	1368	1680	888	792	960	696	720	696		177	
MAINT & INSPECT	744	792	1680	312	168	552	696	264	168		57	
MALFUNCTION												
AOCP		576		576	624	408		456	528		120	

SOURCE AF FORMS 110

AIRCRAFT IN VS OUT OF COMMISSION

TEST SUPPORT UNIT



C-47	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
HOURS IN COMMISSION	1268	1673	1690	2288	1669	1989	2277	2015	2264	1996	1120	
PERCENT IN COMMISSION	71	83	82	77	56	73	76	75	76	69	78	
TOTAL HOURS OUT	522	359	403	688	1211	807	699	675	712	884	320	
MAINT & INSPECT	259	324	311	121	795	539	545	620	592	685	283	
MALFUNCTION	263	35	92	229	198	268	154	55	120	201	37	
AOCP				338	218							
H-[illegible]												
[illegible] HOURS IN COMMISSION	1696	1268	1152	1503	2175	3387	1503	1231	1511	2746	1112	
PERCENT IN COMMISSION	76	57	52	35	51	65	67	59	67	59	51	
TOTAL HOURS OUT	536	964	2420	2417	2069	1801	1706	1471	1713	1918	1048	
MAINT & INSPECT	87	32	192	989	1025	418	1180	409	1005	1017	905	
MALFUNCTION	39	8	528	528	956	1473	638	282	696	901	197	
AOCP	710	926	1700	700	94	230	948	780			46	
L-13												
HOURS IN COMMISSION	6390	6895	5984	5791	5408	7026	6556	4685	5573	4264	2160	
PERCENT IN COMMISSION	78	84	76	71	68	85	80	57	79	66	67	
TOTAL HOURS OUT	802	1291	1936	2395	2767	1412	1629	2359	1415	2214	1080 *	
MAINT & INSPECT	144	901	1106	1189	1178	1217	1153	1378	991	1207	1146	
MALFUNCTION	658	390	830	1206	1589	195	477	1151	424	1007	934	
AOCP				3			240	216				

* INCLUDES 2 AIRCRAFT IN STORAGE = 528 HOURS

SOURCE AF FORM 110

AIRCRAFT INVENTORY

BY TYPE

SECRET

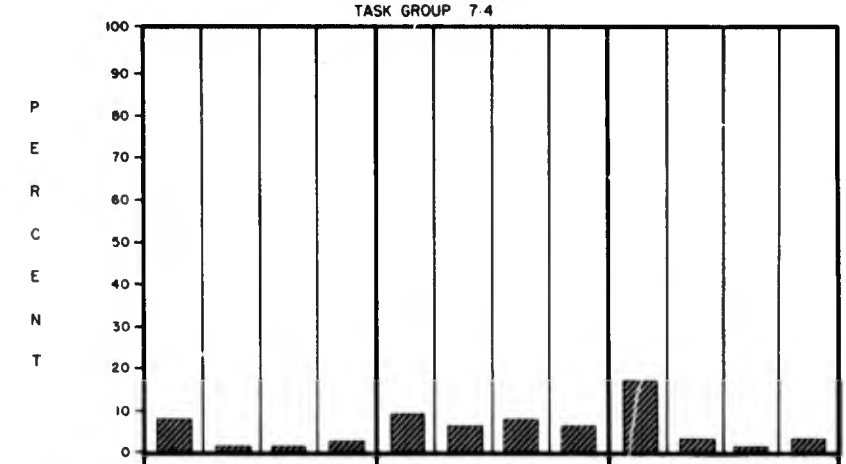
AIRCRAFT TYPE	1953						1954					
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
B-36			3	3	3	3	3	3	3	3	3	
RB-36			1	1	1	1	1	1	1	1	1	
B-47			1	1	1	1	1	1	1	1	1	
C-47	3	3	4	4	4	4	4	4	4	4	4	
C-54			4	4	4	4	4	4	4	4	4	
F-84G		13	15	15	15	15	15	15	15	15	15	
H-13	3	3	3	3	3	3	3	3	3	3	3	
H-19A	3	3	3	3	3	3	3	3	3	2	2	
H-19B			2	4	4	4	4	4	4	4	4	
L-13	11	11	11	13	13	11	11	10	9	9	9	
SA-16			2	2	2	2	2	3	5	5	5	
WB-29			8	8	9	9	9	9	9	9	8	
*PBM									2	2	2	
TOTAL	20	33	57	61	62	60	60	60	63	62	61	

*COSTED TO NAVY SECRET

SOURCE AF FORM 110

AOCP RATE

TASK GROUP 7.4



	TEST AIRCRAFT UNIT				TEST SERVICES UNIT				TEST SUPPORT UNIT			
	FEB	MAR	APR	MAY	FEB	MAR	APR	MAY	FEB	MAR	APR	MAY
AIRCRAFT ASSIGNED	572	671	674	342	399	465	448	216	429	672	700	323
AIRCRAFT AOCP	43	8	8	7	38	28	36	13	74	19	9	10
AOCP RATE	08	01	01	02	09	06	08	06	17	03	01	03

B-50 AIRCRAFT

(I B D A)

SECRET

SHOTS	GALLONS USED	NO OF AIRCRAFT
BRAVO	18,095	3
ROMEO	18,190	3
KOON	24,229	3
UNION	40,006	3
YANKEE	21,432	3
NECTAR	70,819	3

FUEL CONSUMPTION 115/145 GRADE

0 3 6 9 12 15 18 21 24 27 30

GALLONS IN THOUSANDS

SHOTS	QUARTS USED	NO OF AIRCRAFT
BRAVO	1580	3
ROMEO	800	3
KOON	1176	3
UNION	872	3
YANKEE	912	3
NECTAR	2200	3

OIL CONSUMPTION 1100 GRADE

0 2 4 6 8 10 12 14 16 18 20

QUARTS IN HUNDREDS

SHOTS	HOURS FLOWN	NO OF AIRCRAFT
BRAVO	43	3
ROMEO	43	3
KOON	43	3
UNION	44	3
YANKEE	43	3
NECTAR	114	3

FLYING TIME

0 10 20 30 40 50 60 70 80 90 100

HOURS

SECRET

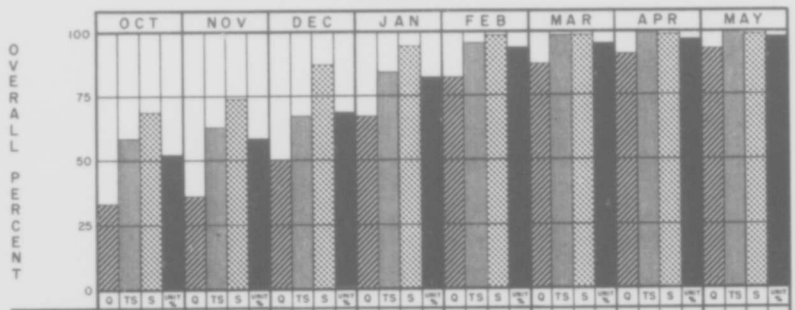
SOURCE REFUELING SECTION & AF 110 REPORTS

SECURITY

PERSONNEL CLEARANCE STATUS

BY TYPE

TASK GROUP 7.4



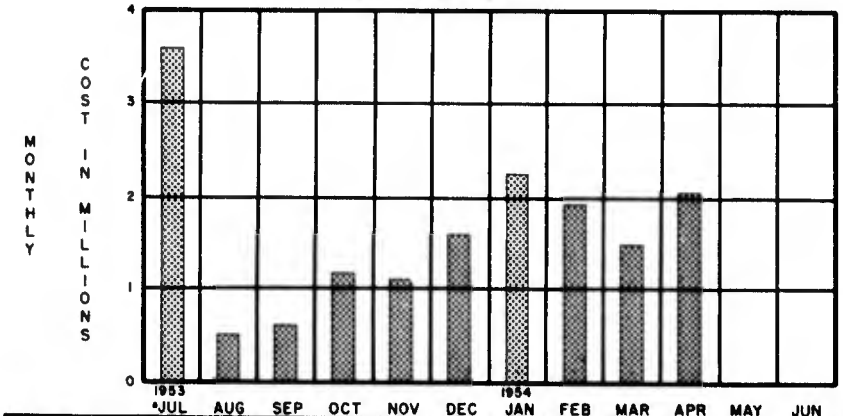
	OCT				NOV				DEC				JAN				FEB				MAR				APR				MAY			
	Q	TS	S	UNIT %	Q	TS	S	UNIT %	Q	TS	S	UNIT %	Q	TS	S	UNIT %	Q	TS	S	UNIT %	Q	TS	S	UNIT %	Q	TS	S	UNIT %	Q	TS	S	UNIT %
HEADQUARTERS TASK GROUP 7.4	85	80	95	87	90	81	95	89	91	81	95	89	94	92	98	95	97	100	100	99	97	100	100	99	97	100	100	98	97	100	100	99
TEST SUPPORT UNIT	40	33	62	45	41	33	62	45	41	41	80	54	66	81	89	79	70	97	96	88	77	97	96	90	84	100	97	94	84	100	97	94
TEST (S) AIRCRAFT UNIT	29	79	54	54	28	79	54	54	63	86	73	74	71	86	91	83	77	86	100	88	87	100	100	96	93	100	100	97	95	100	100	98
TEST (E) AIRCRAFT UNIT	6	100	83	61	10	100	100	70	37	100	100	79	57	100	100	86	80	100	100	93	87	100	100	96	90	100	100	97	90	100	100	97
TEST SERVICES UNIT	6	0	39	15	11	20	60	30	18	27	87	44	48	61	94	68	86	100	100	95	98	100	100	96	93	100	100	99	97	100	100	99
OVERALL PERCENT	33	58	68	52	36	63	74	58	50	67	87	68	67	84	94	82	82	96	99	93	87	99	99	95	91	100	99	97	93	100	99	98

SOURCE: SECURITY RECORDS

COMPTROLLER

[redacted]

AIR FORCE COST
BY COMMAND PARTICIPATION
TASK GROUP 7.4

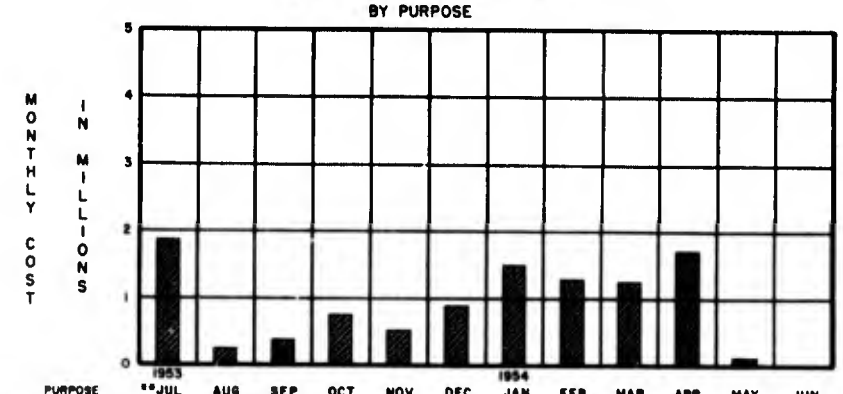


	*JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
**TASK GROUP 7.4	1,885,236	203,005	381,521	749,897	509,335	871,778	1,666,303	1,280,425	1,261,771	1,714,453		
AMC	52,775	18,066	11,027	23,354	39,685	22,894	34,316	6,079	20,017	-10,442		
WADC					10,880	107,937	16,064	16,054	191,885	-146,250		
MATS	1,823,862	279,591	208,866	365,671	496,472	466,371	578,085	658,177	5,334	487,708		
SAC		1,825	14,822	13,099	27,093	72,854	129,233	0	0	0		
MONTHLY TOTAL	3,559,873	493,307	609,836	1,151,881	1,083,185	1,603,838	2,243,894	1,960,736	1,478,775	2,045,469		
CUMULATIVE TOTAL	3,559,873	4,052,980	4,662,816	5,814,697	6,897,882	8,501,720	10,745,614	12,706,646	14,185,221	16,229,710		

* JUL INCLUDES ALL PREVIOUS COST
** INCLUDES AFSWC COST

SOURCE COST REPORTS

[redacted] TASK GROUP 7.4 COST
BY PURPOSE



PURPOSE	**JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
TDY, TVL, PER DIEM	17,335	3,402	3,868	219	-334	13,859	53,185	21,269	3,164	2,440	-2,090	
TRANSPORTATION								5	22		0	
COMMUNICATIONS	888	317	882	186	371	864	206	-22	156	16	1,978	
HQ OVERHEAD	171,230	46,411	73,440	32,977	81,145	57,878	23,906	36,502	20,307	104,144	384	
SAMPLING PROGRAM				39,731	68,595	20,811	244,046	234,857	349,183	247,063	*** 0	
EFFECTS PROGRAM							98,865	82,485	61,373	87,115	*** 0	
DOC PHOTO PROGRAM							13,261	119,718	22,176	33,854	*** 0	
COMMON TO PROJECT	1,693,783	175,800	280,305	676,512	356,598	799,383	1,042,852	815,841	808,732	1,240,021	97,228	
MONTHLY TOTAL	1,885,236	225,930	358,596	749,897	509,335	892,599	1,490,303	1,278,425	1,264,115	1,714,453	97,480	
CUMULATIVE TOTAL	1,885,236	2,109,166	2,467,762	3,217,359	3,726,694	4,619,293	6,109,596	7,388,021	8,650,136	10,364,577	10,462,057	

* INCLUDES COST TO AFSWC
** JUL INCLUDES ALL PREVIOUS COST
*** COSTS TO 15 MAY INCLUDED IN APRIL FIGURES

[redacted]

[redacted]946

[redacted]

[redacted]