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HARDTACK

FINAL REPORT

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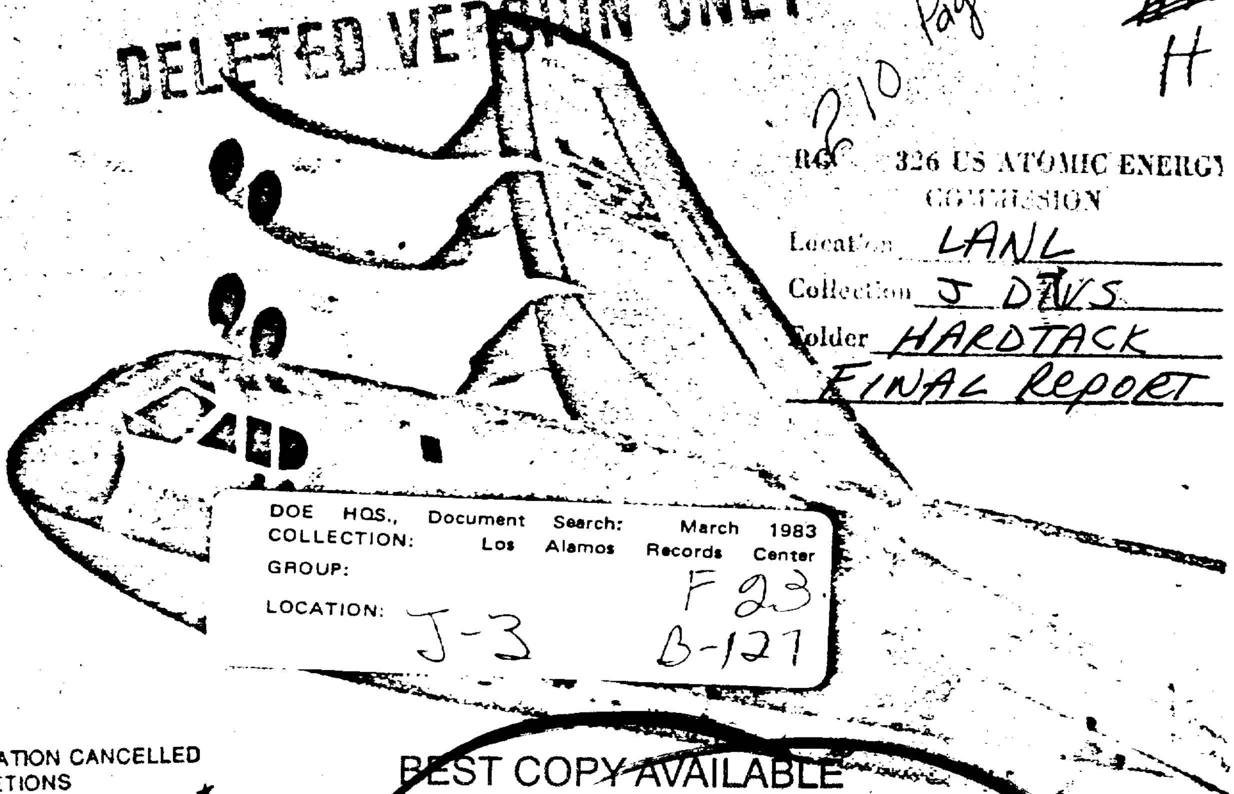

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TASK GROUP 7.4 ENIWETOK, MI

1958

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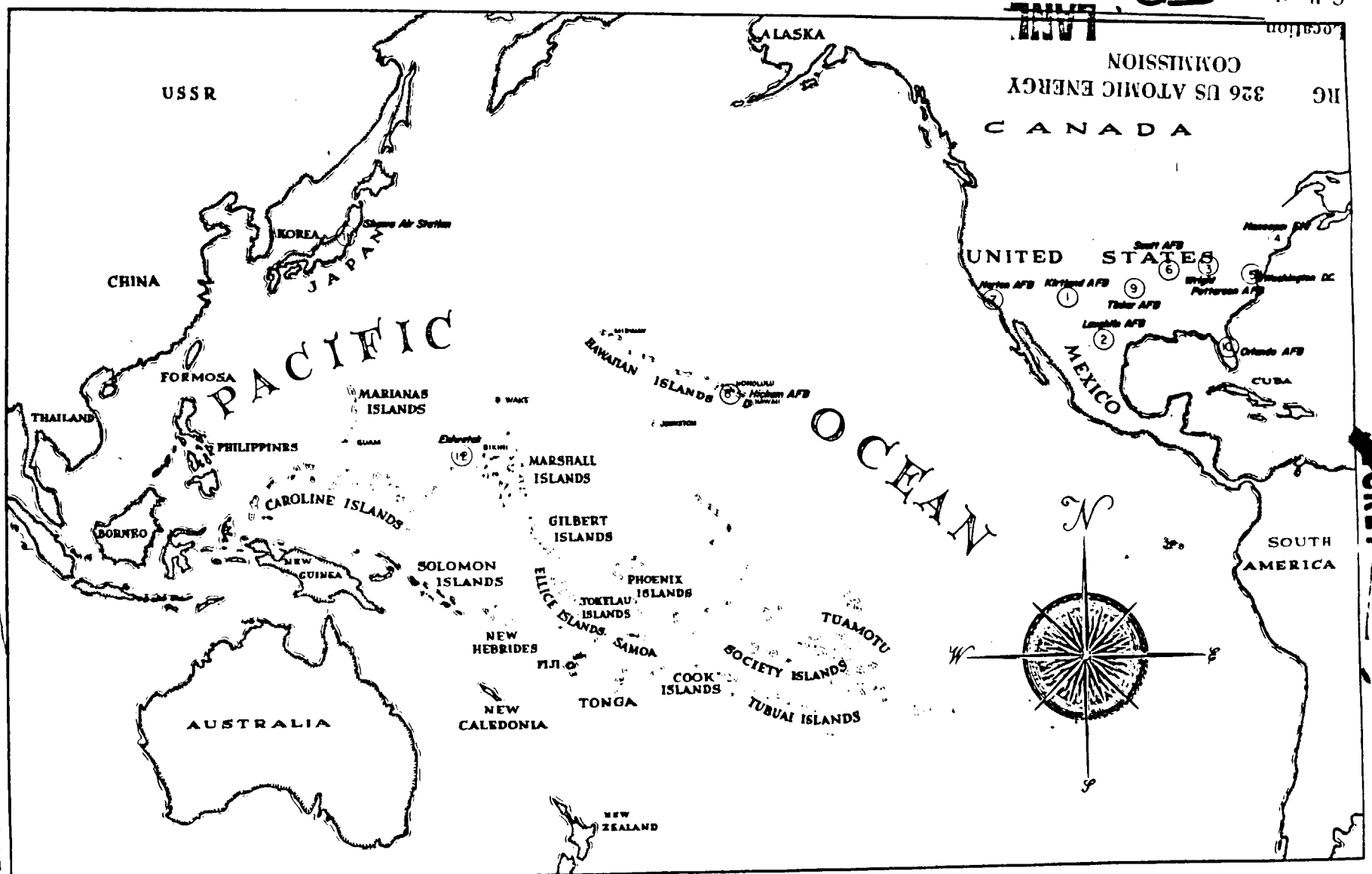

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PREFACE

Our job in Task Group 7.4 was to provide air support to Joint Task Force SEVEN. The purpose of this report is to brief what we did in carrying out this job. Anyone interested in more detail than contained in this report is referred to the histories of the Task Group and of its units.

Although Headquarters Task Group 7.4 was not formally established for Operation HARDTACK until October 1957, plans and preparation for its participation in the operation started long before that within Headquarters, Joint Task Force SEVEN, and within the headquarters and squadrons of the 4950th Test Group (Nuclear) of the Air Force Special Weapons Center. Thus, this report covers activities starting as early as the Spring and Summer of 1957. The last shot of the HARDTACK series took place at the Eniwetok Proving Grounds on 18 August 1958. Roll-up activities, deactivation of provisional units, and reassignment of personnel will take place for several weeks to come. These matters are routine, however, and therefore this report has been cut off as of 18 August 1958 in order to permit early publication.

The report is organized into five parts as follows:

Part	I	Summary
Part	II	Command
Part	III	Personnel & Administration
Part	IV	Operations
Part	V	Materiel

I take this opportunity to express appreciation to all the officers and airmen who have served in Task Group 7.4 so faithfully and well. All

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of us are happy to have been able to contribute to the success of Joint Task Force SEVEN in the conduct of Operation HARDTACK.

WM B. KIEFFER
Colonel, USAF
Commander

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45	Comdr AMC	MCFO
46	Comdr WESTAF	DCS/Plans
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PART I

SUMMARY

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The mission of Task Group 7.4, Provisional, was to provide and operate certain aircraft and to provide weather and other services in support of Joint Task Force SEVEN during Operation HARDTACK in the spring and summer of 1958. The Group reached a peak strength of 2262. Although the Group manned some sixteen different operating sites, the bulk of the people served on FRED Island at Eniwetok Atoll. Some thirty-seven (37) Navy personnel served in Task Group 7.4, Provisional. All of the remaining people were members of the United States Air Force.

Planning for the participation of Task Group 7.4, Provisional, in Operation HARDTACK began within the Air Force Special Weapons Center at Kirtland Air Force Base, New Mexico early in 1957. In October of that year the Task Group and its operating Elements were formally established. Task Group personnel began moving into the Forward Area in December and continued at an ever increasing rate until 15 March 1958 when the Task Group Headquarters and all its Units and Elements became operational in the Eniwetok Proving Grounds (EPG).

During the five months that the Task Group participated in sustained support of HARDTACK, its flying and technical elements participated in 35 nuclear test events. Of these, 11 took place at Bikini, 22 at Eniwetok, and 2 at Johnston Island.. On four occasions it was necessary for the Group to participate in two events on the same day. In all, the test effects and sampler aircraft of the Test Aircraft Unit flew 257 sorties and 1982 hours in direct support of nuclear test operations.

The Group provided weather reporting, weather reconnaissance, and weather forecasting services to Joint Task Force SEVEN. Weather reporting stations were set up on eight islands ranging in distance from one hundred to eight hundred miles distance from Eniwetok. Weather reconnaissance

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was accomplished with a unit of ten WB-50 aircraft which flew daily out to distances of twelve hundred miles from Eniwetok and returned. The weather forecasting organization, of course, played an important part in providing the Task Force Commander with that weather information which he needed to determine whether or not to shoot.

Air support activities included the operation of C-54, SA-16, liaison and helicopter aircraft carrying passengers and cargo in the Forward Area.

At peak strength, Task Group 7.4 was assigned a total of 78 aircraft of 16 different types. Between 15 March and 18 August a total of 18307 flying hours were accomplished. Four major accidents were suffered involving one liaison aircraft and three helicopters. One life was lost as a result of these accidents.

All United Elements of Task Group 7.4, Provisional, were redeployed to their home stations as soon as they could be spared from the Forward Area. On 15 August the main Headquarters of the Task Group transferred back to Kirtland Air Force Base leaving only a small echelon to finish the roll-up of supplies and equipment.

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PART II

COMMAND

Chapter 1 - ral

Late in 1956 the 4950th Test Group (Nuclear) was established by Headquarters Air Research and Development Command as part of the Air Force Special Weapons Center at Kirtland Air Force Base. It is a permanent organization whose mission is to plan for and to provide direction of air support for full-scale nuclear test programs both in Nevada and the Pacific. The members of the Headquarters of this group, while participating in the PLUMBBOB exercise in Nevada in the Spring and Summer of 1957, concurrently initiated plans for Task Group 7.4 participation in HARDTACK. Upon activation of Task Group 7.4, Provisional, by Headquarters Air Research and Development Command on 1 October 1957, the Commander and other personnel assigned to the Headquarters of the 4950th, merely assumed similar titles within the newly formed Task Group 7.4 and continued doing the job at hand. Thus there was no time lost in organizing a new group of people to do the Headquarters Task Group 7.4 job.

During the period from 1 October until the opening of the operational phase of HARDTACK in the forward area on 15 March, the provisional units and elements of Task Group 7.4 were established and organized at their various ZI home bases. Commanders were assigned and planning proceeded under the guidance of the Commander, Joint Task Force SEVEN and the Commander, Task Group 7.4.

Although advance detachments were in the forward area as early as February, operational control of these units was not assumed by Task Group 7.4 and Joint Task Force SEVEN until their commanders arrived on 12 and 19 March respectively; this assumption of command was accomplished smoothly and without misunderstanding.

Command arrangements during shots varied depending upon the shot situation. At no time was there any serious difficulty in maintaining

adequate communication between the various operating locations. Thus, it was possible for the Commander of Task Group 7.4 to command all the air operations while at the same time keeping the Commander Joint Task Force SEVEN fully informed of the situation and responding to his orders.

Flying Safety was a special subject at all levels within the Task Group. The accident rate achieved was 21.3 per one hundred thousand flying hours. This compares with an Air Force-wide rate during Calendar Year 1957 of 13.6 per one hundred thousand flying hours and for the first six months of calendar year 1958 of 10.8 per one hundred thousand flying hours.

Chapter 2 - Mission

The mission of Task Group 7.4 during Operation HARDTACK was two-fold: to operate aircraft for the purpose of collecting data and samples and to provide certain of the air support services required by Joint Task Force SEVEN. This latter function included the operation of air base facilities at Eniwetok and Bikini Atolls, an inter-island and inter-atoll airlift system, weather reporting and forecasting services, air terminal, search and rescue and communication services.

Chapter 3 - Organization

Headquarters Task Group 7.4 was organized into three directorates (Personnel and Administration, Operations, and Materiel) and a small special staff reporting directly to the Commander and consisting of the Flying Safety Officer and the Flight Surgeon. The operating personnel were organized into three units: the Test Aircraft Unit, Test Services Unit, and Test Base Unit. The organization structure and the general functional areas of responsibility of each of the three operating units are indicated in Figure 1.

The Commander of the Task Group was formerly assigned as Deputy Commander of the Air Force Special Weapons Center and, thus, has been associated for some time with the atomic weapons research and development program. On 15 July 1957 he was reassigned to the post of Deputy Commander for Overseas Tests in preparation for his subsequent assumption of command of the Task Group. This arrangement made it possible for him to participate in the field phase of Operation PLUMBBOB, the 1957 atomic test series conducted in Nevada. He assumed command of the 4950th Test Group and Task Group 7.4 on 1 October 1957. The former commander of the 4950th Test Group became his deputy, a move which served to insure the continuity of that unit's operations.

With the activation of Task Group 7.4 on 1 October 1957, the various staff officers of the 4950th Test Group assumed like staff positions within Task Group 7.4, an arrangement which proved particularly effective. In the case of two officers making up the Commander's special staff it was necessary to request manning from resources other than that of the Air Force Special Weapons Center. The services of a Flight Surgeon with experience in the biological effects of radiation was obtained by arrangement with Headquarters Joint Force SEVEN and Headquarters United States Air Force.

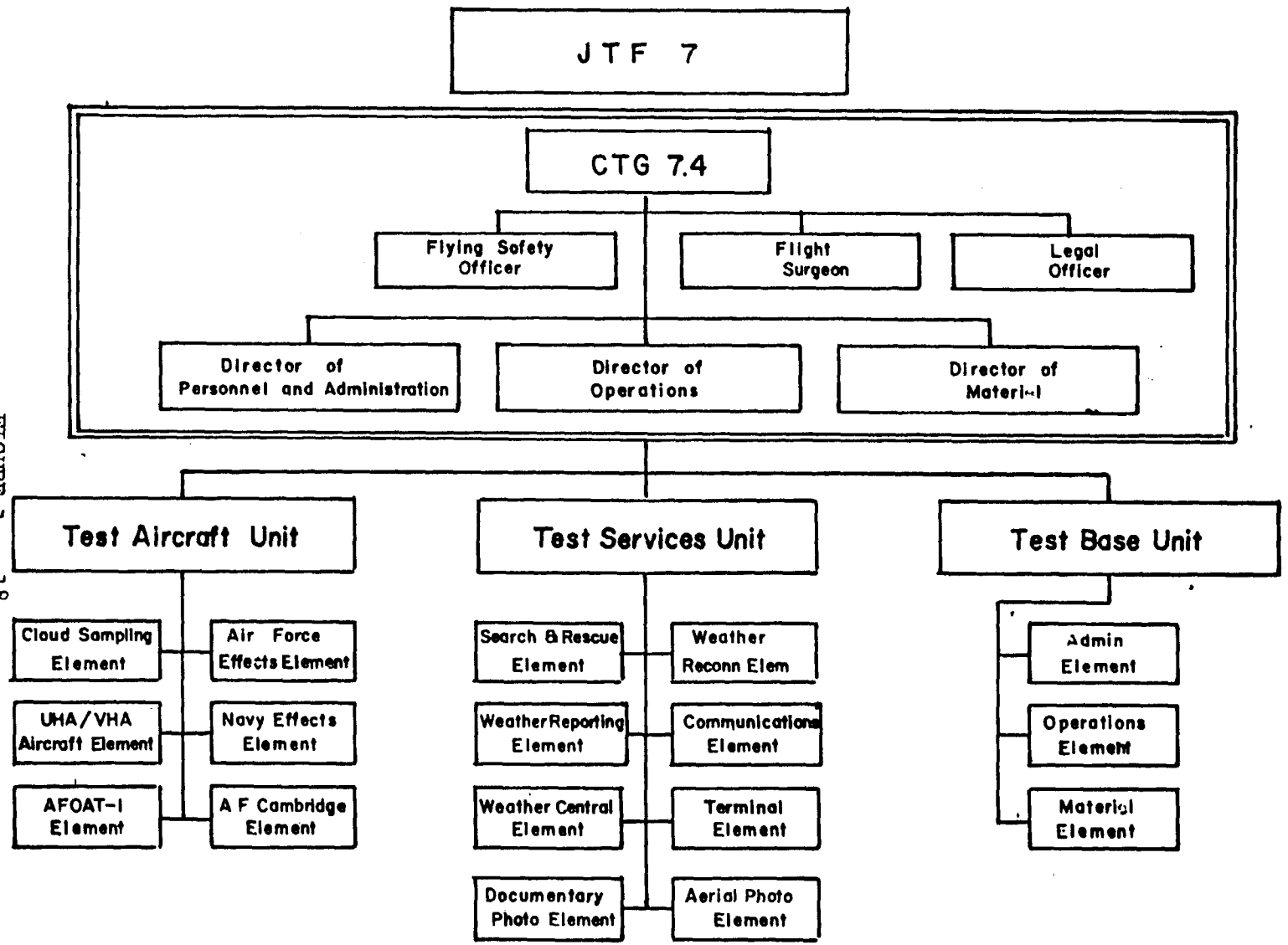

FIGURE 1

During riod when Task Group 7.4 was operating at Kirtland Air Force Base, assistance was provided by the Staff Judge Advocate of the Air Force Special Weapons Center. Arrangements were made with the Commander Pacific Air Forces to provide legal assistance when needed at Eniwetok by placing a qualified officer of his staff on TDY with the Task Group. It proved necessary to request such assistance on three occasions during the on-site phase of the operation.

The Test Aircraft Unit included the data and sample collection aircraft. Its commander was formerly the Deputy Commander of the 4950th Test Group. Therefore, he well understood the problems connected with flying aircraft in the vicinity of nuclear detonations and through nuclear clouds. His deputy was the Commander of the 4926th Test Squadron (Sampling), one of the units assigned to the 4950th Test Group. This latter officer and his unit were experienced, through participation in previous operations, with all aspects of nuclear cloud sampling. The remaining Elements assigned to the Test Aircraft Unit were provided by various Air Force and Navy commands and came under our operational control when they arrived at the Eniwetok Proving Ground.

The Test Services Unit was manned and organized by the Military Air Transport Service to provide normal MATS services to the Joint Task Force. Its commander was an officer with experience in many phases of MATS operations. Coincident with the arrival of the Commander Test Services Unit in the forward area he assumed command responsibility for all MATS units based in the Proving Ground.

The Test Base Unit, whose task was to provide air base facilities and local airlift, had as its nucleus the 4951st Support Squadron (Test), and a detachment of the 24th Helicopter Squadron, PACAF, whose permanent homes are at Eniwetok. These units were augmented as needed to meet the test requirements by their parent commands, the 4950th Test Group and PACAF respectively.

In addition it was necessary to request all participating units to make a pro-rata contribution of additional personnel needed to augment the field maintenance shops.

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Chapter 4 - Planning and Buildup

Planning for Task Group 7.4 participation in Operation HARDTACK commenced in late 1956 coincident with the roll-up of that year's nuclear test at Eniwetok, Operation REDWING, and with the planning for the 1957 continental test, Operation PLUMBBOB. The first efforts were directed at the preparation of aircraft, supply, construction, transportation, and budget requirements. These studies led to the development of the data which was presented at the Joint Task Force SEVEN planning conference in February 1957 as being our needs for the conduct of our test mission. By mid-1957 a Schedule of Events and a Communications Plan had been published and our officer and airmen personnel requisitions had been forwarded to higher headquarters for action. As has been mentioned previously, the activation of the various Task Group 7.4 agencies occurred early in the month of October 1957. Immediately thereafter the Task Group held its Logistics Planning Conference which brought the test participants together with representatives of the various Air Materiel Areas and the Task Group Materiel staff for the purpose of outlining requirements and the steps necessary toward meeting those needs. Meanwhile, the Task Group staff published its first planning directive outlining the general operational concepts, undertook rehabilitation of the air control equipment, the AN/USQ 12, arranged for the modification of additional sampling aircraft, and prepared supplemental budgets necessary to reflect the changing requirements. By the end of the year the Operations Plan and a draft of the Movement Directive had been completed and the Commander and his deputy had completed staff visits to the forward area. One of the principal purposes of these visits was to make mutually satisfactory arrangements with the Army Task Group, 7.2, for the support they would provide during the operational period.

In early 1958, the Task Group staff directed its efforts to the preparation of detailed plans necessary for carrying out each facet of the mission. An advance echelon led by the Deputy Commander arrived at Eniwetok during the first week in February to monitor and expedite completion of the construction program, establishment of weather island stations and off-island sites, and preparation of base facilities for incoming units.

Chapter 5 - Operational Phase

Operation HARDTACK involved the detonation of some 35 nuclear devices. Of these, 11 were detonated at Eniwetok, 22 at Bikini Atoll, and two at Johnston Island. On four occasions two detonations occurred the same day and 17 occurred on successive days. A total of 257 sorties were flown in connection with the operation. The organizational structure and the resources made available to Task Group 7.4 proved adequate to meet its mission committments. Five of the events: the two underwater shots, WAHOO and UMBRELLA, and the three high altitude shots, YUCCA, TEAK and ORANGE, gave rise to some new operational problems but in each instance we were able to resolve these problems and perform the required missions.

The command arrangements in the forward area were varied depending on location of events and operational requirements. The first event was YUCCA, the high altitude balloon shot conducted at Bikini Atoll. This event imposed some unusually stringent command and operational problems. The Task Group Commander exercised command of the air operation from the Air Operations Center (AOC) in the USS BOXER. His deputy was responsible for the dispatch and recovery of test aircraft from Eniwetok. He used the Air Operations Center at FRED Island, Eniwetok Atoll, as his command post. On subsequent Bikini events, the Bikini Air Operations Center was under the direct on-the spot supervision of either the Task Group Commander or one of his senior officers, and the Task Group Commander exercised overall control from the FRED AOC. The Commander of the Test Aircraft Unit was responsible for the pre and post-mission operation of aircraft on the air base. He exercised this control from a radio-equipped vehicle on the ramp itself. The Flying safety Officer or a senior operations officer manned the tower during missions to assist in expediting landings and takeoffs.

On WAHOO and UMBRELLA, when there were especially stringent local aircraft requirements, a senior staff officer was also stationed at the central dispatch office controlling the helicopter and liaison aircraft.

Throughout the operation a rear echelon was maintained at Kirtland Air Force Base. Its function was to monitor and to assist the actions being taken at that Base in the support of the operation. In addition, it provided an agency through which the dependents could obtain information and assistance, a function which contributed materially to the morale and welfare of the families of the men participating in the operation.

When it was decided to conduct the high altitude shots, TEAK and ORANGE at Johnston Island rather than at Bikini, we placed one of our operations staff officers on detached service with Joint Task Force SEVEN to serve as Base Operations Officer at Johnston Island and later established command posts at both Johnston Island and Hickam Air Force Base, Honolulu. Immediate control of the air operations in connection with the two events was exercised by the Task Group Commander from the AOC in the USS BOXER (a destroyer was used to provide AOC facilities when they were required at Bikini during the absence of the BOXER). Aircraft participating in NEWSREEL operated from Hickam Air Force Base and Barbers Point Naval Air Station in Hawaii. Operational control of these aircraft during the takeoff, enroute and landing phase of the missions was exercised by the Deputy Commander, Task Group 7.4, from a command post located in the Honolulu Air Traffic Center. The Commander of the Test Services Unit served as the acting commander at the Eniwetok Proving Ground while the Task Group Commander and his deputy were away participating in NEWSREEL. Task Group was required to provide planning assistance and aircraft for Operation LITTLE DAVID, a nuclear rocket test to be conducted at Eglin Air Force Base during August.

Planning for this support was done by the rear echelon with the assistance of several officers of the 4926th Test Squadron (Sampling) who were returned early for that purpose.

Many command functions in connection with Task Group 7.4 operations were normal to those experienced by any commander at Wing level, but there were a few problems which merit special comment.

In addition to those stations in the Eniwetok Proving Ground itself, Task Group 7.4 manned several other locations for the purpose of making and reporting weather observations. In several cases personnel of other task groups were also resident on these islands. The Task Group Commander having the senior individual permanently assigned was instructed to appoint that individual as the personal representative of the CJTF SEVEN to be responsible for maintaining discipline among JTF-7 personnel and establishing correct relations between the JTF-7 personnel and the local inhabitants. Task Group 7.4 manned eight weather islands and was responsible for the administration on four of these. Frequent visits were made to the camps. There were no untoward incidents during the operation; but in two cases personnel who had indicated some lack of stability were replaced to forestall any possible breach of discipline.

A new arrangement for the dispatch and control of liaison aircraft was evolved for operation HARDTACK. In the past it had been the practice to provide a previously agreed upon number of aircraft to the Task Group 7.5 dispatcher at ELMER (Parry) Island each day. In turn, he re-dispatched these airplanes as they were needed to meet the requirements of the scientific and contruction personnel of Task Groups 7.1 and 7.5 respectively. Another group of aircraft was retained on the strip at FRED to meet all other JTF SEVEN requirements and to serve as spare aircraft. During HARDTACK the two dispatch functions were consolidated into a single office known as the Eniwetok Airlift Operations

Office, located at FRED. This office controlled the movement of aircraft through the use of two-way radio with the aircraft and telephone and radio circuits with each of the passenger and cargo agents on all the up-atoll airstrips. The EAOO knew the precise location and status of each aircraft at all times and was in a position to give the best feasible service to all customers.

During the operation the long range construction program at Eniwetok was reviewed and amended to reflect the projected needs of Task Group 7.4 for future test operations in the EPG. A similar review was conducted of the unit manning documents of each of the units assigned to the 4950th Test Group (Nuclear) in order that future manning documents would reflect the experience gained during HARDTACK.

The support rendered to Task Group 7.4 by other task groups was outstanding. Although the construction program lagged behind schedule prior to the operation, most of the delays were beyond the control of Task Group 7.5 and all of the essential facilities were completed prior to the beginning of the operational phase itself. The housekeeping support required of the Army's Task Group 7.2 was entirely adequate in every respect.

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Chapter 6 - Flying Safety

Throughout the exercise the Task Group Commander and other supervisory personnel devoted much attention to flying safety. During the period when accidents in the Eniwetok Proving Grounds were chargeable to the Task Group (21 February to 18 August 1958) a total of 18307 flying hours were achieved and four major accidents were experienced for a rate of 21.3. It is worthy of note that three of the four accidents involved helicopters. Exclusive of helicopters, the accident rate was only 6.8 per 100,000 hours of flying time. The attached chart shows our accident rate on a cumulative basis.

Our four accidents involved an L-20 and three helicopters as follows:

a. On the morning of 7 April the pilot of a L-20 took off with a near empty fuel tank. The engine died soon after takeoff and the pilot stalled the aircraft onto the reef. Major damage to the aircraft resulted, but there was no injury to personnel.

b. On the evening of 7 April the pilot of a H-19B aircraft, in an attempt to maintain VFR flight during a heavy rain shower, lost control of his aircraft and crashed in the lagoon. A civilian passenger was drowned in this accident; the other four people aboard survived without major injury.

c. On 10 July 1958 an H-21B aircraft crashed into the ocean when the pilot experienced some kind of materiel failure in the control system. The failure could not be determined precisely as the aircraft sank in very deep water and could not be recovered. All people aboard the aircraft escaped without injury.

d. On 14 August 1958 an H-21B aircraft crashed near Yvonne in 35 feet of water approximately 1500 feet short of the runway. No passengers were aboard. No one was injured. The cause of the accident was the blow out of the master cylinder which severed the ignition harness of the engine.

Our Group Flying Safety Council was established as soon as the operation was started. It met weekly throughout the exercise. Under its supervision, vigorous flying safety programs were conducted by all Units and Elements. The program began with flying safety survey of all Units and Elements with continuous follow-up action throughout the operational period.

Many unusual features of the flying operation in the Eniwetok Proving Grounds made flying safety a particular important subject. Some of these were:

a. Airfield construction at FRED was not completed before we started to operate. Consequently we had to operate while painting and grading, installation of lights, etc, took place.

b. There were roads across the runway at two points.

c. The parking and taxi areas were cramped.

d. The many diverse type of aircraft operating off the single runway required the coordination of several different types of traffic patterns.

e. SA-16's landed at lagoons where in some cases the markings and buoys were marginal.

f. There were many flights in the area of nuclear detonations.

In addition to the four accidents which we experienced, many incidents occurred which could have led to accidents. Two examples are:

a. A B-57D aircraft experienced failure of the nose gear hydraulic actuator. The runway was foamed and the aircraft landed in the foam. The nose gear collapsed with only slight damage to the aircraft. It was later discovered that many of the nose gear actuators on our aircraft were defective. The aircraft were grounded until the actuators could be tested and all the defective ones replaced.

b. A life raft inflated and ejected from A WB-50 in flight. It struck the left horizontal stablizer and did such damage as to reduce the normal control

available to pilot. The aircraft landed safety at Wake.

Although the Task Group 7.4, Provisional, accident rate of 21.3 was in fact higher than the Air Force wide accident rate in 1957 of 13.6, we feel that our great efforts in the flying safety area were not in vain.

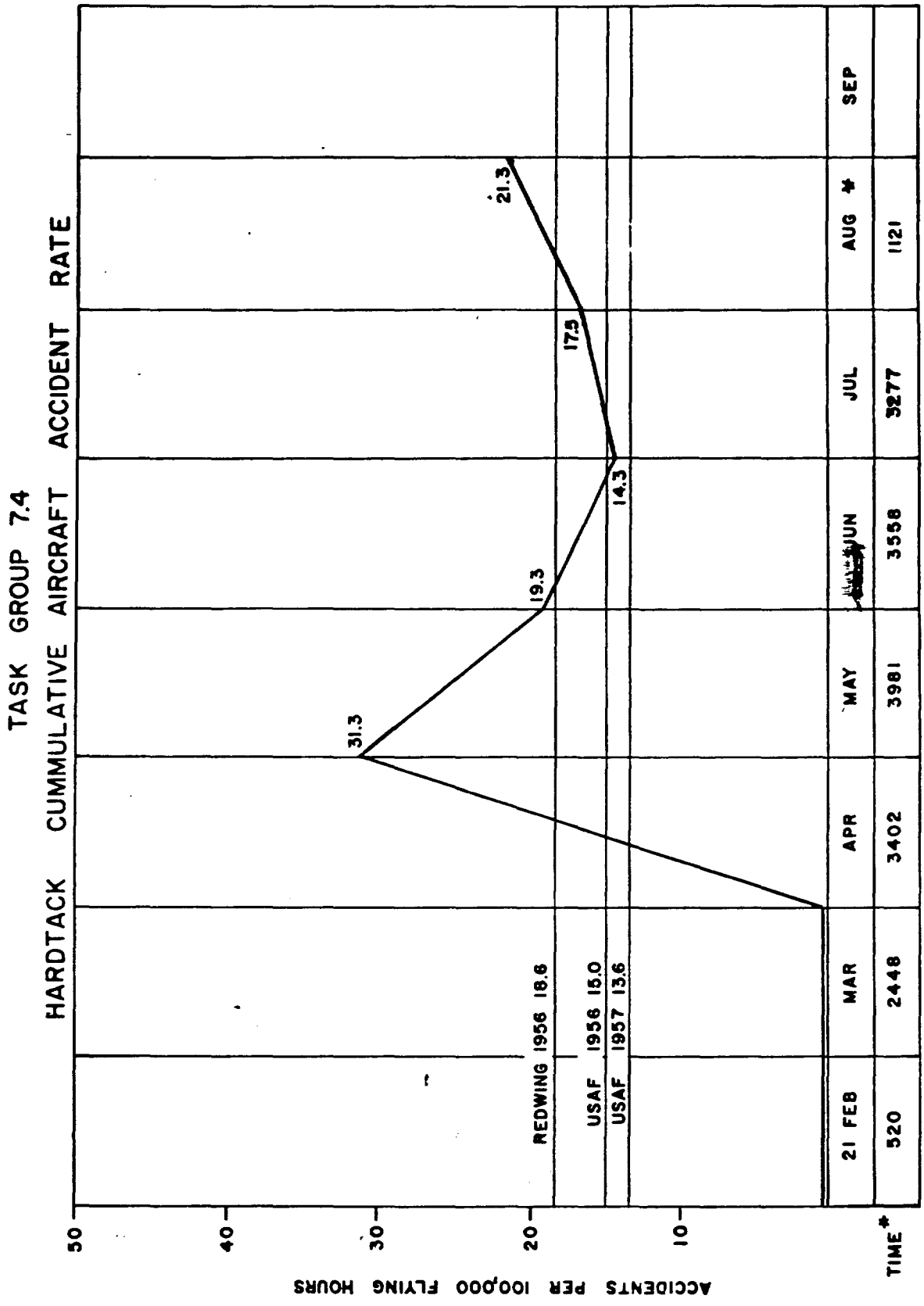

FIGURE 2

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Chapter 7 - Medical

Task Group 7.2 was responsible for providing medical attention to Task Group 7.4 personnel and was manned with sufficient doctors to do this job well. By and large the command remained extremely healthful throughout the exercise. We had no epidemics. The majority of the cases treated fell into one of three groups, i. e.

a. Superficial skin infections.

b. Upper respiratory infections.

c. Minor injuries.

Medical services to Task Group 7.4 personnel on outlying islands were provided by the assignment to each of a medical technician, plus occasional visits by Task Group 7.2 doctors and the Task Group 7.4 Flight Surgeon. Because we had a large number of flying personnel engaged in diversified flying activities, Task Group 7.4 had assigned to it a Flight Surgeon from 4 March 1958 to the completion of the exercise. He was provided with an office in one of our operations buildings and was very effective in taking care of medical problems for our flying personnel. His activities were somewhat handicapped by lack of medical technicians; we recommend that medical technicians be provided for future operations of this nature.

From time to time during the exercise medical services were provided in emergency situations on outlying islands where we maintained detachments. These services were provided to both military and indigenous personnel and included diagnosis, treatment and/or evacuation. Outstanding among these events were:

a. Evacuation of two cases of acute appendicitis.

b. Evacuation of a suspected case of smallpox.

c. Evacuation of a case of multiple fractures in a boy who had fallen from a tree.

d. Evacuation of a case with a huge abscess in his right flank.

PART III

PERSONNEL AND ADMINISTRATION

Chapter 1 - Introduction and Summary

To describe the personnel and administrative activities of Task Group 7.4, it is necessary to devote some preliminary remarks to the organization of the 4950th Test Group (Nuclear) which isthe nucleus for Task Group 7.4. Unlike many components of Task Group 7.4, the 4950th is not a transitory organization established only for participation in Operation HARDTACK. It is a permanent organization that is in being for the purpose of planning and directing Air Force participation in nuclear test operations both in Nevada and the Eniwetok Proving Grounds.

In addition to Headquarters, 4950th Test Group (Nuclear) which becomes Headquarters Task Group 7.4 for overseas tests, there are four squadron in the 4950th. The 4935th Air Base Squadron at Indian Springs Air Force Base, Nevada, is the primary support organization for all continental tests and has no role in the overseas operations. The 4951st Support Squadron at Eniwetok provides Air Base Support in the Eniwetok Proving Grounds. The 4926th Test Squadron (Sampling) is permantly stationed at Kirtland Air Force Base but spends a good part of each year TDY either at Nevada or the Eniwetok Proving Grounds, depending on where the tests are

being condu The mission of the 4926th is that of collecting particulate and gaseous samples by flying specially equipped B-57 aircraft through nuclear clouds. This squadron becomes the nucleus of the Test Aircraft Unit that is formed at each site. The remaining squadron, the 4952nd Support Squadron, is made up of military specialists and technicians who are sent TDY to either Nevada or Eniwetok to augment these support activities during test operations. The 4952nd has a normal strength of about 250 airmen and 12 officers. Its strength and composition has to be changed after each test; however, because the augmentation required at Eniwetok where some items of base support are the responsibility of the Army (Task Group 7.2) is much different than that required at Indian Springs Air Force Base where the entire base support is a 4950th responsibility.

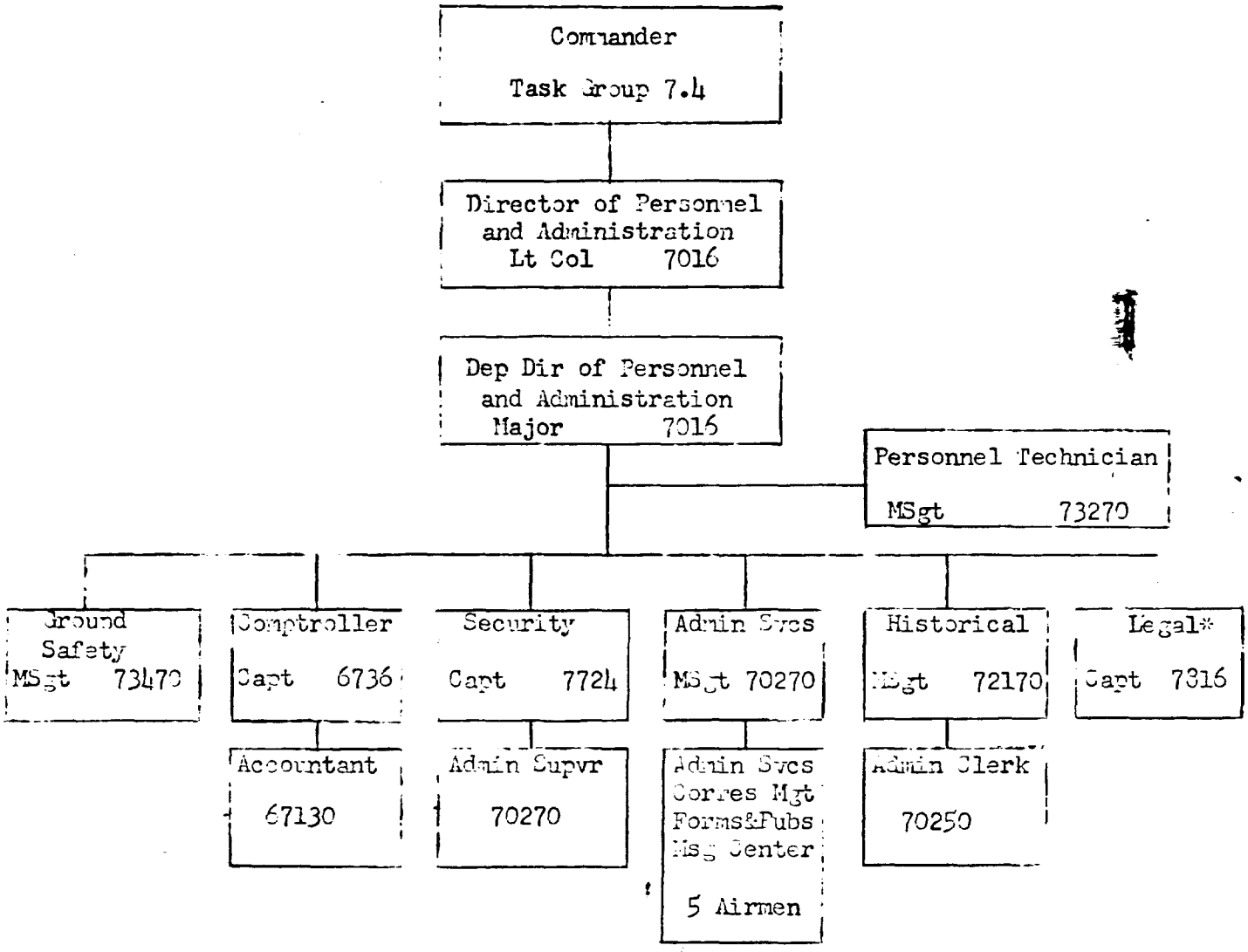
During the Summer and Fall of 1957 when the 4950th and its subordinate organizations were participating in Operation PLUMBOB in Nevada, the Directorate of Personnel and Administration was additionally engaged in revising the Unit Manning Document of the 4952nd Support Squadron and requisitioning personnel necessary to augment and support the Test Base Unit (4951st Support Squadron) in the Eniwetok Proving Grounds during Operation HARDTACK. It was necessary to compute the overall strength of the Task Group and to predict the personnel support requirements that were not at the time firmly established. Conferences and meetings were held with individuals who were later to form the Test Services Unit, Test Aircraft Unit and the Test Base Unit. Strength and billeting figures of their respective organizations were discussed. Emphasis was placed on attempting to get the job done with a minimum of personnel. Estimates were obtained as to length of time that various

units would require to move to, set up, and become operational in the Eniwetok Proving Grounds. Based on these figures, it was possible to determine movement dates for the various organizations.

With the establishment of firm personnel figures and movement dates it was possible to revise and make more accurate the preliminary budget estimates that were submitted early in 1957. Further, it was then possible for the Test Base Unit to predict with greater accuracy when they could require the movement of augmentation personnel from the 4952nd Support Squadron to the EPG. An attempt was made to predict with the most accuracy possible the exact dates that personnel would be required in the EPG. This was particularly necessary because of an indication in the Summer of 1957 of a decision by the Comptroller General that TDY in excess of 180 days in future cases might be regarded by his office as unwarranted. By mutual agreement with the various services, it came about later that Headquarters Joint Task Force SEVEN was granted authority to approve extensions of TDY beyond 180 days for those persons for whom replacements were not available and extension of TDY was essential. Although we were not at the time able to foresee all the complications the 180 day limitation was to cause during the operation, it was known that our biggest personnel problem area was going to be in the manning of the Supply area. Not only were supply personnel required in December, seven (7) months before the expected termination of the operation; they would also be required throughout the operation and for two months thereafter during the roll-up phase. Anticipating this problem, arrangements were made to replace the earliest augmentation personnel sent to the EPG, and to stagger the movement of the remainder so that a sizable force would be

available from December through most of August. The many complications centering around the 120 day TDY restriction were intensified in June when the decision was made to extend the operation through August.

The organization of the Directorate of Personnel and Administration for Task Group 7.4 was as follows:



* This function was performed by an officer from Hq PACAF on a TDY basis as required.

It will be noted that no personnel record-keeping function was established at Group Headquarters. The records keeping and basic personnel function was established in TSU for all MATS organizations and in TBU, which performed a consolidated function for TAU and TBU elements. This type of organization left the small Group Personnel and Administration staff free to do necessary planning, to promulgate policy and to publish regulations as well as to supervise the Group Message Center, the security program, protocol activities, the preparation of the history, and ground safety and comptroller activities. In general, the organization was satisfactory and no major problems were encountered.

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Chapter 2 - Personnel

Task Group 7.4 had the responsibility for the planning and establishment of personnel activities to support 314 officers and 1915 airmen during Operation HARDTACK. The attached charts (Figures 1 thru 3) reflect the flow of personnel to the EPG during the build-up phase and their phasing out as the operation neared completion. This movement of personnel to and from the EPG was accomplished in accordance with pre-determined schedules based on known mission requirements during the planning and operational phases of HARDTACK.

In addition to determination of the total numbers and types of personnel that would be required to execute the Task Group mission, it was necessary to provide the best possible personnel services while keeping numbers of personnel specialists to a minimum. Consolidated Personnel Sections were established in Test Services Unit(for all their attached personnel) and in Test Base Unit (for TBU, TAU and Headquarters personnel), providing records maintenance, classification and assignment and pay and personal affairs services. Also, Test Base Unit, as the Base support organization, was responsible for conduct of a Personnel Services (Recreation) program and operation of a Personnel Classification Board for all Task Group 7.4 personnel.

The Personnel Services Section coordinated with Task Group 7.2 on scheduling of Inter-Task Group sports competitions, and maintained a Special Services Supply, from which individuals could draw almost every type of recreational and athletic equipment. In all, more than $2,000 in recreational and athletic gear was purchased for use by Task Group personnel.

The personnel Classification Board convened by Test Base Unit met on four (4) occasions, considering 18 cases involving Task Group personnel.

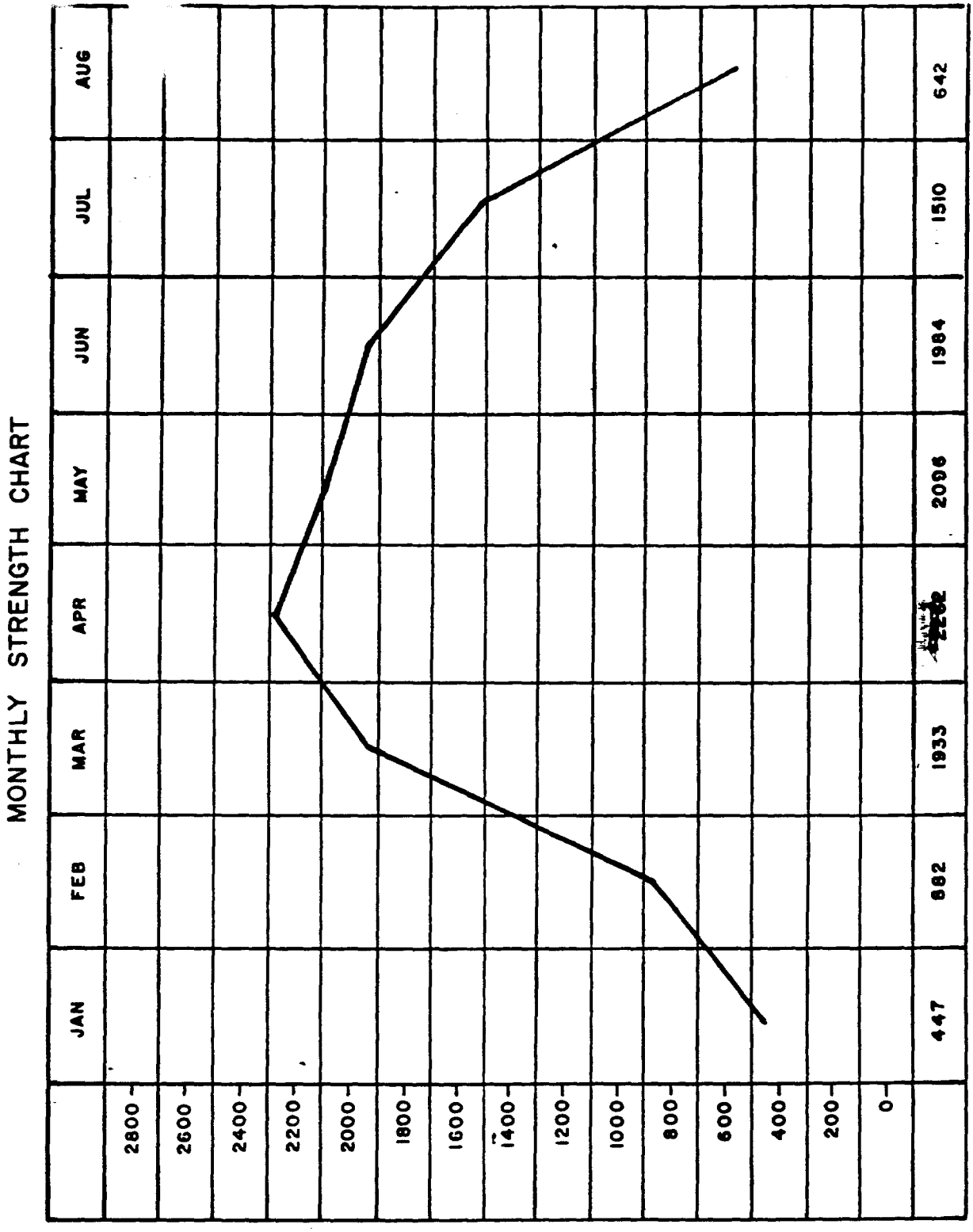

FIGURE 1

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PEAK MONTHLY STRENGTH REPORT

UNIT/ELEMENT	JAN	FEB	MAR	APR	MAY	JUN	JUL	* AUG
HQ T.G. 7.4		25	77	88	76	74	56	6
HQ T.B.U.	314	548	662	682	643	610	538	500
HQ T.S.U.	16	16	17	17	16	16	12	1
SAR ELEM		6	135	132	129	130	117	
WX REPTG ELEM		33	151	146	149	147	125	
WX RECC ELEM		75	336	368	369	368	231	
COMM ELEM	106	163	300	318	272	269	206	85
WX CENTRAL ELEM			20	20	20	20	14	
MATS TERM ELEM	11	11	34	36	41	42	44	47
AERIAL PHOTO ELEM		1	62	74	73	34	14	
DOC PHOTO ELEM		4	19	17	14	12	9	
TOTAL T.S.U.	133	309	1074	1130	1083	1038	775	133
HQ T.A.U.			1	1	1	1	1	
CLOUD SAMPLING ELEM			22	236	235	238	136	
AF EFFECTS ELEM			1	21	21	21		
AFOAT-1 ELEM			5	10	10	2	4	3
NAVY EFFECTS ELEM			31	37	31			
IONOSPHERE ELEM			8					
VHA/UHA ELEM			58	57				
TOTAL T.A.U.			120	362	298	141		3
T.G. 7.4 GRAND TOTALS	447	882	1933	2262	2096	1984	1510	642

* Represents 15 Aug. Strength.

FIGURE 2
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MONTHLY ISLAND STRENGTH

ISLAND	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
ENIWETOK	384	743	1629	1952	1793	1697	1290	613
PARRY	38	82	100	100	91	85	47	79
BIKINI	15	34	36	34	30	33	37	18
TARAWA			23	24	24	23	19	
KUSAIE		6	28	28	29	27	20	
UTIRIK			24	24	22	20	17	
RONGELAP			9	9	8	8	3	
WOTHO			9	9	8	7	3	
KAPINGAMARANGI			23	24	22	21	19	
JAPTAN	8		5	5	5	4	2	2
TRUK		5	6	8	8	7	9	
UJELANG			10	5	7	7	3	
KWAJLEIN		10	8	10	7	7		
NAURU	2	2	22	26	25	24	10	
JOHNSTON					9	10	21	
BRUCE					3			
HAWAII				3	4	5	9	
JAPAN				1	1	1		
TOTALS	447	882	1933	2262	2096	1984	1510	642

FIGURE 3

As stated in the preceding chapter, the 4950th Test Group (Nuclear) had a dual responsibility for operation as a Group under the Air Force Special Weapons Center and as Task Group 7.4 under Joint Task Force SEVEN. During the initial planning stages of Operation HARDTACK, the 4950th was participating in a continental test series at the Nevada Test Site. Determination of personnel requirements and procurement of personnel for duty in the EPG had to be accomplished in addition to the normal workload incident to a continental test operation.

Personnel requirements within the Test Services Unit were established by Headquarters, MATS, on the basis of planning information made available to them relative to the scope of their participation in Operation HARDTACK. Headquarters MATS assumed full responsibility for the manning of all Test Services Unit elements from within MATS resources. Those Test Aircraft Unit and Test Base Unit elements composed of personnel from other than Air Force Special Weapons Center resources were also manned by the appropriate Major Air Command.

In order to determine and better estimate the requirements for the augmentation force during Operation HARDTACK, it was necessary to study the strength figures that applied to Operation REDWING in 1956. This was somewhat complicated by the changes that had taken place in the organization of the permanent Eniwetok Air Base Squadron. In 1956, during Operation REDWING, it was a large organization with a permanent strength of over 400 men. During Operation HARDTACK it was a much smaller organization that had to be augmented by TDY personnel from the 4952nd Support Squadron to meet its increased requirements during the test operation.

On 14 March 1957, the officer manning requirements for HARDTACK were established and a requisition was submitted to Air Research and Development Command. This requisition was based on mission requirements only. By May

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when the Unit Manning Documents were written, insufficient officer space allocations were available, but requisitions remained valid as originally approved. This resulted in assignment of some officers on an overage basis but no major problems arose as a result of such assignments.

Concurrent with finalization of airmen manning requirements in May 1957, a requisition was submitted, listing skills required and desired in-place dates. This included those 4950th positions which are manned only during an overseas test period (i.e. MCU, Liaison Supply, etc.). For the most part, personnel requested were in place per established schedule.

During the course of the Task Group 7.4 Logistics Conference in October 1957, brief mention was made of the probable future need for placing levies upon units participating in Operation HARDTACK for personnel to augment the field maintenance activities, and to support supply rollup operations. Such levies would only be for people who could not be provided from within Task Group 7.4 resources.

In December 1957, a review of maintenance man hour requirements, as submitted by each element in Task Group 7.4 revealed that approximately 162 specialists in various maintenance areas would be needed in the EGP over and above those which could be provided from within the 4950th. On the basis of these requirements, levies were placed on Headquarters MATS, CINCSAC, AFSWC and other agencies, for personnel to report to the Eniwetok Proving Grounds 1 March 1958. Some difficulty was encountered in implementation of this program, and it is believed that earlier identification of maintenance personnel requirements would be desirable in future test planning.

Personnel for the supply roll-up were procured in the same manner as were the maintenance specialists, reporting 1 July 1958.

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Movement of Task Group personnel to the Eniwetok Proving Grounds was effected in an orderly manner, following a pre-set schedule for movement of each element. The Air Force Movement Directive, published in January, 1958, contained a detailed breakdown of the Task Group, listing assigned shipment numbers and readiness dates for each increment of personnel departing the ZI for the Eniwetok Proving Grounds. Each Major Air Command, followed by issuing Movement Orders directing movement of their personnel.

In mid-June, when it became apparent that the operation would extend over a longer period of time than had been anticipated, it became necessary to review the manning status of the entire Task Group to determine the need for extension or replacement of personnel in the EPG. We had planned for replacement of 31 augmentation personnel whose TDY tours would of mission necessity be in excess of the 179 day limitation. Extension of the operational period necessitated establishment of a program to insure that a much larger number of people now required for conduct of the operation either (1) be returned to the ZI and replaced by parent organization or (2) extended beyond 179 days under authority granted Joint Task Force SEVEN in the USAF Movement Directive.

The Task Group 7.4 complement established at Johnston Island for operation NEWSREEL amounted to only six officers and one airman. The bulk of Task Group 7.4 personnel engaged in NEWSREEL were based at Hickam Air Force Base and Barbers Point Naval Air Station. Personnel at these two locations totalled approximately 82 officers and 302 enlisted personnel.

Chapter 3 - Administrative Services

The Task Group 7.4 Administrative Services Activity included a Message Center and Courier Service, a Correspondence Management acitivity, an orders issuing agency, a publications distribution point, and a muster and safety reporting activity. During Operation HARDTACK, 79 Task Group directives were published, and 50 Special Orders and/or indorsements thereto were issued, the latter authorizing emergency and morale leaves and TDY from EPG.

During the operation, a problem area was encountered involving the inadequacy of reproduction facilities which were established in the Test Base Unit. Necessary equipment was on hand, but trained operators were not available, causing some difficulty in getting reproduction service as quickly as desired. Future planning will include a complete reproduction facility, with trained operators as a part of the Task Group Headquarters.

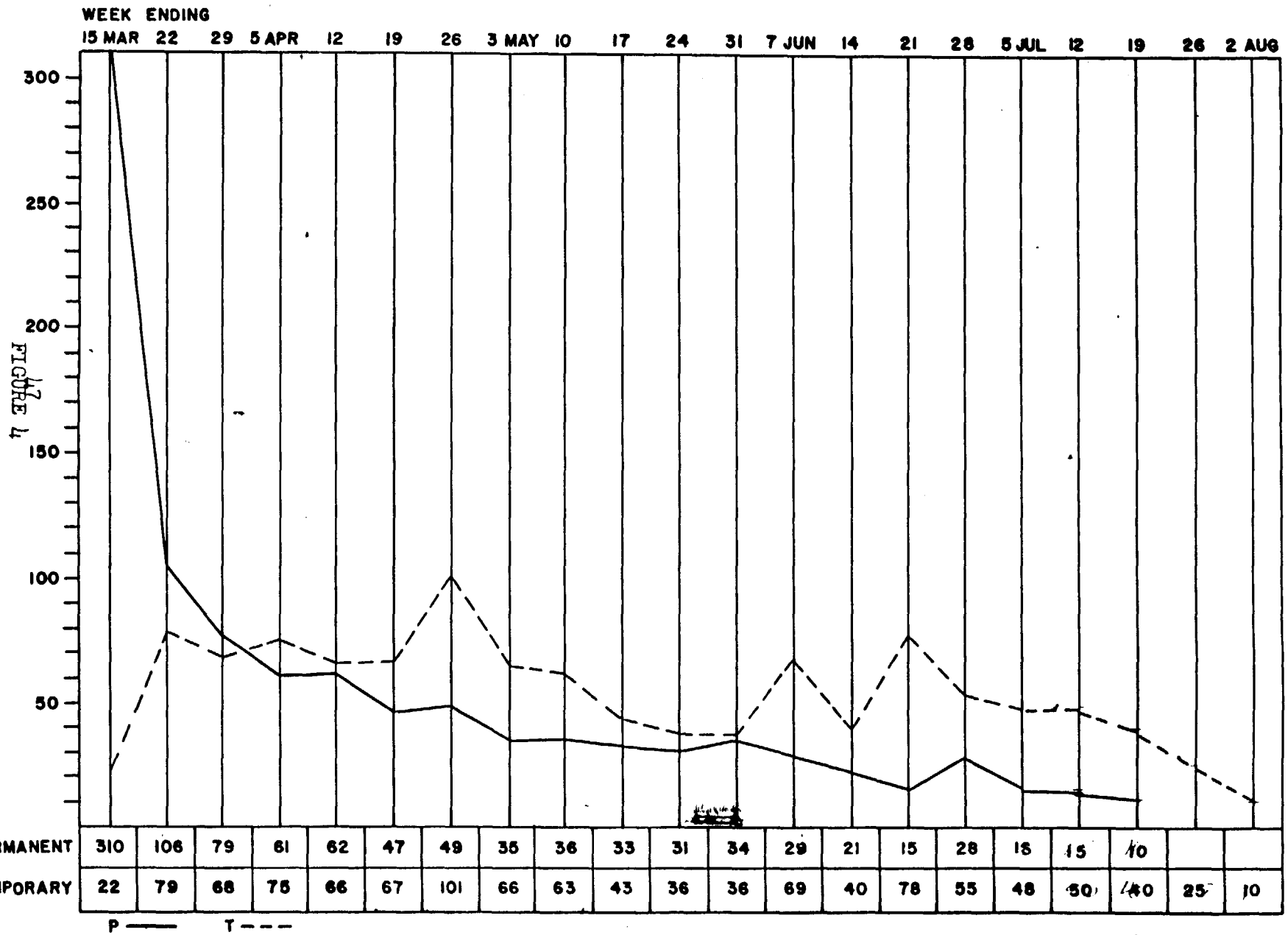
Chapter 4 - Security

During Operation HARDTACK, only two security violations were reported by Task Group 7.4 elements. These involved inadequate safe security in which no compromise of classified matter was concerned. This record was achieved primarily through the cooperation of all Task Group 7.4 agencies in requiring all personnel to familiarize themselves thoroughly with Air Force, Joint Task Force SEVEN and Task Group directives regarding proper security discipline.

During the planning stages of the Operation, necessary Task Group Security Regulations were published and distributed for the purpose of providing guidance to all participants prior to their departure for the [redacted]. Additional guidance in the form of [redacted]CP's, letters and supplements to directives was designed to insure that necessary security information was available to each echelon. The security criteria were forwarded to the Task Group elements sixty days prior to the commencement of the operational period.

The Air Police Section of the Test Base Unit was responsible for the badging of all Task Group personnel. During the operational period, 1017 permanent Operation HARDTACK badges were issued to Task Group personnel. 1137 temporary badges were also issued for those personnel requiring infrequent access to controlled areas. (Reference figure 4)

NUMBER OF SECURITY BADGES ISSUED BY TASK GROUP 7.4



	15 MAR	22	29	5 APR	12	19	26	3 MAY	10	17	24	31	7 JUN	14	21	28	5 JUL	12	19	26	2 AUG
PERMANENT	310	106	79	61	62	47	49	35	36	33	31	34	29	21	15	28	18	15	10		
TEMPORARY	22	79	68	75	66	67	101	66	63	43	36	36	69	40	78	55	48	50	40	25	10

Chapter 5 - Comptroller

During the period 1 January to 31 August 1958, Task Group 7.4 expended $1,300,000.00 in direct support of Operation HARDTACK. This money was spent for travel, transportation, communications, overhead and Operations and Logistics Support. Availability of these funds was derived from two major sources; (1) Normal Service Operating Expenses which were funded by the services, and (2) Extra Military Expenses which were funded by Joint Task Force SEVEN.

Funding guide lines were established as agreed upon by the Atomic Energy Commission and the Department of Defense. These guide lines were further supplemented by policies issued by the Comptroller, Air Force Special Weapons Center and the Comptroller, Task Group 7.4.

During the operation the Comptroller, Task Group 7.4, remained at Kirtland Air Force Base where the accounting records were maintained. A forward area Comptroller accompanied the Task Group to the Eniwetok Proving Grounds to monitor expenditures of funds and prepare revisions to financial plans as required.

Task Group funds were administered in a different manner from those of a normal Air Force activity, since 86% of the allotted funds were issued to other organizations in the ZI and overseas. These funds were made available by means of Obligation Authorities, 61% of which involved expenditures for travel and per diem of Task Group personnel.

During the planning phase of Operation HARDTACK all units assigned to Task Group 7.4 were asked to submit an estimate of the approximate number of officers, airmen and civilians who would participate in the operation. Upon receipt of this information, the Task Group 7.4 Comptroller prepared the original Financial Plan for Operation HARDTACK, enabling the Task Group to receive funds in sufficient time to facilitate movement of personnel to the Eniwetok Proving Grounds.

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During operation it was necessary to hire native labor at the camps on the various weather islands. Arrangements were made to pay the natives at Kusaie with broken lots of food. At Tarawa and Kapingamarangi, the only other islands where indigenous personnel were hired, payment was made in cash.

To expedite payment of these laborers, it was necessary to establish definite methods of payment in each case.

To effect payment in broken lots of food, the island Magistrate certified to the hours worked and signed for appropriate amounts of food, which was paid on the basis of the current retail value of similiar items in the local store.

In the case of payments made in cash, the Finance Officer at Eniwetok authorized the appointment of a Class "A" agent who would make a monthly trip to each camp site to make payments.

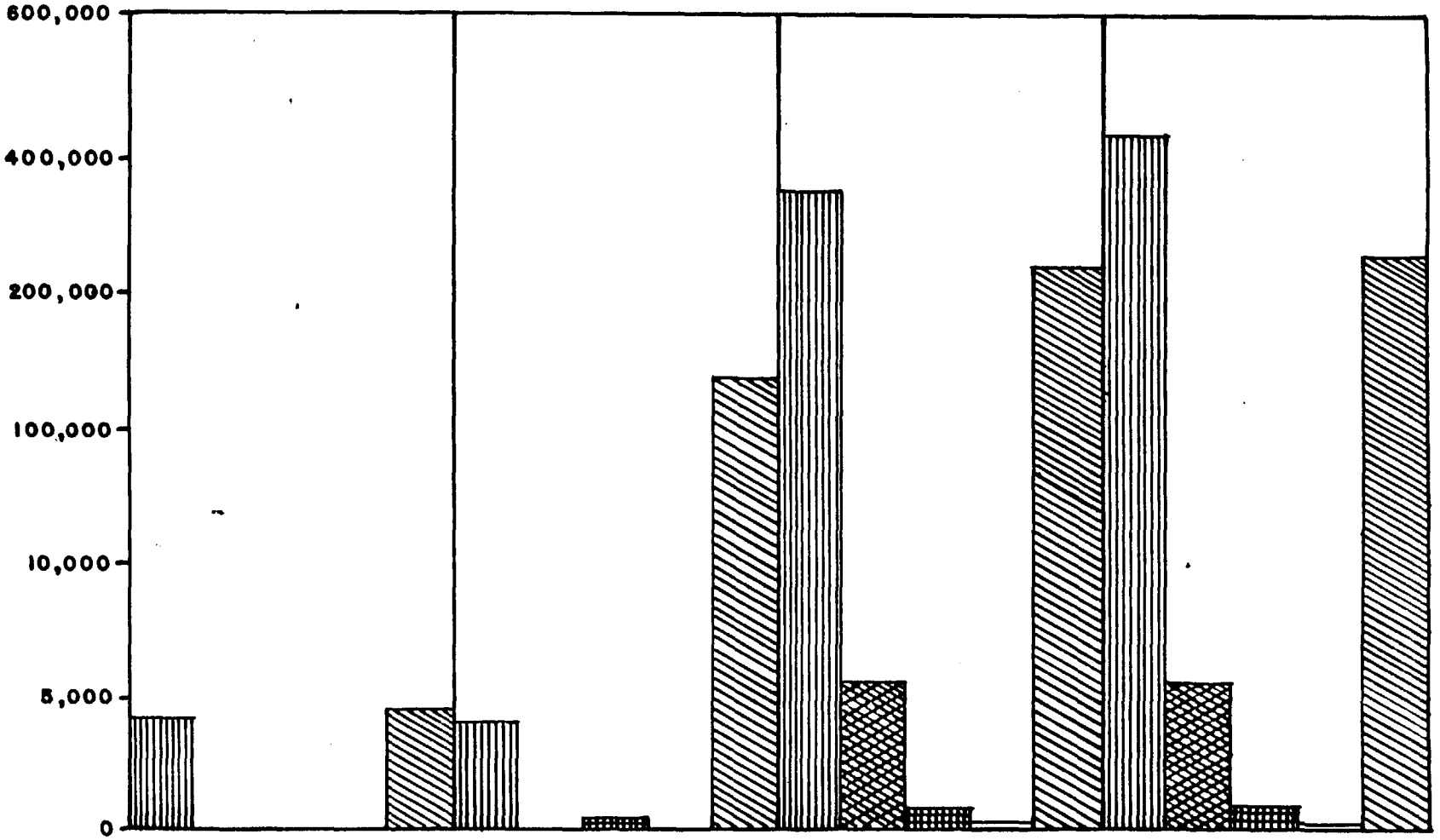
An additional expense was incurred on the island of Nauru, where the Australian authorities asked payment of guard fees to natives who guarded aircraft landing at the Nauru airport. Prompt payment was essential in order to maintain good relations with the Nauru administration; therefore payment was effected expeditiously upon receipt of each bill for such charges.

Two other minor charges were handled in the same manner as the guard fees.

The above procedures were considered satisfactory and it is recommended that similiar procedures be adopted for subsequent tests.

The attached charts indicate funds utilization during Operation HARDTACK.

FY 1958
TASK GROUP 7.4
OBLIGATIONS BY CATEGORY



	1st QUARTER	2nd QUARTER	3rd QUARTER	4th QUARTER
TRAVEL	4265	40,281	376,302	[illegible]
TRANS	0	0	5,507	5,524
COMM	0	152	998	11,224
OVERHEAD	0	0	172	1,426
OPS & LOG SUPPORT	4916	123,329	239,681	339,072

FIGURE 5

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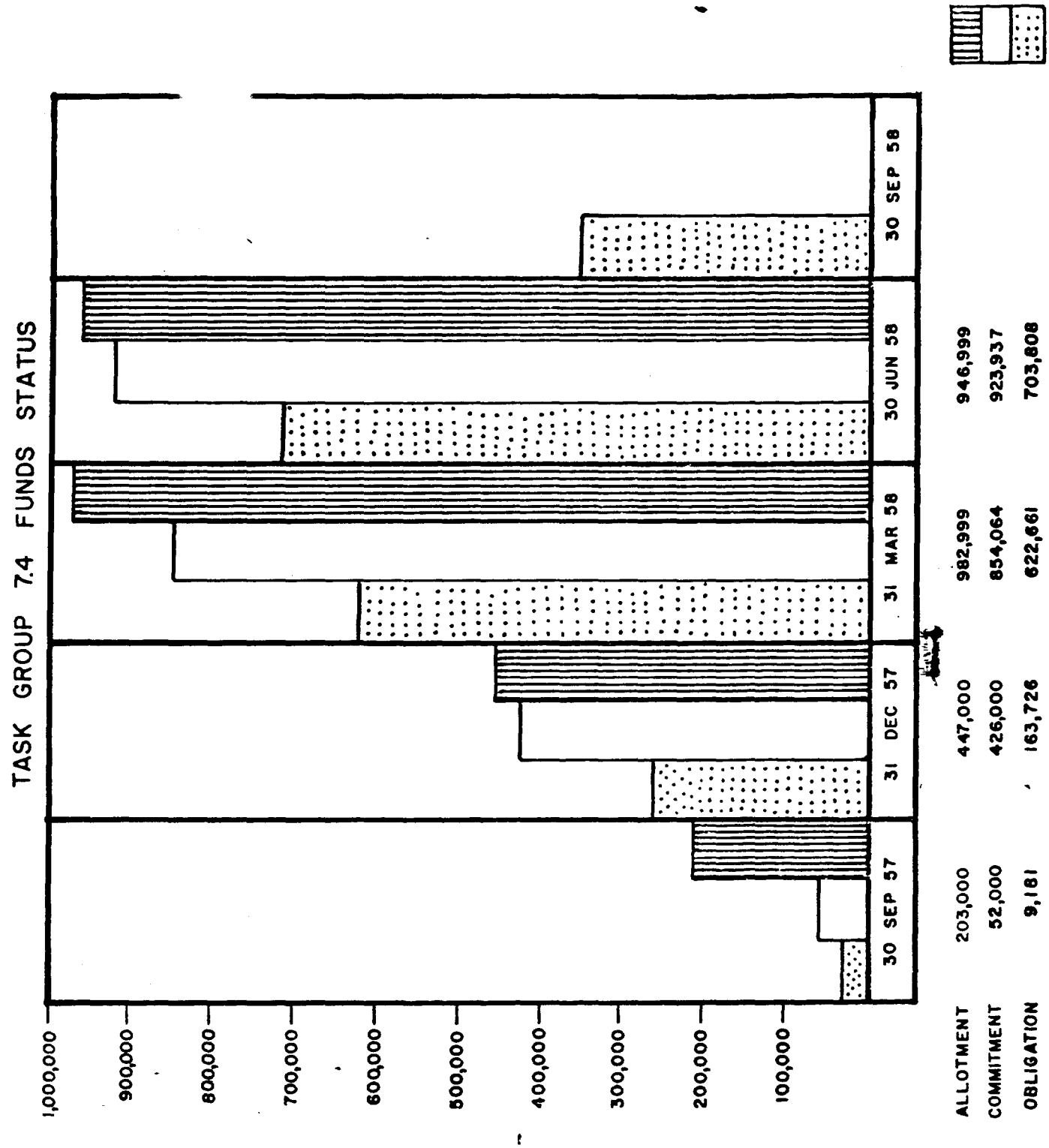

FIGURE 6

Chapter 6 - Ground Safety

Task Group 7.4 Accident experience during Operation HARDTACK was as follows:

1. Personal Injuries:

ORGANIZATION	MINOR INJURIES	DISABLING INJURIES	DOLLAR COST
HEADQUARTERS	3	1	$ 171.00
TEST AIRCRAFT UNIT	8	0	56.00
TEST BASE UNIT	36	1	552.00
TEST SERVICES UNIT	30	6	1800.00
TOTAL	77	8	$2579.00

2. Property Damage:

ORGANIZATION	VEHICLES DAMAGED	AIRCRAFT DAMAGED	EQPMT DAMAGED	DOLLAR COST
HEADQUARTERS	2	0	0	$ 16.00
TEST AIRCRAFT UNIT	0	1	1	23.00
TEST BASE UNIT	4	3	2	3882.00
TEST SERVICES UNIT	2	1	0	80.00
TOTAL	8	5	2	$3994.00

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Minor injuries are those involving the individual's return to duty on the same day on which the accident occurs; disabling injuries are those in which the individual does not return to duty the same day, and are considered "lost time" cases. Vehicle, aircraft and property damage involves accidents resulting in damage to any Air Force property, regardless of the costs. The costs indicated on the above tables reflect the dollar value determined by the type of injury which occurs, as follows:

Minor Injury - $7.00 each

Disabling Injury - $30.00 for each day hospitalized or quartered

Fatal - $31,500 each. These are charged as disabling injuries.

The commanders of the Test Services Unit, Test Aircraft Unit, and Test Base Unit had the responsibility for conduct of an effective ground safety program within their organizations. To assist them during the operational period, a Ground Safety Technician was furnished by Headquarters Air Force Special Weapons Center, at Kirtland Air Force Base. This individual worked from the Task Group Headquarters, providing staff-level assistance, inspecting facilities and assisting in preparation of Ground Accident Reports. He also received and made distribution of safety posters and other promotional materials and conducted occasional meetings with flight line and maintenance personnel.

Frequent safety inspections were conducted of all organizations to determine unsafe conditions and pinpoint existing inadequate safety measures. From the results of these inspections, corrective action was taken by commanders and supervisors to preclude recurrence. A total of 246 discrepancies were noted during the test period, all of which were corrected or minimized, resulting in less exposure to hazardous conditions. The safety education program aided in eliminating most unsafe acts of personnel.

The highlights of the most serious or frequent accidents are outlined in this Chapter, covering the period through August 1958.

An incident that occurred during the build-up period was the drowning of an airman of the Weather Reporting Element on 22 February. Two airmen had been instructed to become familiar with and check out in the operation of an amphibious vehicle (DUKW). The plan was to enter the Eniwetok Lagoon at the cargo pier and travel East to the personnel pier. Approximately 15 minutes after departure on the established course, the DUKW struck a coral head and was abandoned by the two airmen concerned. Only one of the airmen was able to swim to shore, the other was apparently drowned. The only life preserver aboard the DUKW was the kapok seats, and a policy of requiring that all persons in water craft be equipped with life vests might have prevented this fatality.

An aircraft received extensive damage as a result of ground operations. While towing a C-54 aircraft out of the hanger, the tug operator and wing walker were not coordinated on their signals. As a result, the aircraft was turned before the stabilizer and rudder had cleared the upper door slot. Total damage to the rudder and vertical fin was $3786.00. Corrective action taken to preclude recurrence was directing that spotters be placed at each wing tip and the tail of the aircraft when towing from or into the hanger. A yellow line was painted at each entrance as a guide line for the tug operator to follow when towing aircraft.

To control vehicle traffic crossing the ends of the runway, lights, Claxton horns and Stop signs were installed. The red flashing lights and Claxton horns were controlled and operated by the control tower operators. During the times when the runway was not in use, the Stop signs were used in conjunction with signs warning vehicle operators of the dangers of

crossing the runway. Signs were placed at the entrance to flight line areas, indicating the types of vehicles authorized and the speed limits. A directive was published by the 4951st, outlining vehicle operations on the airfield.

Sports injuries accounted for 60% of the minor injuries reported during the operation, most of which occurred while participating in swimming, softball or volleyball. The majority of these injuries were as a direct result of falls caused by over-exuberance of players, over-exertion and inexperience. Due to the physical terrain in the swimming and recreational areas, lacerations and abrasions were predominant. The seemingly high percentage of minor sports injuries does not reflect a deficiency in the program, because a great amount of off-duty time is spent in some type of sport. The percentage actually reflects an exceptional record of treatment of minor injuries, preventing them from becoming "lost time" cases.

Chapter 7 - [illegible] and Discipline

During [illegible] operational period 25 disciplinary actions were taken against Task Group 7.4 personnel:

	HQ	TAU	TBU	TSU	TOTAL
Article 15	0	1	7	12	20
Summary Courts-Martials	0	0	3	2	5
Special Courts-Martials	0	0	0	0	0

Most of the above actions were necessary as a direct result of intemperate consumption of alcoholic beverages:

Drunk and Disorderly	17
Driving while under the influence	1
Fighting (Drunk)	4
Theft	1
Miscellaneous	2

Fifty cases were investigated during the operational period:

Theft and Pilferage	28
Misconduct	22

To insure that a legal capability was readily available, a judge advocate from the 6486th Air Base Wing, Hickam Air Force Base, T. H. was furnished when requested to advise and provide legal assistance to Task Group 7.4. The judge advocate was present at the EPG during two weeks in March, one week in May, and ten days in July. During the organizational period in March a regulation pertaining to disciplinary matters was published. The legal officer held briefings for officers appointed to try summary courts-martial, personnel officers and clerks designated to prepare charge sheets and allied papers.

On 22 May 1950 Pacific Air Forces, by General Order 31, attached Air Force personnel assigned to Joint Task Force SEVEN to the 6486th Air Base

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Wing for courts-martial jurisdiction, administration of punishment under Article 15, and certain board actions. This attachment was made pursuant to a request from Joint Task Force SEVEN to Pacific Air Forces. On 10 June 1958 the Commander 6486th Air Base Wing by General Order 12 redelegated authority to Commander Task Group 7.4 to convene Summary Courts-Martial and administer punishment under Article 15, UCMJ (Figure 7). Prior to the attachment by Pacific Air Forces the Commander Task Group 7.4 was authorized to exercise special and summary court-martial jurisdiction and to administer punishment under Article 15, UCMJ over personnel assigned or attached to Task Group 7.4 pursuant to the authority contained in AFOOP Bood Message 51415, 11 October 1957 as amended, Task Group 7.4 Operations Order 1-58 and Article 24, UCMJ.

HEADQUARTERS
6486TH AIR BASE WING (PACAF)
United States Air Force
APO 953, San Francisco, California

GENERAL ORDERS)
NUMBER 12)

10 June 1958

I. DISCIPLINARY CONTROL. General Orders No. 15, this headquarters, 16 August 1957, pertaining to disciplinary control, is rescinded.

II. DISCIPLINARY CONTROL. 1. The organizations listed below, including their subordinate units which are physically located in the Hawaiian Islands, Johnston Island, Kwajalein, or Eniwetok Atoll, are assigned or attached to the 6486th Air Base Wing (PACAF), for disciplinary control and administration of military justice, including the imposition of punishment under Article 15, and the processing of matters requiring action by an officer exercising general courts-martial jurisdiction in accordance with agreements between the Commanders concerned.

2. General, special, and summary courts-martial jurisdiction will be exercised by the Commander, 6486th Air Base Wing (PACAF), for all units listed below, and their subordinate units which are physically located in the Hawaiian Islands, Johnston Island, Kwajalein, or Eniwetok Atoll, unless otherwise indicated below.

UNIT	LOCATION
Hq Pacific Air Forces	Hickam Air Force Base, T. H.
Hq 6486th Air Base Wing	Hickam Air Force Base, T. H.
4440-1 Aircraft Delivery Group Detachment 1	Hickam Air Force Base, T. H.
Hq 1502d Air Transport Wing (H)	Hickam Air Force Base, T. H.
C-124-2 Mobile Training Detachment	Hickam Air Force Base, T. H.
Hq 6002d Air Intelligence Service Group	Hickam Air Force Base, T. H.
Hq 6005th Air Postal Group	Hickam Air Force Base, T. H.
Team 103, 1009th Special Weapons Squadron	Hickam Air Force Base, T. H.
6928th Security Flight	Hickam Air Force Base, T. H.
Detachment 2, 1358th Aeronautical Chart and Information Squadron	Hickam Air Force Base, T. H.
6001st Special Investigations Squadron (IG)	Hickam Air Force Base, T. H.
76th Air Rescue Squadron	Hickam Air Force Base, T. H.
57th Weather Reconnaissance Squadron	Hickam Air Force Base, T. H.
5th Communications Construction Detachment	Hickam Air Force Base, T. H.
Hq Air Materiel Forces, Pacific Area	Wheeler Air Force Base, T. H.
Hq Pacific AACS Area	Wheeler Air Force Base, T. H.
Hq 1st Weather Wing	Wheeler Air Force Base, T. H.
Hq 326th Air Division	Wheeler Air Force Base, T. H.
Hq 2nd Air Rescue Group	Wheeler Air Force Base, T. H.
Air Force-Civil Air Patrol Liaison Office	Camp Catlin, Honolulu, T. H.
Joint Task Force-7	Eniwetok Atoll
4951st Support Squadron (Test)	Eniwetok Atoll
1253rd AACS Squadron	Eniwetok Atoll
Office of the Field Representative, Far East	Hickam Air Force Base, T. H.
1960th AACS Squadron	Kwajalein, MI

3. Under the supervisory authority of the Commander, 6486th Air Base Wing (PACAF), the commanders of the units indicated below are authorized to convene summary courts-martial for the trial of Air Force personnel in the area indicated. In accordance with Air Force Regulation 11-4, Air Force personnel in such areas are also attached for disciplinary control, including the imposition of punishment under Article 15.

a. Eniwetok Area -- Commander, Task Group 7.4
Commander, 4951st Support Squadron (Test)

b. Kwajalein Area -- Commander, 1960th AACS Squadron

c. Johnston Island -- Commander, Johnston Island Base Command

FOR THE COMMANDER:

WILLIAM D. BROWN
Lt Colonel, USAF
Director, Admin Services

DISTRIBUTION: S

FIGURE 7

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Chapter 8 - Protocol

Soon after arrival in the Eniwetok Proving Grounds, it became apparent that Task Group 7.4 required a protocol section to perform the many duties incident to reception and accommodation of visiting Air Force personnel. Accordingly, a Protocol Section, Task Group 7.4 headed by Captain Testerman, Headquarters Squadron Commander, was established and operated throughout the exercise.

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PART IV

OPERATIONS

Calendar of Events

APRIL

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

MAY

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

JUNE

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

JULY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

AUGUST

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

SEPTEMBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

The purpose of Part IV of this report will be to portray the operational aspects of the participation of Task Group 7.4 in Operation HARDTACK. This foreword will trace the scope of Task Group 7.4 operations. Chapter 2 will deal with the organization of Task Group 7.4 and the operational reasons for this type of organization. Part IV will then be broken down into other chapters which will relate in some detail the major facets of the Task Group operation as follows: Weather reporting and forecasting, operation of test aircraft, aerial support for the operation, control of air traffic within the Eniwetok Control Area, communications and radiological responsibilities concerned with the gathering and handling of radiological samples.

Although information was meager at the time, some very preliminary planning on communications and aircraft requirements for Operation HARDTACK was started as early as October 1956. By the time that Joint Task Force SEVEN held the first planning meeting for Operation HARDTACK on 20 February 1957, Task Group 7.4 had fairly solid requirements on communications systems and on the numbers and type of aircraft required for support roles. Additions of project aircraft were later made after Headquarters, Armed Forces Special Weapons Project approved the projects participation in Operation HARDTACK.

Early in March, a preliminary book message was drafted and sent to Headquarters, USAF for them to publish directing the major commands of the Air Force to support ARDC, who would be designated as the Air Force Executive Agency. This directive when published on 29 April by Headquarters, USAF, became the official authorization which allowed the

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4950th Test Group (Nuclear) to work directly with major commands in formulating definite plans for the operation.

In the months following the receipt of this preliminary book message, Headquarters, Task Group 7.4 was active in the planning stages outlining specific requirements and policies for the participating organizations. Many documents were issued during this planning phase, the following being the most important: Task Group 7.4 Planning Directive published on 17 October 1957; Task Group 7.4 Operations Plan on 6 January 1958; and Headquarters, USAF Movement Directive on 9 January 1958.

The Task Group 7.4 Operations Plan, made effective as an Operations Order on 15 March 1958, was to be the directing and guiding document for activities throughout the entire operation. This started the second phase of Operation HARDTACK, that of build-up in the forward area. At this time, all units came under the control of Task Group 7.4 and the majority of the time, up to the first shot, was spent on practicing and rehearsing for the first event.

The nuclear testing for Operation HARDTACK commenced with the firing of the first event, YUCCA, on 28 April. The test series itself included 35 nuclear detonations at Eniwetok, Bikini and Johnston Islands. (See Figure 1). This is the largest nuclear test series yet conducted by the United States. Aircraft operated by or under the operational control of Task Group 7.4 participated in every shot fired during HARDTACK. In support of the operation, the aerial support elements carried 60,901 passengers and 2,626,265 pounds of cargo. These aircraft flew a total of 10,841 flying hours from the beginning of the operational phase of

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HARDTACK in March 1958 until its conclusion on 18 August 1958.

The sampling aircraft flew 240 sampling missions and logged 1,635 flying hours. The effects aircraft flew 47 successful missions on 18 shots and logged 347 flying hours. The Aerial Photography Element flew 32 missions on certain specified shots and logged 199 flying hours in support of both documentary and technical photography requirements. The Weather Reconnaissance Element flew 334 flights and logged 3,696 flying hours obtaining weather information over an area that stretched from the Territory of Hawaii to a point west of Guam and covered well over 10,000,000 square miles, in the Central Pacific. In addition to the flying activities listed above, during this operational phase the Task Group operated weather reporting and communications stations at eight (8) island sites remote from the testing location.

While the operational phase was still in progress, some elements completed their projects and rolled up their personnel and equipment and returned to their home station. First of these was the Navy Effects Element which completed its scheduled participation on the ELDER shot on 28 June. They were followed shortly by the Air Force Effects Element which completed their mission on the POPLAR Event on 12 July.

When on 27 July it was officially announced that PINON, the next shot for the United Nation Observers and news personnel, had been cancelled there were only two (2) [redacted] shots left to be fired at Eniwetok and the two (2) high altitude missile shots to be fired at Johnston Island. At this time, weather reporting requirements were decreased in the Eniwetok Proving Ground and immediate roll-up of Weather

Reporting and Weather Reconnaissance Elements was started. At the same time, requirements for cloud sampling were decreased and most of the personnel and equipment of this element were returned to the states.

By the time that the FIG device was fired on 18 August, the Test Aircraft Unit had been reduced to a sampling and decontamination element. The Test Services Unit had been reduced to a Search and Rescue (SAR), Communications, Weather Central and MATS Terminal Element. These elements were quickly rolled-up and redeployed to the ZI.

[redacted]

Chapter 2 - [redacted]cation and Manpower

The general responsibility which Joint Task Force SEVEN delegated to Task Group 7.4 can be separated into five (5) general areas:

1. That of providing test aircraft to obtain scientific information from the individual detonations.

2. That of providing air transportation for military and civilian personnel connected with the test series.

3. That of providing supply and maintenance support for all aircraft assigned to Task Group 7.4.

4. That of providing services such as weather information, Search and Rescue (SAR) and airport terminal facilities.

5. That of controlling all aircraft movement within the Eniwetok Air Control Area.

To perform these responsibilities, Task Group 7.4 was organized into a headquarters and three (3) subordinate units. The three (3) subordinate units were further subdivided into elements to carry out their various duties.

Headquarters, Task Group 7.4 was organized with a Command Section and three (3) Directorates; Personnel and Administration, Operations, and Materiel. These three (3) Directorates guided the units in their planning for the accomplishment of their mission. In addition to normal staff activities, the Operations and Materiel Directorates also carried out operational duties. The Materiel Directorate operated a Maintenance Control Unit for coordinating and expediting the accomplishment of all aircraft maintenance. The Directorate of Operations actively controlled all aircraft within the Eniwetok Control Area. Manpower spaces for the entire headquarters came from the resources of the 4950th Test Group (Nuclear) of the Air Force Special Weapons Center.

[redacted]

The Test Aircraft Unit was responsible for providing test aircraft to obtain scientific information from the individual detonations. All aircraft provided for the purpose of collection of scientific data were assigned to TAU. These included 16 B-57's (ten B-57B's from ARDC, six B-57D's from SAC) provided to obtain particulate and gaseous samples from the nuclear clouds, two (2) B-36's, one (1) P2V and one (1) C-97 provided to obtain technical data from the high altitude detonations, and one (1) B-52 and four (4) Navy jet fighters provided to obtain effects information. Suitable manning tables for these units were developed in cooperation with the commands which furnished the aircraft and the personnel to fill the spaces were provided by these commands.

Test Base Unit was responsible for providing inter-island and inter-atoll transportation. To perform this mission they were furnished with five (5) C-54's, eight (8) L-20's, six (6) H-19's and nine (9) H-21's. Two (2) of the C-54's and the eight (8) L-20's were provided by ARDC. Three (3) of the C-54's and all of the helicopters were provided by PACAF. Augmentation personnel were assigned to the Test Base Unit from the 4952nd Support Squadron to cover the increased load of operating the additional L-20's. Flight crews and maintenance personnel for the three (3) C-54's and the helicopters were provided by PACAF.

Additionally, the Test Base Unit was responsible for providing supply and maintenance support for all aircraft assigned to Task Group 7.4. Augmentation manning to carry this extra load was provided by assigning the 4952nd Support Squadron of the 4950th Test Group to the Test Base Unit.

The Test Services Unit had the responsibility of providing those services normally provided by the Military Air Transport Service. These included weather information, search and rescue, communications, photography, and airport terminal facilities. The aircraft assigned to this unit

were ten (10) WB-50's for weather reconnaissance purposes, seven (7) SA-16's for Search and Rescue and weather island resupply missions, three (3) C-54's and two (2) RB-50's for photographic missions. Personnel to operate these aircraft and to carry out the functions of operating eight (8) weather islands, a weather central, Air Force communications, a Military Air Transport Service Terminal and documentary photograph were supplied by MATS.

This was the organization which Task Group 7.4 set up to plan for and to conduct Operation HARDTACK. See Figure 1, Chapter 3 - Command Section for a presentation of the organization.

Chapter 3 - Weather Operations

Weather conditions, particularly wind directions and velocities, are of considerable significance in conducting a nuclear test series. Since the possibility of hazard to life and property from radioactive fallout exists in nearly all nuclear detonations, the commander responsible for authorizing the detonation of a nuclear device must be completely informed on the fall out pattern to be expected. Other weather factors, such as cloud cover, precipitation, and visibility which might have an adverse effect on the gathering of scientific data, or which might intensify the local effects of shock and blast must be considered. To provide Joint Task Force SEVEN with a weather reporting and forecasting capability to meet these requirements, Commander, Joint Task Force SEVEN required Task Group 7.4 to provide and train the personnel for a Weather Central Element, a Weather Reporting Element, with widely dispersed reporting stations throughout the Central Pacific area adjacent to the Eniwetok Proving Ground, and a Weather Reconnaissance Element operating ten (10) WB-50 aircraft and having a capability of gathering synoptic data over a tremendous area.

As stated above, Task Group 7.4 was responsible to furnish the personnel to man the Joint Task Force Weather Central Element. The Weather Central, however, was under the operational control of Joint Task Force SEVEN. Its mission was to collect, plot and analyze weather information concerning the Pacific Ocean area, with emphasis on the Central Pacific and the Eniwetok Proving Ground, to issue severe weather advisories and typhoon warnings, and to maintain technical control of and to coordinate the land station weather observing and aircraft weather reconnaissance programs.

The Weather Central Element gathered its weather data from many sources. In addition to the weather reporting stations operated by the Task Group 7.4 Weather Reporting Element, and the WB-50 equipped Weather Reconnaissance Element, the Weather Central gathered data from weather units afloat on Task Group 7.3 ships, weather observations from Task Group 7.3 Security Patrol aircraft, U. S. Weather Bureau observing stations at MAJURO, PONAPE, WAKE, and TRUK, Naval Station at Kwajalein, and routine intercept of the Pacific Ocean area weather broadcast network.

The officers assigned to the Weather Central reported to the Joint Task Force SEVEN Metecrological Center, Pearl Harbor, T. H. on 20 January 1958 for six (6) weeks training in tropical weather analysis. The airmen assigned reported on 24 February for two (2) weeks of training. The Element then moved to the forward area arriving between 6-13 March. The Weather Central became operational 15 March 1958.

During the entire operation, briefings were held for the Commander, Joint Task Force SEVEN and his staff prior to each test event. Standard times for forecasts were H-Hour minus 18 hours, minus 12 hours, and minus six (6) hours. At times, when conditions were marginal or very critical special briefings and forecasts were made as required. The following statistics indicate the high degree of validity maintained in making these forecasts:

Month	Forecasts	Hits	Busts
April	39	37	2
May	73	65	8
June	65	62	3
July	40	39	1

The mission of the Weather Reporting and Forecasting Element was to provide surface and balloon sounding metecrolcgical observations as required by the Weather Central on Parry Island. To accomplish this,

eight (8) r[redacted]ng stations were established. These were located at KAPINGAMARANGI, NAURU, KUSAIE, RONGELAP, UJELANG, WOTHO, UTERIK and TARAWA. Operation of camp facilities was the responsibility of this element at KAPINGAMARANGI, NAURU, KUSAIE and TARAWA. Task Group 7.5 operated camp facilities at the remaining locations. Activation of these locations began on 4 February and was completed on 5 April 1958.

On 11 April 1958, the Weather Central Element conducted the first maximum effort shakedown of all reporting locations. During the period 19-30 April 1958 a continuous maximum schedule was undertaken with all stations participating. Operational commitments, both normal and maximum effort observations were met during the entire operation.

During May 1958, five (5) personnel from this element were transferred to Johnston Island to augment the detachment there in support of the NEWSREEL Project.

During June 1958, the NAURU Weather Station was closed and moved to Bikini to replace the facilities of the USS BOXER which was deployed to Johnston Island to support NEWSREEL.

On 27 July, CJTF-SEVEN directed the roll-up of all Weather Island sites except the Bikini site due to the cancellation of the PINON Event. It was decided that the Eniwetok and Bikini stations could provide adequate coverage of remaining events.

The mission of the Weather Reconnaissance Element was to provide inflight meteorological data, perform tracking missions and radiological safety missions as required by Commander, Joint Task Force SEVEN.

The first WB-50 aircraft arrived at Eniwetok on 11 March 1958. This was the first of ten (10) WB-50 aircraft that had been decided as necessary to perform the weather mission for HARDTACK. MATS supplied all of the WB-50 aircraft for the operation. The 57th Weather Reconnaissance Squadron,

normally based at Hickam AFB formed the nucleus of this element. It was augmented by aircraft and crews from the 55th Weather Reconnaissance Squadron based at McClellan AFB, Sacramento, California, to bring its strength up to the ten (10) required.

In March, a transition schedule was set up for incoming crews so that all pilots would receive ADF letdowns, GCA approaches, and day and night landings at Eniwetok. Practice missions commenced on 18 March 1958, flying one (1) weather track per day in preparation for actual missions commencing 1 April 1958. The weather tracks required from ten (10) to twelve (12) hours of flight and consisted of 1,100 to 1,500 mile outbound legs which were flown at 10,000 feet and then a reverse of this leg, with at least four (4) hours of the return leg flown at 30,000 feet.

During the practice phase, a deficiency in communications between the aircraft and the high frequency radio station operated by the Weather Central at ELMER Island was discovered. The problem was resolved by the addition of more channels, an increase from two (2) to five (5) authorized, which allowed sufficient flexibility to establish communications on the frequency with the best propagation characteristics for the time and place.

In April, of the sixty-nine missions flown, the mission credit point, a point at which sufficient data had been collected to be useful to the Weather Central, was reached in every case. Three flights aborted, two (2) prior to reaching the mission credit point and one (1) beyond mission credit point. The flights aborting prior to reaching mission credit point returned to Eniwetok, changed gear to the standby aircraft, and completed the mission successfully within the required time limit. Seven of the missions had late take-offs.

During the month of April the mission requirements were accelerated from the one (1) per day planned to two (2) per day. On 20 April, the mission schedule was boosted up to three (3) missions per day, two (2) early morning flights and one (1) afternoon flight, with take-off times at 0430 and 0500 for the morning flights and 1630 for the evening flight.

In May, the Weather Reconnaissance Element flew seventy-eight missions of which seventy-three were weather reconnaissance missions, four (4) were cloud sampler missions and one (1) was a three (3) hour rad-safe mission combined with a weather reconnaissance. Only one (1) late take-off occurred during May and six (6) aborts were experienced. Two of the aborts were beyond mission credit point. Two flights aborted short of missions credit but were not required to be made up.

For the month of May, mission requirements for D minus 2 and D minus days were increased to three (3) for each day. Three missions were flown on eighteen days in May, two (2) missions on eleven (11) days and one (1) mission on two (2) days. The element maintained the capability for three (3) missions per day throughout the month but a lull in shooting activity during the middle of the month resulted in several days when only two (2) missions per day were required.

During the month of June, seventy-nine missions were flown, seventy-one being weather missions, four (4) cloud sampler missions, three (3) cyclone reconnaissance missions and one (1) ferry flight. There was only one (1) late take-off during this period, and of nine (9) aborts five (5) occurred prior to mission credit point. Only four (4) of these five (5) required a make up flight to complete the mission. One ferry mission was flown as a result of an aircraft aborting the track and landing at Wake Island. The aircraft was ferried to Hickam for repairs and later flew a weather mission on the return flight to Eniwetok.

For June, mission requirements for D minus two (2) and D minus one (1) days remained at Three (3) per day. During this period, four (4) missions were flown on two (2) days, three (3) per day on sixteen days, two (2) per day on eleven (11) days and one (1) per day once.

During the month of July mission requirements for D minus two (2) and D minus one (1) days remained at three (3) per day. During this period 79 weather tracks were flown. Operation NEWSREEL at Johnston Island required two (2) weather tracks per day beginning 25 July. To meet requirements at both Eniwetok and Johnston, it was decided to move the periodic maintenance capability of the Weather Reconnaissance Element to Hickam AFB and to stage aircraft there from Eniwetok. One (1) aircraft was to depart Eniwetok daily and give weather reports for that area on its outbound track. Inbound to Hickam, it would give a report on Johnston Island area weather. A flight on a reverse track would depart Hickam daily for Eniwetok, giving the required daily coverage. On 26 July, however, it was decided that weather reconnaissance flights were no longer needed for Eniwetok. Between that date and 1 August, all the WB-50 aircraft departed for Hickam. All further NEWSREEL weather reconnaissance was performed from Hickam AFB.

During HARDTACK, the Weather Reconnaissance Element flew 3696 hours and 334 missions. Of these 324 were weather reconnaissance missions ten (10) were cloud sampler missions. For a complete resume of WB-50 flying activities, see Figure 2.

A highly trained organization of specialists in the Weather Centeral Element collected weather data from a variety of sources, analyzed this data and with a high degree of accuracy furnished to Commander, Joint Task Force SEVEN the weather forecasts vital to the successful firing of a

WB-50 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	7	10	10	10	10	9
IN-COMMISSION RATE	51%	80%	60%	60%	66%	70%
MONTHLY FLYING TIME	285:45	822:05	805:10	826:25	773:35	183:15
AVERAGE HOURS/ASSIGNED A/C	40:50	82:10	75:00	82:35	77:35	23:50
WEATHER RECON FLIGHT TIME	145:10	796:30	750:25	753:45	695:00	163:45
WEATHER TRACKS FLOWN	14	69	73	71	79	18
AVERAGE TIME ASSIGNED PILOT	37:00	62:10	60:45	61:30	35:15	10:40
LANDINGS	150	111	80	108	105	43

FIGURE 2

nuclear test series. Over a sustained period of five (5) months, these specialists provided this information. A lion's share of the data from which the Weather Central made its forecasts was furnished by other Task Group 7.4 Elements concerned with the gathering of weather information. The Weather Reporting Element with eight (8) island stations outside the Eniwetok Proving Groud, as well as two (2) from within, functioned smoothly in its data gathering responsibility. The Weather Reconnaissance Element with its ten (10) WB-50 aircraft flew 324 weather reconnaissance missions and 3696 hours over an area reaching from Hawaii to points west of Guam, covering over 10,000,000 square miles of the Central Pacific in fulfilling its responsibility to the network weather information gathering.

A part of the mission charged to Task Group 7.4 was to provide, maintain and operate aircraft in support of diagnostic and weapons effects test missions. These aircraft supported a large number of scientific projects gathering scientific data. Most of these aircraft were operated by the Test Aircraft Unit. Some of the aircraft in this classification were operated by the Test Services Unit. These were aircraft supporting technical and documentary photography projects. Figure 3 shows the complete aircraft participation in nuclear test events. This chart shows all aircraft airborne at H-Hour, both test support and test aircraft, as well as those test aircraft which were airborne after H-Hour. Test aircraft participation may be divided roughly into four (4) categories: Samplers, effects aircraft, instrument carriers and photographic aircraft.

The mission of the Sampling Element was to collect particulate and gaseous samples from within the nuclear cloud. The nucleus of this organization was the 4926th Test Squadron (Sampling), a subordinate unit of the 4950th Test Group (Nuclear). The 4926th operated ten (10) B-57B aircraft, especially modified to perform its primary mission of collecting samples from nuclear clouds. For Operation HARDTACK, the Sampling Element was augmented by six (6) specially modified B-57D aircraft of the 4080th Strategic Reconnaissance Wing (SAC). Aircraft of the Sampling Element participated in all of the nuclear tests in the Eniwetok Proving Ground. Only the TEAK and ORANGE shots at Johnston Island did not require the participation of the sampler aircraft.

On a typical sampling mission the sample controller aircraft with a scientific observer took off prior to H-Hour. This aircraft was considered a part of the test array and was placed in a safe position. The distance

AIRCRAFT PARTICIPATION

		B-36	B-52	P2V NASWF	A4D	FJ4	B-57B	B-57D	RB-50	RC-54	SA-16	WB-50	OTHER
YUCCA	28 APR	2		1			3				1	1	
CACTUS	6 MAY				2	2	7				1	1	
FIR ✓	12 MAY		1				4	3			1		
BUTTERNUT	12 MAY			1	2	2	5	4			1		
KOA ✓	13 MAY		1	1	2	2	5	5		2	1	2	
WAHOO	16 MAY						3		2	3	2	1	
HOLLY	21 MAY						3	2		2	2		
NUTMEG	22 MAY						7		1	2	1	1	
YELLOWWOOD ✓	26 MAY		1		2	2	5	2			1		
MAGNOLIA	27 MAY				2	2	5				1		
TOBACCO	30 MAY		1		2	2	4	1			1		
SYCAMORE ✓	31 MAY		1				7	1		2	1	1	
ROSE	3 JUN		1		2	2	5				1		
UMBRELLA	9 JUN						4		2	3	2		
MAPLE	11 JUN		1				5	2			1		
ASPEN	15 JUN		1				5	2			1		
WALNUT	15 JUN		1		2	2	2	5			1	2	
LINDEN	18 JUN										1		

FIGURE 3A

FIGURE 33

AIRCRAFT PARTICIPATION

		B-36	B-52	P2V NASWF	A4D	FJ4	B-57B	B-57D	RB-50	RC-54	SA-16	WB-50	OTHER
ELDER	28 JUN		1				3	2		2	1		
REDWOOD	28 JUN		1				4	2			1		
OAK	29 JUN		1				4	5			3	1	
HICKORY	29 JUN						6				1		
SEQUOIA	2 JUL						5				1		
CEDAR	3 JUL		1				4	3			2		
DOGWOOD	6 JUL		1				5	4			1		
POPLAR	12 JUL		1				4	4		1	2		
SCAEVOLA	14 JUL						2				1		
PISONIA	18 JUL						4	2			1		
JUNIPER	22 JUL						6	1		1	1		
OLIVE	23 JUL						6	2			1		
PINE	27 JUL						4	3			1		
TEAK	31 JUL	2		1								1	6
QUINCE	6 AUG						3				1		
ORANGE	12 AUG	2		1								1	6
FIG	18 AUG						3				1		

CLOUD SAMPLING ACCOMPLISHMENT CHART "HARDTACK"

EVENT	DATE MO	DATE DAY	B-57 BorD	PENETRATION ALTITUDE 1000's OF FT.
CACTUS	5	6	D	13.5 TO 13.8
			B	13
			B	8 TO 10
			B	10 TO 12
			B	11
FIR	5	12	B	26 TO 29
			B	40 TO 33.5
			B	43 TO 48
			D	BASE -1.5 TO -1
			D	BASE -4 TO -2
			D	BASE -8
BUTTERNUT	5	12	B	20
			B	22.5
			B	26 TO 27.5
			B	26 TO 27.5
			D	20 TO 20.7
			D	24.5
			D	15 TO 20
			B	26
KOA	5	13	B	33.5 TO 34.7
			B	38 TO 40
			B	45
			B	49
			D	BASE +.6
			D	BASE -5 TO -3

NUMBER OF FISSIONS
1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9
X10^14 X10^15 X10^16

AMOUNT OF COLLECTED SAMPLE LESS THAN THE DESIRED QUANTITY

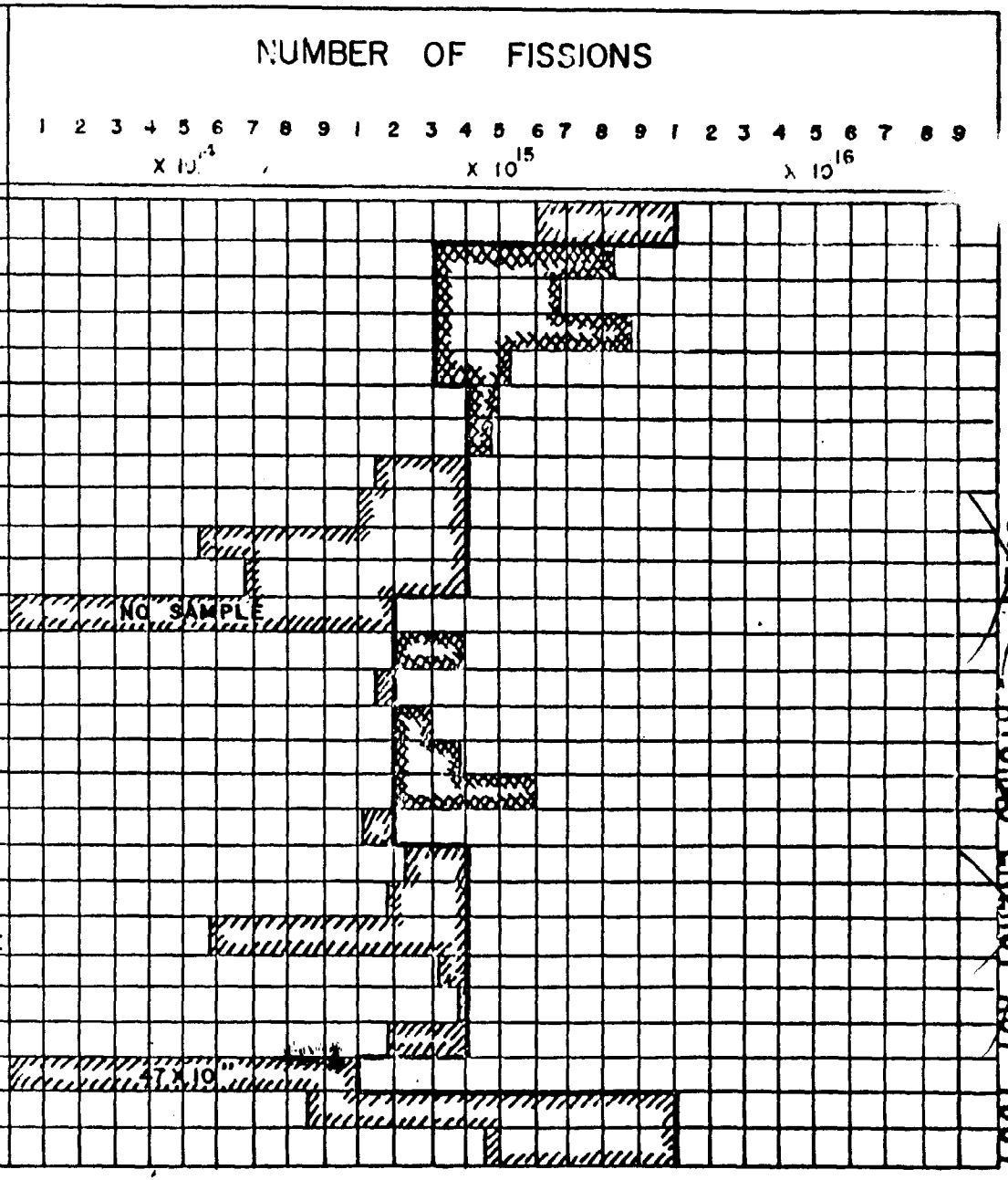
AMOUNT OF COLLECTED SAMPLE GREATER THAN THE DESIRED QUANTITY

DESIRED SAMPLE QUANTITY

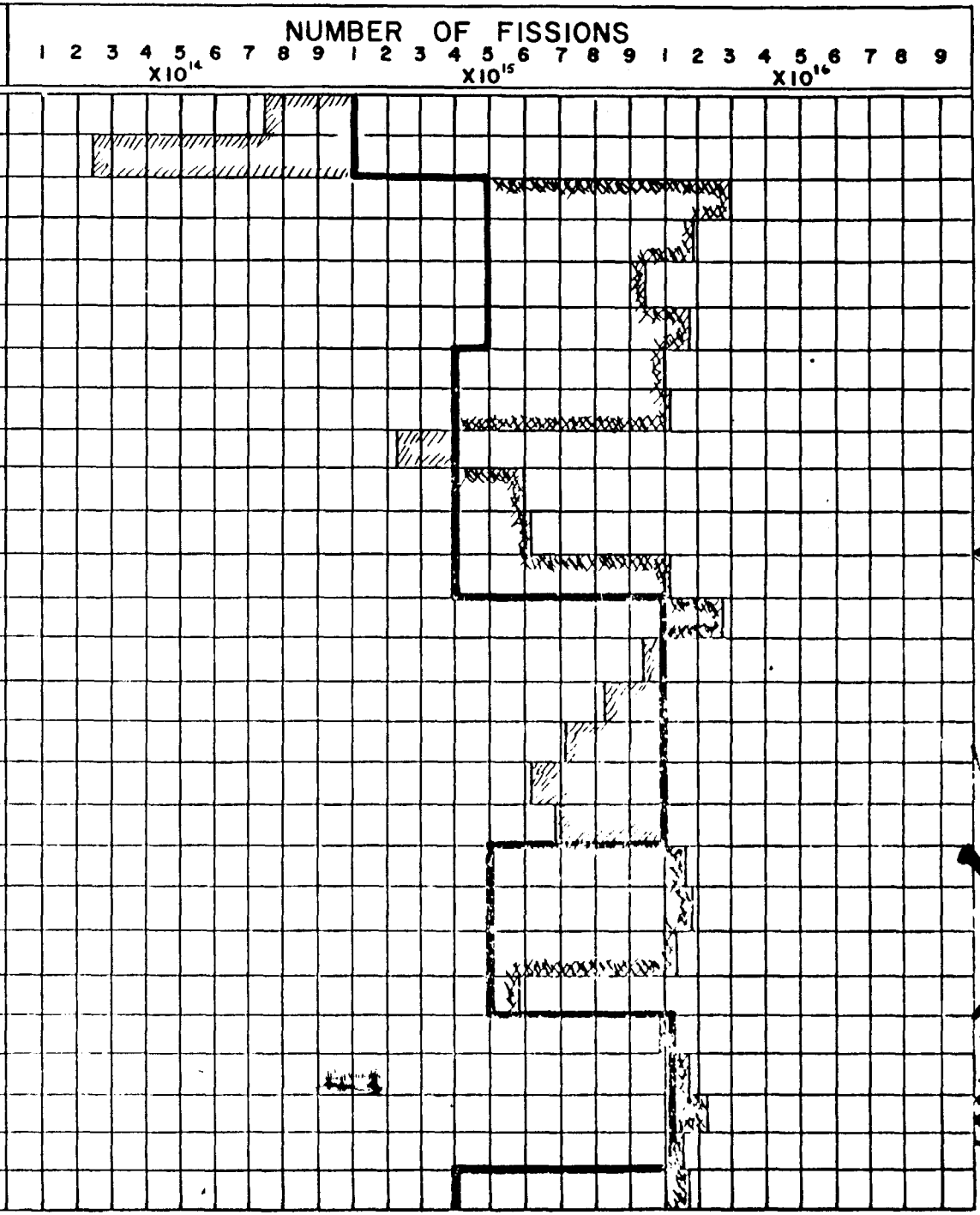
80

FIGURE 4A

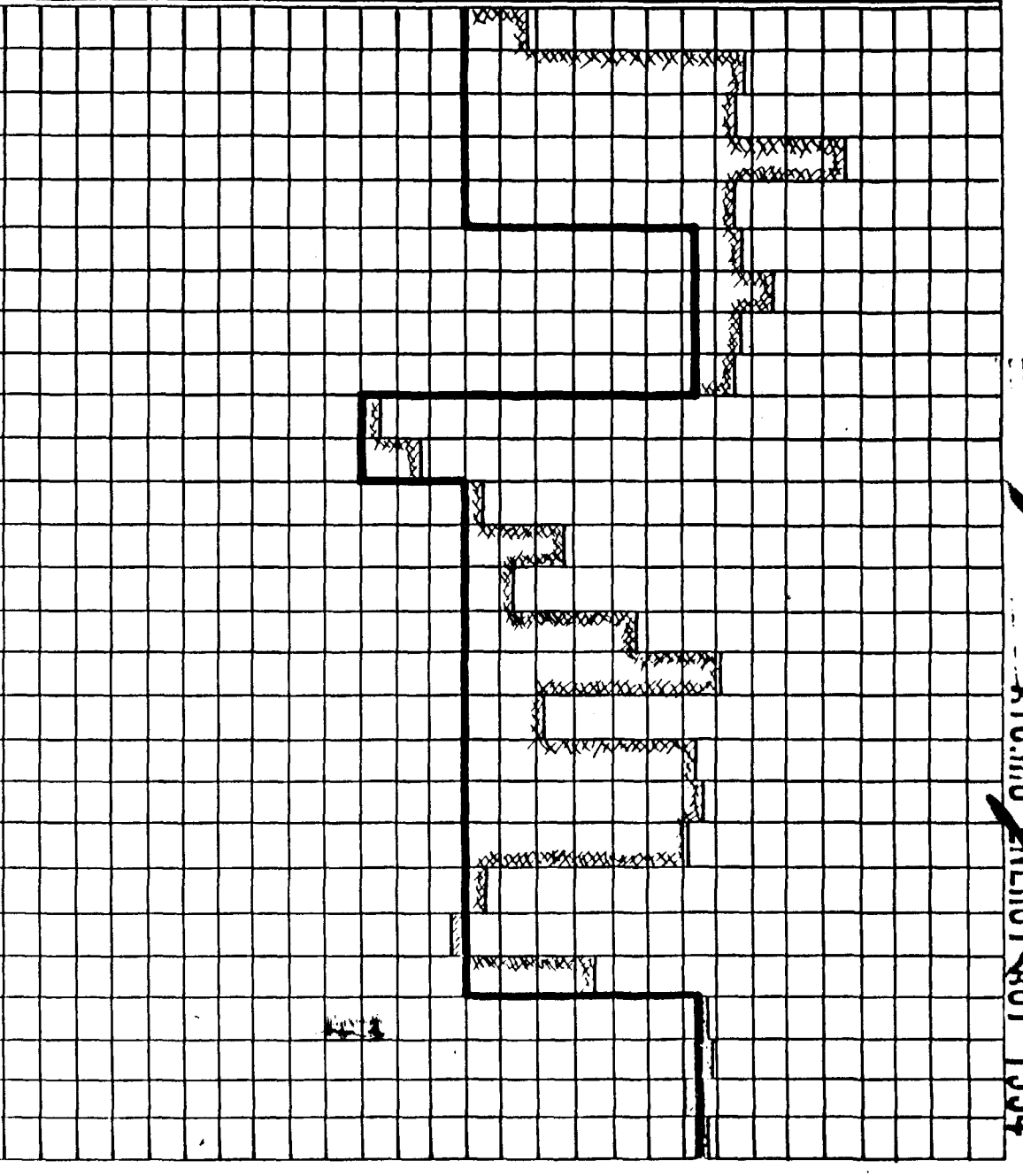
EVENT	DATE MO	DAY	B-57 B OR D	PENETRATION ALTITUDE 1,000 OF FEET
HICKORY	6	29	B	10 TO 12
SEQUOIA	7	2	B	11 TO 13.5
			B	10 TO 10.5
			B	8.5 TO 8.8
			B	11
CEDAR	7	3	B	25
			B	26 TO 28
			B	31 TO 39
			D	45
			D	49
			D	BASE - 10
DOGWOOD	7	6	D	BASE -2 TO -2.5
			B	40 TO 49
			B	46
			B	46.5
			D	BASE -7 TO -6
			D	49
			D	50 TO 51
POPLAR	7	12	D	41.2 TO BASE
			B	48
			D	BASE -2 TO BASE
			B	50
			D	BASE
			D	BASE
SCAEUOLA	7	14	B	1.5
PISONIA	7	18	D	BASE -3 TO -2
			B	43 TO 47



EVENT	DATE MO	DAY	B57 BorD	PENETRATION ALTITUDE 1,000 OF FT.
WAHOO	5	16	B	1.4 TO 3
			B	1.5
HOLLY	5	20	B	11.2 TO 12
			B	10 TO 10.5
			D	4
			D	10.7 TO 10.8
NUTMEG	5	21	B	6 & 18
			B	11 TO 11.5
			B	14
			B	16
			B	13 TO 14.5
			B	16
YELLOWOOD	5	26	B	5 TO 13
			B	21
			B	33 TO 38
			B	41
			D	44 TO 45
			D	BASE −8
MAGNOLIA	5	27	B	37 TO 38
			B	25
			B	14 TO 19
			B	28.5 TO 30
TOBACCO	5	30	B	9
			B	13 TO 14
			B	17 TO 18
			B	15.5 TO 17.2
SYCAMORE	5	31	B	31 TO 39.5



EVENT	DATE MO	DAY	B-57 BorD	PENETRATION ALTITUDE 1,000 OF FT.
SYCAMORE	5	31	D	43.5
			B	2.7 TO 37
			B	20 TO 22
			B	19.3
			B	15
ROSE	6	3	B	4.5 TO 4.7
			B	7.5 TO 12
			B	15
			B	15
UMBRELLA	6	9	B	.85
			B	.3 TO .8
MAPLE	6	11	D	BASE -11
			D	BASE -9 TO -12
			B	46 TO 47
			B	44.7
			B	27
			B	46
ASPEN	6	15	B	46 TO 47
			B	15 TO 24
			B	30
			B	37 TO 39
			B	42
			D	47 TO 52
WALNUT	6	15	D	BASE -3
			B	40
			B	41 TO 43
			B	46

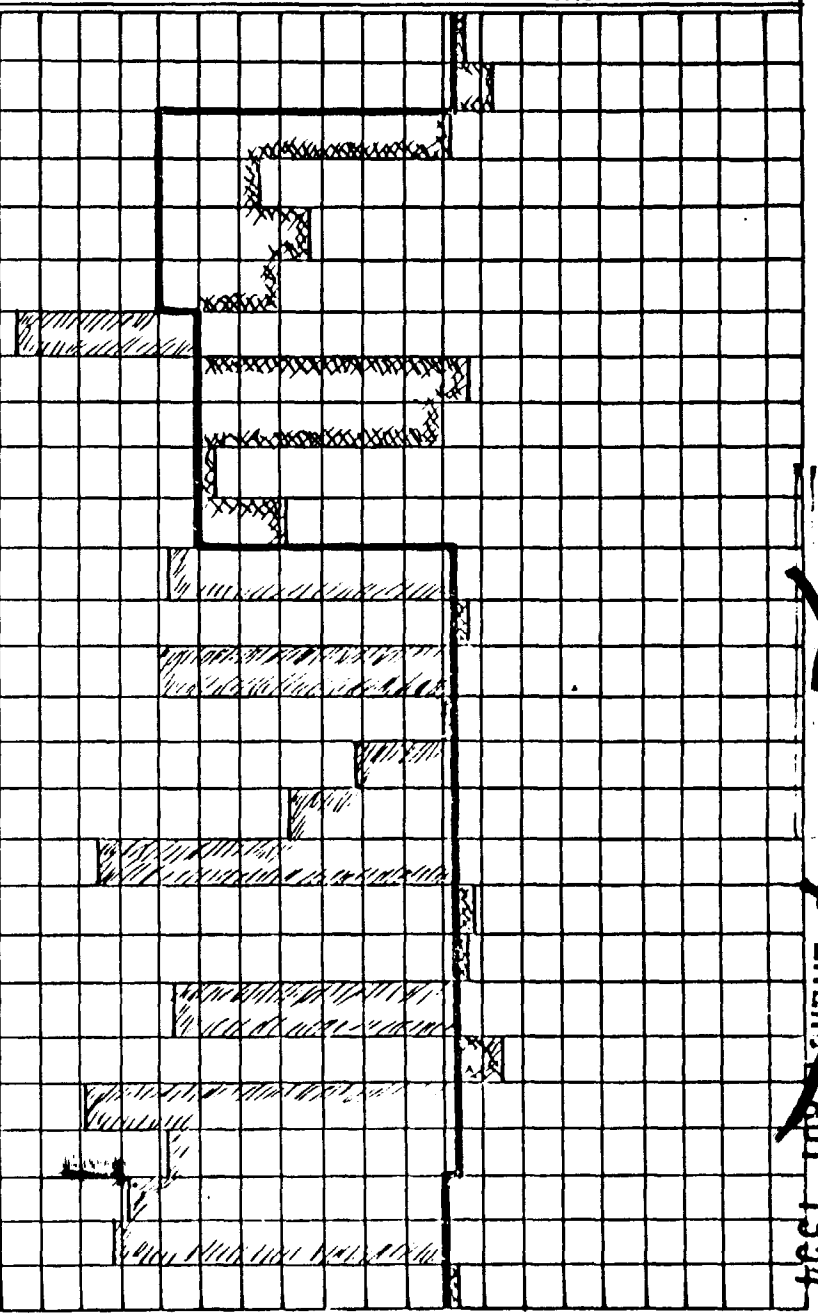


EVENT	DATE MO	DAY	B-57 BorD	PENETRATION ALTITUDE 1,000 OF FT.
WALNUT	6	15	B	48
			D	BASE -3
LINDEN	6	18	B	16 TO 17
			B	14.5
			B	6 TO 14
			B	5 TO 14
REDWOOD	6	28	D	BASE -9.5
			B	20 TO 23
			B	26 TO 27
			B	42 TO 44
			B	49
ELDER	6	28	D	BASE -1.5 TO -1
			B	34
			B	39 TO 47
			D	BASE -5
			B	49.5
OAK	6	29	D	BASE 0 TO 3.5
			D	BASE -5
			B	45
			B	47 TO 48
			B	52.5
			B	43.5
			D	BASE -5
			D	BASE -5
HICKORY	6	29	B	20 TO 23
			B	16 TO 18
			B	9 TO 12

NUMBER OF FISSIONS

1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9

X 10^{14} X 10^{15} X 10^{16}



EVENT	DATE MO	DAY	B-57 B ORD	Penetration Altitude (Thousands of feet)
PISONIA	7	18	B	47 TO 48
			D	Base Base to 1.5
			Spare B	34
JUNIPER	7	22	D	45 TO 47
			B	14 TO 18
			B	27
			B	38.5
			B	28
OLIVE	7	23	D	50
			B	15
			B	30
			B	38
			B	26
			D	Base - 8
PINE	7	27	D	Base -8 TO -5
			B	40
			B	48
			B	52.5
			D	Base +1 TO +1.5
			D	Base -5
			Spare B	29 - 31
QUINCE	8	6	B	.4 TO .8
FIG	8	16	B	4.5
			B	3.9

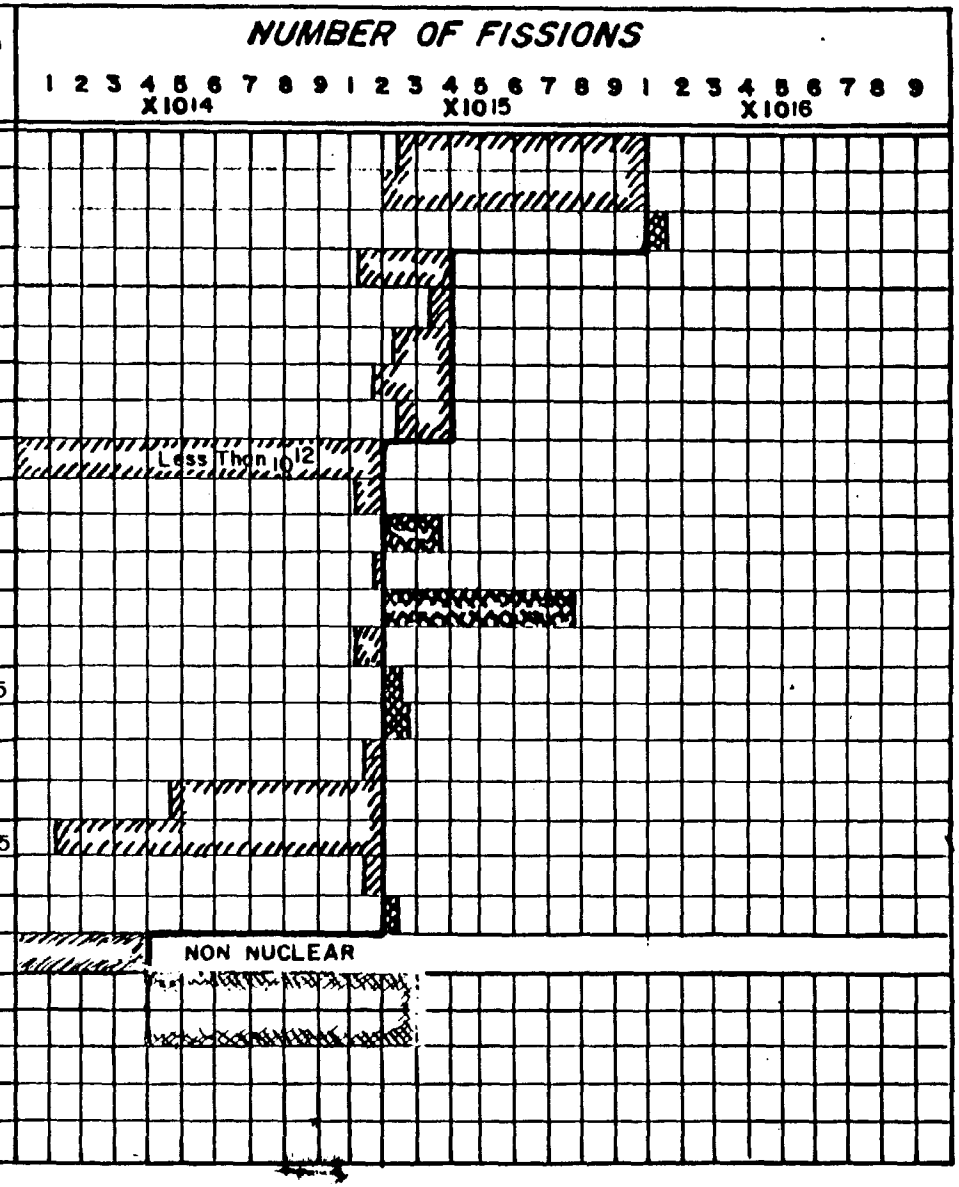


FIGURE 1F

and direction from ground zero varying with the expected yield of the device to be detonated. After the detonation, the controller watched the development of the nuclear cloud and observed its drift and configuration. The sampler aircraft took off at pre-determined times after H-Hour and were vectored toward the sampler controller by the Air Operations Center. The sampler controller then vectored the sampler aircraft into the cloud at the points where he expected to obtain the desired samples. The crews recorded radiation readings obtained on the special instruments and read them to the scientific controller, who took this information on both a written record and on a tape recorder. The requirements of the scientific laboratories were met in most cases during HARDTACK. At some times weather conditions prevented maximum results from being obtained. On other shots, failure of the device to perform as predicted made changes of altitude necessary to obtain suitable samples. Figure 4 illustrates nuclear test events; the desired fissions to be obtained in the samples and the results obtained. All bars to the right of the required fissions line indicates a sample as great or greater than required. Bars to the left show sample sizes smaller than desired.

In planning for Operation HARDTACK, the aircrew requirements for sampler aircraft were computed on the basis of the number of nuclear clouds to be sampled and the amount of radiation exposure that the crew members were to get in obtaining the desired sample. The inclusion of several additional shots to the program and the riscalculation of exposures on certain shots resulted in some aircrew members receiving maximum exposures before the end of the operation. This necessitated the replacement of some of the B-57 pilots and the training of additional observers from volunteers among Task Group 7.4 rated personnel. Figure 5 shows the radiation exposure of

RADIATION EXPOSURE RECORD

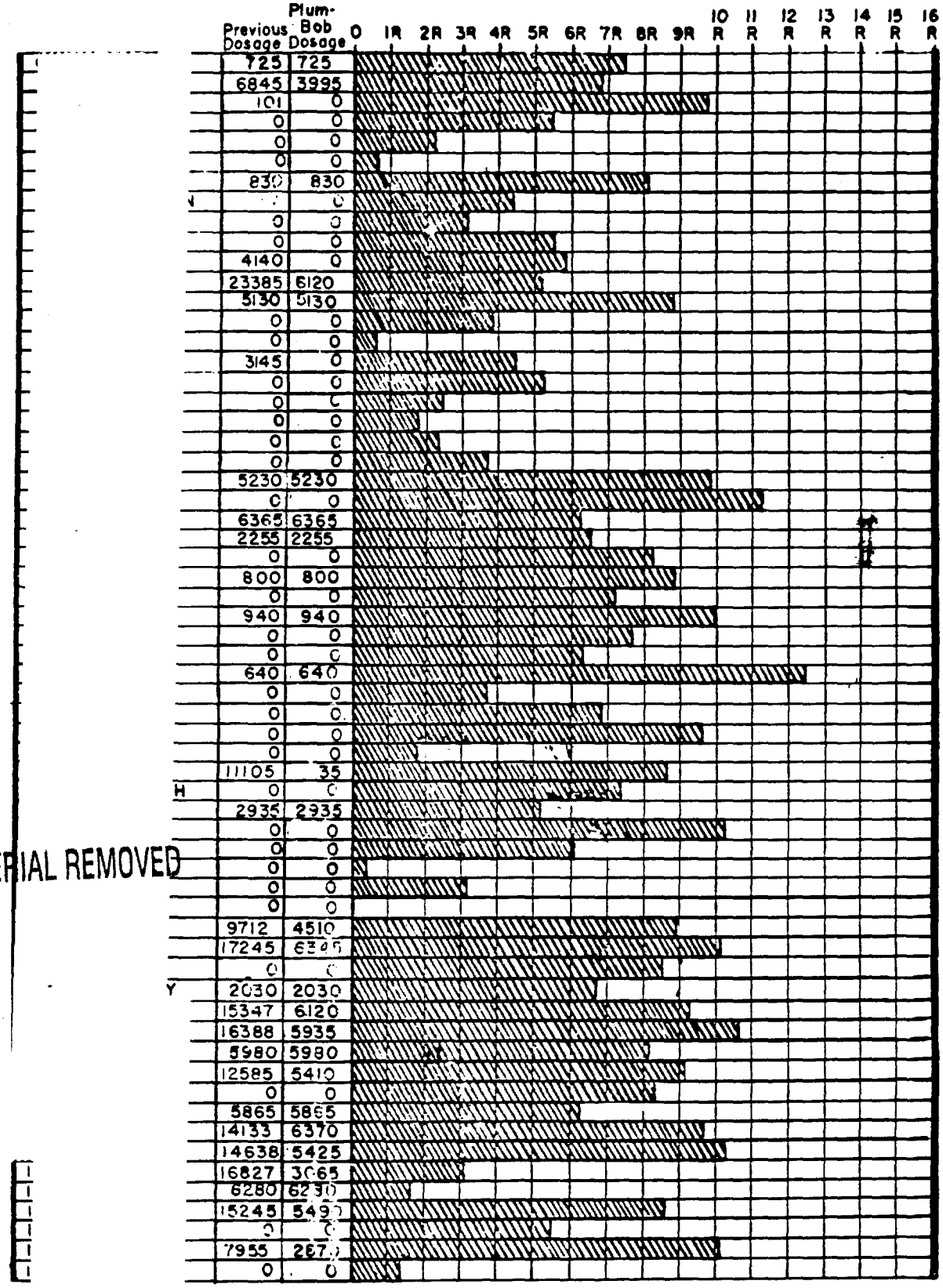


FIGURE 5

the sampler ai[illegible]s during Operation HARDTACK.

See Figure 6 for a summary of the B-57B and B-57D flying activities during Operation HARDTACK.

The participation of the Naval Effects Element was planned by the Naval Air Special Weapons Facility located at Kirtland AFB. They planned to participate with two (2) AL4D's and two (2) FJ4's. The mission of these aircraft was to measure the structural response and blast loading of the aircraft when exposed to nuclear detonations.

Participation by the AL4D's and the FJ4's was practically identical. During April, May and June the FJ4's flew seventy-seven hours and the AL4D's flew eighty-four hours. These aircraft participated in eight (8) nuclear detonations and flew sixty-nine sorties practicing for these events. They also flew eight (8) sorties for missions which were postponed after the aircraft had become airborne. The events in which they participated were: CACTUS, BUTTERNUT, KOA, YELLOWWOOD, MAGNOLIA, TOBACCO, ROSE and WALNUT. Some of the earlier shots failed to give the predicted yields and no worthwhile data was obtained from some of these events. On others, however, the WALNUT Event in particular, excellent results were obtained. These aircraft participated in every event as scheduled and experienced no air aborts or pre-take off cancellations.

The Navy fighters were loaded on the USS BOXER for transportation to Honolulu on 24 June, concluding their participation in Operation HARDTACK.

The USAF had only one (1) effects aircraft in Operation HARDTACK. This aircraft was a B-52 furnished by the Wright Air Development Center. The effects tests were a continuation of the test series conducted during REDWING. On that operation, effects tests head-on and tail-to the detonation were carried out. The HARDTACK tests were designed to give data on

B-57 B FLYING SUMMARY

x 2 A/C DEPARTED 14 JULY
3 A/C DEPARTED 28 JULY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	—	10	10	10	5 x	5
IN-COMMISSION RATE	—	99%	95%	94%	93%	98%
MONTHLY FLYING TIME	—	275:25	245:50	217:40	139:40	35:00
AVERAGE HOURS / ASSIGNED A/C	—	27:20	24:30	21:40	22:10	5:00
SHOT PARTICIPATION SORTIES	—	1	58	51	40	6

FIGURE 6

B-57 D FLYING SUMMARY

x 3 A/C DEPARTED 18 JULY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	—	6	6	6	3 x	—
IN-COMMISSION RATE	—	98%	86%	88%	95%	—
MONTHLY FLYING TIME	—	174:00	188:40	193:35	100:00	—
AVERAGE HOURS / ASSIGNED A/C	—	29:00	31:25	32:15	20:00	—
SHOT PARTICIPATION SORTIES	—	0	15	18	19	—

FJ4 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	2	2	2	2	—	—
IN-COMMISSION RATE	100%	98%	94%	100%	—	—
MONTHLY FLYING TIME	6:00	31:20	33:55	10:50	—	—
SHOT PARTICIPATION SORTIES	0	0	12	2	—	—

A4D FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	2	2	2	2	—	—
IN-COMMISSION RATE	100%	100%	100%	100%	—	—
MONTHLY FLYING TIME	5:30	31:55	40:00	11:25	—	—
SHOT PARTICIPATION SORTIES	0	0	12	2	—	—

side loading effects on the B-52, particularly on the fin. The aircraft arrived in the Eniwetok Proving Ground late in March and became operational early in April.

The B-52 flew a total of 176 hours during its participation in HARDTACK. It flew in fourteen nuclear detonations and in twenty practice missions for these events. The events in which the B-52 flew were: FIR, KOA, YELLOWWOOD, TOBACCO, SYCAMORE, ROSE, MAPLE, WALNUT, REDWOOD, ELDER, OAK, CEDAR, DOGWOOD and POPLAR. The Air Force Effects Element had not intended to participate in so many events. This larger participation was made necessary because several of the earlier shots failed to produce the expected yield. On the shots which failed to come up to expectations, this element did not get sufficient usable data and had to be programmed for a larger number of shots. See Figure 8 for a summary of the B-52 flying activities on HARDTACK.

With the POPLAR Event, the Air Force Effects Element completed its participation in Operation HARDTACK. On 16 July the B-52 and its crew departed Eniwetok. It is noteworthy that during Operation HARDTACK, the B-52 had no air aborts and no pre-take off cancellations. In addition, on 28 June, it participated in the REDWOOD Event at Bikini with H-Hour at 0530 and in the ELDER Event at Eniwetok with an H-Hour of 0630; only one (1) hour later. This is the first time that an effects aircraft has participated in two (2) events in one (1) day and within one (1) hour of each other. The B-52 then participated in OAK the following day, establishing the remarkable record of participation in three (3) major nuclear test events in twenty-six hours.

The instrument carrying aircraft have been so styled to differentiate

them from the aircraft whose instrumentation measured the effects of the nuclear detonation on the aircraft structure and those that measured the fissions present in the detonation. These aircraft carried instruments for a wide variety of scientific projects for the purpose of gathering data wich will enable researchers to better understand some of the phenomena associated with certain types of nuclear detonations. All of these aircraft were carrying instrumentation for projects interested in the very high and ultra high altitude shots carried out under the aegis of the Department of Defense. Originally, these aircraft were limited to the B-36 aircraft of the VHA/UHA Element, the P2V sponsored by the NASWF and the C-97 aircraft of the Ionospheric Element. Much later during the operation, other aircraft supporting other projects became active in the test series and participated in the last two (2) Department of Defense sponsored tests.

The mission of the P2V was to obtain basic data concerning infra-red radiation for high altitude shots and sea level shots for correlation purposes.

The P2V aircraft arrived in the Eniwetok Proving Ground on 31 March 1958. It flew a total of sixty hours in April and May before returning to the ZI. It participated in three (3) practice missions and two (2) rehearsals for the YUCCA Event and in that event. It also flew eight (8) practice missions for the BUTTERNUT and KOA Events and in those events. The P2V then returned to the ZI in May and returned to Barber's Point NAS in July for participation in the TEAK and ORANGE Events held at Johnston Island. On 17 July it participated in a practice for the TEAK Event and in rehearsals for TEAK on 22 and 26 July and made an emergency landing at Johnston Island, blowing tires on both main landing gears on landing. Fast maintenance enabled the aircraft to overcome its difficulties in time

to participate.

Participation for the ORANGE shot was similar to that for TEAK, except that only one (1) rehearsal was held and it was necessary to change the H-Hour position of the P2V in order for the project to obtain usable data. The P2V aircraft was positioned by an air controller in the Air Operations Center aboard the USS BOXER for the YUCCA Event but positioned itself by its own airborne radar on the TEAK and ORANGE shots. On both of these shots, an MSQ-1A radar helped the P2V to positively mark his position after H-Hour on the last two (2) events. See Figure 9 for a summary of the flying activities of the P2V during its participation in Operation HARDTACK.

The Air Research and Development Command was responsible for furnishing the aircraft comprising the Very High/Ultra High Altitude Element. This responsibility was passed to AFSWC at Kirtland AFB. These aircraft arrived at the Eniwetok Proving Ground in March 1958. These aircraft were to support Projects 8.2, 8.3 and 8.4. The respective interests of these projects were thermal radiation measurements, early fireball photography and thermal radiation spectrum measurements. These projects satisfied their requirements through special photographic equipment which was installed on the aircraft. After YUCCA, it was decided that Project 4.1, which was interested in retinal burns caused by a high altitude nuclear detonation, would place rabbits aboard the B-36's in such a way as would expose them to retinal burns from the detonation.

After arrival at Eniwetok, the B-36's began to practice for the YUCCA Event. This event was the detonation of a small nuclear device carried aloft by a free balloon to an altitude of between 80,000 and 90,000 feet.

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B-52 FLYING SUMMARY

x A/C DEPARTED 16 JULY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	1	1	1	1	1 x	—
IN-COMMISSION RATE	50%	70%	75%	85%	86%	—
MONTHLY FLYING TIME	14:50	33:40	58:45	42:50	26:10	—
SHOT PARTICIPATION SORTIES	0	0	5	5	3	—

FIGURE 8

NASWF P2V FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	1	1	1	—	1	1
IN-COMMISSION RATE	68%	100%	100%	—	87	100
MONTHLY FLYING TIME	62:30	45:10	14:55	—	45	30
SHOT PARTICIPATION SORTIES	0	1	2	—	1	1

FIGURE 9

The aircraft had to be positioned within a very close t[illegible] position in space relative to the device so that the fixed camera mounted on the aircraft could photograph the detonation. As the normal airborne radar would not scan above the aircraft and since the target was a free moving body in the upper air currents, a special installation of an E-4 radar set with an upward field of scan was made on these aircraft and a beacon installed in the equipment carried by the balloon. This equipment, unfortunately, never functioned properly and an alternate method of positioning had to be arrived at. Through much practice, a system was devised where the balloon was tracked by optics and by radar aboard the USS BOXER and its position passed to the Task Group 7.4 Controllers, who plotted this position on their radar scopes. The controllers in turn vectored the B-36's to the proper position relative to the balloon and maneuvered the aircraft into their proper H-Hour positions. The pilots of the aircraft also were able to check the ACC positioning by flying formation on the balloon visually while the navigator checked for proper slant range from the target through optical instruments. Due to the flash blindness hazard, the visual and optical observations had to be abandoned just prior to time zero and final positioning done by the controller but this ingenious method of positioning the aircraft against a position in space relative to a moving target proved highly effective and all scientific requirements were met.

The positioning problem was not so great on the TEAK and ORANGE shots. On these events, a large nuclear device was detonated after being carried to heights of 250,000 and 125,000 feet by a Redstone Missile. The detonation was programmmed to occur within a fixed envelope in space. One (1) aircraft positioned itself by using its own airborne radar while the other was positioned by an MSQ-1A radar on the ground. Air controllers monitored

the positioning of both aircraft and had the capability to position either aircraft within specified limits.

The TEAK and ORANGE Events had originally been scheduled to be fired at Bikini and most of the necessary installations had been completed. Due to the possibility of causing permanent damage to the eyes of the native population within 400 miles of the fireball, Commander, Joint Task Force SEVEN decided to move these events to Johnston Island and assigned the codeword NEWSREEL to the operation there. The NEWSREEL Events were still a part of Operation HARDTACK and the various Task Groups still retained their primary responsibilities. As a result of these changes, the B-36's departed Eniwetok in May, after YUCCA, as the TEAK and ORANGE shots were rescheduled for 1 August and 15 August respectively. These aircraft returned to Hickam AFB in mid-July to resume participation in the NEWSREEL phase of HARDTACK, staging their mission from that location. Figure 10 gives the pertinent statistics concerning the B-36 participation in Operation HARDTACK.

The Air Force Cambridge Research Center sponsored the Ionosphere Element and furnished a C-97 aircraft to support its participation in Operation HARDTACK. Its participation was to be limited to the TEAK and ORANGE shots. This aircraft arrived at Eniwetok shortly before the decision was made to move these shots to Johnston Island and returned to the ZI without having participated in the Eniwetok Proving Ground phase of the operation. It was scheduled to return to Hickam AFB and stage its missions from there at the same time as the B-36 aircraft. It was delayed in its arrival due to storm damage and an engine change and missed some of the early practices for TEAK. It did, however, participate in both events.

FIGURE 10

B-36 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	2	2	—	—	2	2
IN-COMMISSION RATE	76%	69%	—	—	88	87
MONTHLY FLYING TIME	80:50	65:25	—	—	52:50	34:35
SHOT PARTICIPATION SORTIES	0	2	—	—	2	2

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FIGURE 11

C-97 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	7	1	—	—	1	1
IN-COMMISSION RATE	100%	—	—	—	95	85
MONTHLY FLYING TIME	12:30	21:45	—	—	25	26:15
SHOT PARTICIPATION SORTIES	0	0	—	—	1	1

The mission of this aircraft was to aid in the investigation of ionization and associated effects in the high atmosphere caused by a large nuclear detonation at altitudes over 100,000 feet. It took vertical sounding measurements on the ionospheric layers after the high altitude detonations gathering data on radio wave absorption and on the physics of the high atmosphere. See Figure 11 for statistics on the flying activities of this aircraft

Quite late in the operation, the School of Aviation Medicine decided that its studies of retinal damage to the eye caused by exposure to high altitude nuclear detonations needed airborne stations. These stations were deemed necessary to minimize cloud cover between shipborne stations and the detonation. MATS was required to furnish a C-97 aircraft to carry rabbits above cloud cover and to place them at a distance of 300 miles horizontal range from the detonation. It flew 6 sorties on practices and rehearsals and participated in both of the NEWSREEL shots. It flew a total of 39 hours during its participation in HARDTACK.

Project 6.13 furnished two (2) WV2 aircraft to the NEWSREEL Events to study the effects of the high altitude detonations on its air search radar equipment. These aircraft staged their missions from Barber's Point NAS and participated only in the NEWSREEL Events. They simulated barrier patrol missions at a distance of 200 miles horizontal range from the detonations, positioning themselves with their own airborne navigational equipment. They flew 7 practice missions and participated in both NEWSREEL Events flying a total of 103 hours.

To aid in their studies of methods of detection of high altitude

nuclear detonations, AFOAT-1 participated in the NEWSREEL phase of HARDTACK with one (1) C-54 aircraft staged from Hickam AFB and furnished by the Air Research and Development Command. This aircraft positioned itself approximately 300 miles horizontal range from the detonation. The crew positioned the aircraft with airborne navigational equipment. It flew 4 practice missions and in both NEWSREEL Events. It flew a total of 90 hours during its participation in Operation HARDTACK.

It was decided that to perform the aerial photographic work for HARDTACK three (3) C-54 aircraft and two (2) RB-50 aircraft would be required. The Aerial Photographic and Charting Service of MATS was directed to furnish these aircraft and people. Two (2) of the C-54's and both of the B-50's came from Palm Beach AFB and one (1) C-54 came from Clark AFB. Two (2) of these C-54's arrived during March, as did one (1) of the RB-50's. The other two (2) aircraft arrived in April.

The Aerial Photo Element was given the mission of providing aircraft and crews for aerial photography during HARDTACK and to supplement the air transport activities of the Fixed Wing Element.

The C-54 aircraft of this element flew 616 hours during HARDTACK and the RB-50's flew 241 hours. The C-54 hours devoted to airlift will be covered in another chapter. During HARDTACK, the aircraft of the Aerial Photo Element flew many different types of photo missions. Aerial photos of the islands of both Eniwetok and Bikini Atolls were made. A complete aerial survey of populated atolls and islands within a 400 mile radius of Bikini was made prior to the TEAK and ORANGE Events being moved to Johnston Island. Photographs for water landing survey were made of many weather island sites for use of the SAR Element. Aerial photographic coverage was made of Johnston Island prior to the decision to use that site for NEWSREEL.

Pre and post shot crater survey photography was made for several of the nuclear detonations during the test. Aerial photography of many of the detonations was included in the program and much miscellaneous aerial photography was done, such as photography of B-57's and the B-52 in flight and silhouetted against a nuclear detonation, shots of Naval vessels and Navy jet fighters in flight.

The largest shot participation for this element was on the underwater shots WAHOO and UMBRELLA. On these shots all five (5) of the Aerial Photo Element aircraft participated. With the completion of the UMBRELLA shot, the participation of the RB-50's was completed and on 11 June they departed the EPG. On 22 June, one (1) C-54 was returned to Clark AFB. After the ELDER shot another C-54 was returned to Palm Beach AFB on 30 June. One (1) C-54 was retained for use in aerial photography and airlift until after the last shot. Figure 12 gives a summary of flying activities of the C-54 aircraft of this element and Figure 13 gives a similar summary of the flying activities of its RB-50's.

This chapter has described the missions and the participation of test aircraft in Operation HARDTACK. This operation was the largest nuclear test series yet held. During the Operational phase, 33 nuclear detonations were held in the Eniwetok Proving Ground and two (2) at Johnston Island. Test aircraft, under the operational control of Task Group 7.4, participated in every test shot in the operation in support of many scientific projects. The aircraft had many various missions but could be categorized into four (4) different types of missions:

1. Samplers, whose missions was to collect particulate and gaseous samples from the nuclear cloud.

2. Effects aircraft, whose mission was to aid in the study of the effects of nuclear explosions on aircraft structures.

RC-54 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	3	3	3	3 *	1	1
IN-COMMISSION RATE	81%	66%	77%	93%	90.5	
MONTHLY FLYING TIME	168:00	132:30	95:40	96:50	62.55	
AVERAGE HOURS/ASSIGNED A/C	56:00	44:10	31:55	32:15	62.55	
PHOTO FLIGHTS (HOURS)	57:35	15:10	53:10	11:15	7:25	
SHOT PARTICIPATION SORTIES	0	0	9	7	3	
AIRLIFT FLIGHTS (HOURS)	—	103:05	22:40	61:35	52:50	
CARGO (POUNDS)	—	86,909	8,667	33,777	17,583	
PASSENGERS	—	387	46	321	238	
AVERAGE TIME / ASSIGNED PILOT	52:45	46:55	29:30	34:00	62:55	
LANDINGS	39	49	40	55	26	

* 22 JUNE 2 A/C

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RB-50 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	1	2	2	2 *		
IN-COMMISSION RATE	FERRY TIME ONLY	97 %	94 %	88 %		
MONTHLY FLYING TIME		73:35	62:25	94:15		
AVERAGE HOURS / ASSIGNED A/C		36:45	31:15	47:05		
PHOTO FLIGHTS (HOURS)		7:05	39:35	15:25		
SHOT PARTICIPATION SORTIES		0	6	10		
AVERAGE TIME/ASSIGNED PILOT		36:05	26:40	23:35		
LANDINGS	4	14	23	7		

* DEPARTED 11 JUNE

3. Instrument carriers, whose mission was to gather scientific data about many of the phenomena associated with nuclear detonations.

4. Photographic aircraft, whose mission was to furnish a platform from which still and motion picture photography of nuclear detonations and locations connected with nuclear testing could be taken.

During Operation HARDTACK, test aircraft flew 307 sorties on test missions and a total of 3590 hours during the entire operation.

Chapter 5 - Support Aircraft

Task Group 7.4 was charged with many support responsibilities in connection with Operation HARDTACK. Among these responsibilities were logistic support of the weather and rad-safe sites at Tarawa, Nauru, Kusaie, Kapingamarangi, Uterik, Rongelap, Wotho, Ujelang, Wake, Midway, Kwajalein, Majuro, Truk, and Guam. Airlift service had to be supplied between the principal Eniwetok Proving Ground sites of Eniwetok and Bikini and among the islands of each atoll. The logistic support furnished by MATS required the services of an air terminal organization. Responsibility for Search and Rescue operations in the Eniwetok Control Area was delegated to Commander, Task Group 7.4 by Joint Task Force SEVEN Operation Order 1-58. These support activities will be discussed in the following paragraphs.

In planning for Operation HARDTACK, it was recognized that air transportation requirements in support of the test series would be varied, and would require several different types of aircraft to carry them out. It was established that re-supply of the weather island and rad-safe sites would have to be accomplished by both four engined land based aircraft and amphibious aircraft. It was decided that the transport requirements between Eniwetok and Bikini would also be met by using four engined land based transports. Personnel transport and light cargo transportation requirements between the islands of Eniwetok Atoll and certain scientific support requirements such as rad-safe surveys and recovery of scientific instruments could best be met, it was decided, by liaison and helicopter aircraft. As a result of this planning, the book message which directed

the organization of Task Group 7.4 stated the requirement for eight (8) C-54 aircraft, eight (8) L-20s, three (3) L-19s, and fifteen (15) helicopters, either H-19s or H-21s or a combination of the two. PACAF was required to furnish three (3) of these C-54s, ARDC was to furnish two (2), and MATS three (3). The three (3) C-54s furnished by MATS were to be primarily aerial photo aircraft, but were to be used to supplement the airlift requirements. PACAF was to furnish all of the helicopters. ARDC was to furnish the eight (8) L-20s and was to arrange with the Army for the loan of the L-19s. Seven (7) SA-16 aircraft were to be furnished by MATS for Search and Rescue, and for the amphibious weather island re-supply requirement. All of these aircraft except one aerial photo C-54 were in place or arrived during March 1958.

The control of these aircraft was divided according to the primary mission each was to perform. Those aircraft which were to be primarily engaged in transport operations were placed under the control of the Test Base Unit. These included five (5) C-54s and eight (8) L-20s which were formed into the Fixed Wing Element, and the fifteen (15) helicopters, nine (9) H-21s and six (6) H-19s, which formed Detachment #1, 24th Helicopter Squadron. The Test Services Unit had control of the SA-16s which formed the Search and Rescue Element (SAR), and the three (3) MATS C-54s which were a part of the Aerial Photo Element. The SAR Element was responsible for weather island re-supply where only water landings could be made. The Aerial Photo Element C-54s supplemented the heavy transport requirements of the TBU Fixed Wing Element when their mission requirements permitted. First two, and then three of the L-20 aircraft of the Fixed Wing Element were detached to Bikini to provide airlift between NAN Island and the PETER-OBOE Island complex.

Task Group 7.4 helicopters also provided support at Bikini during the build-up phase until relieved by a Marine helicopter squadron in late January 1958.

To coordinate all airlift requirements, the Test Base Unit operated the Eniwetok Airlift Operation Office. This element was manned by civilians furnished by Task Group 7.5 and military personnel of Task Group 7.4. This element coordinated transportation requirements with the Transportation Coordinating Agent of each Task Group, and allocated space available on the various scheduled and special airlift flights. They also operated FRED Control, which was responsible for flight following and coordination of liaison and helicopter flights among the islands of Eniwetok Atoll.

The C-54 aircraft flew regularly scheduled missions between Eniwetok and Bikini and between Eniwetok and outlying sites. During the operational phase of HARDTACK, and before the cessation of activity at Bikini at least two scheduled flights a day were made between Eniwetok and Bikini, except that at the height of the build-up, three (3) flights per day were required. Weekly flights were made to Nauru and Tarawa, while monthly flights were made to Truk, Guam, Kwajalein, Majuro, Wake, and Midway Islands. Many additional flights were made to all of these sites and to other places when special requirements existed. When technical complications required that the TEAK and ORANGE shots be moved from their planned site at Bikini to Johnston Island, weekly flights between Eniwetok and Johnston Island were instituted. As this operation neared D-Day, the tempo of these flights were stepped up, and a shuttle between Johnston Island and Honolulu became necessary. From the beginning of the operational phase of HARDTACK in March 1958 until

18 August 1958, the C-54 aircraft of the Fixed Wing Element flew over 100% of their programmed flying hours. Only with the end of the operation in sight did this tempo slacken. The C-54's of the Fixed Wing Element carried 12,785 passengers and 1,882,018 pounds of cargo during the operational phase of HARDTACK. To perform these tasks they generated 2522 flying hours. During the months April through July, C-54's of the Fixed Wing Element flew more than 80 hours per month per assigned aircraft. The C-54's of the Aerial Photo Element augmented this effort by flying 1101 passengers and 160,886 pounds of cargo, which generated 294 flying hours. See Figure 14 for a summary of C-54 Flying Activities.

The only problems arising from the operation of the C-54 aircraft arose from over-flying programmed flying hours, which made it difficult to schedule the aircraft into maintenance in as orderly a fashion as might be desired, and caused a few AOCP's late in the operation.

During the build-up phases of HARDTACK, the L-20 aircraft flew a busy schedule. The principal areas of L-20 operation were between ELMER and FRED Islands in the Eniwetok Atoll and between NAN and PETER-OBOE Islands in the Bikini Atoll. Through July, a schedule of a flight every 20 minutes between ELMER and FRED beginning at 0740 in the morning and continuing until 1630 in the afternoon was maintained. As the operational phase progressed the tempo of light aircraft airlift increased and many calls for special airlift were received in addition to the regularly scheduled flights. Early in June, in response to the request of Commander, Task Group 7.1, another L-20 was assigned to Bikini making the division of aircraft five (5) at FRED and three (3) at NAN instead of the six (6) to two (2) ratio

C-54 FLYING SUMMARY
TBU & PACAF

	MAR	APR	MAY	JUN	JUL	AUG
ASSIGNED AIRCRAFT	5	5	5	5	5	5
IN-COMMISSION RATE	84%	70%	71%	82%	76%	82 %
MONTHLY FLYING TIME	443:05	436:00	443:00	405:00	527:00	268:00
AVERAGE HRS / ASSIGNED A/C	88:35	87:10	88:35	81:00	105:25	53:00
CARGO(POUNDS)	560,046	230,661	316,721	294,117	363,865	116,608
PASSENGERS	2,410	2,369	2,260	2,790	2,280	676
AVERAGE TIME / ASSIGNED PILOT	80:35	85:40	78:25	88:00	79:00	52:00
LANDINGS	295	214	290	190	244	56

FIGURE 14

that prevailed earlier. May and June were the peak months for the L-20's. In May, the L-20's flew 571 hours and 1,992 missions. These missions carried 4,128 passengers and 8,575 pounds of cargo. During the entire operation from March through August, these aircraft flew 2622 hours and carried 15,587 passengers and 45,210 pounds of cargo. See Figure 15 for a summary of L-20 flying activities.

Detachment #4 of the 24th Helicopter Squadron was enlarged from its permanent complement of four (4) aircraft to fifteen (15) aircraft for Operation HARDTACK. These aircraft performed yeoman service during the operation. The fifteen (15) were divided into a flight of six (6) H-19's and another flight of nine (9) H-21's. The H-19's were preferred for rad-safe surveys because the aircraft afforded greater protection from radiation and the H-21's were preferred for normal airlift because of their greater carrying capability. The unique performance characteristics of the helicopter made it an invaluable tool in the accomplishment of inter-island airlift at Eniwetok in support of the scientific projects. The helicopters also consistently overflew their programmed flying hours. In spite of the high maintenance cost in man-hours to produce a helicopter flying hour, the in-commission rate of these craft was very high. The average of 69 hours per month for each of the assigned H-21's for the month of May is believed to be an Air Force record for helicopter utilization.

The flow of normal scheduled traffic was smooth, interrupted only by weather. The special airlift requirements, however, were difficult during the first half of the operation due to Task Group 7.4 receiving late requests for scientific recoveries, and many other special missions,

L-20 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
ASSIGNED AIRCRAFT	8	9	9	8	8	8
IN-COMMISSION RATE	77%	73%	76%	88%	66%	74%
MONTHLY FLYING TIME	560:20	480:00	671:00	526:10	292:40	92:00
AVERAGE HRS/ASSIGNED A/C	70:00	53:20	74:35	65:45	36:35	11:00
CARGO (POUNDS)	7,871	10,736	10,561	8,757	5,635	1,450
PASSENGERS	2,759	2,436	4,128	4,963	625	387
AVERAGE TIME/ASSIGNED PILOT	57:00	62:00	65:00	65:00	59:00	33:00
LANDINGS	3,101	2,774	2,850	2,476	1,699	249

FIGURE 15

and due to act that many of the personnel of many of the scientific projects did not understand the proper channels through which to request special airlift support. Also early in April a fatal helicopter accident at night and under adverse weather conditions caused a re-evaluation of helicopter procedures which subsequently placed restrictions on night liaison and helicopter flying. This policy restricted to some extent the support many scientific projects had planned for and through misunderstanding the reasons for these operation limitations, some adverse reaction was experienced. Coordination with scientific project personnel and with supervisory personnel of Task Group 7.1 ironed out most of the difficulties and misunderstandings and during the last half of the operation support airlift activities operated very smoothly.

During HARDTACK, the H-19's flew 1262 hours and carried 6710 passengers and 57,300 pounds of cargo. The H-21's flew 2454 hours and carried 23,328 passengers and 307,150 pounds of cargo. See Figures 16 and 17 for summaries of helicopter operations.

The SA-16 aircraft of the SAR Element flew regular weekly schedules to the weather island sites of Wotho, Kapingamarangi, Uterik, Kusaie, Rongelap and Ujelang. These flight had to be made in amphibious aircraft because no airstrips were available at these sites. The SA-16 flew 1119 hours on airlift flights. These flights carried 1390 passengers and 173,701 pounds of cargo. Certain problems were encountered in this operation but they will be discussed in the portion of this section devoted to the SAR Element.

The three (3) L-19 aircraft were used primarily as executive transports. Two (2) were based at Parry Island and reserved for use of Joint

FIGURE 16

H-19 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
ASSIGNED AIRCRAFT	6	6	6	6	3	3
IN-COMMISSION RATE	73%	73%	76%	78%	65%	30%
MONTHLY FLYING TIME	340:00	261:20	280:20	217:20	139:25	25:00
AVERAGE HRS/ASSIGNED A/C	56:40	43:35	46:45	36:15	46:25	8:00
CARGO (POUNDS)	11,700	10,900	13,400	13,200	4,100	4,000
PASSENGERS	1,456	1,608	1,138	1,851	573	84
AVERAGE TIME/ASSIGNED PILOT	71:00	65:00	51:00	40:00	45:00	8:00
LANDINGS	1,418	958	1,156	1,110	565	120

H-21 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
ASSIGNED AIRCRAFT	9	9	9	9	8	8
IN-COMMISSION RATE	74%	73%	70%	76%	69%	52 %
MONTHLY FLYING TIME	382:55	473:30	619:55	451:55	300:55	225:00
AVERAGE HRS/ASSIGNED A/C	42:35	52:35	68:50	50:10	37:35	28:00
CARGO (POUNDS)	82,300	41,500	61,200	40,150	24,000	58,000
PASSENGERS	3166	4,509	5,608	3,732	3,113	3,200
AVERAGE TIME/ASSIGNED PILOT	73:00	67:00	85:00	30:00	30:00	18:00
LANDINGS	2,540	2,808	4,143	2,406	1,945	1,557

Task Force SEVEN staff officers, while one (1) was based at Eniwetok and used by Commander, Task Group 7.4 and certain senior staff officers. See Figure 18 for a summary of L-19 flying activities.

Seven (7) SA-16 aircraft were required for the SAR and weather island re-supply mission. The Air Rescue Service of MATS was required to furnish the aircraft and personnel for this effort. The nucleus of this organization was the 64th Air Rescue Squadron, based at Norton AFB, which furnished five (5) of the aircraft. Two (2) others were furnished by the 2nd Air Rescue Group, operating in the Pacific area, one coming from Clark AB and the other from Naha AFB. Two of these aircraft arrived during February and the other five arrived at Eniwetok during March.

The SA-16 aircraft flew SAR cover for all of the nuclear detonations in the HARDTACK test series held at the Eniwetok Proving Ground. The operational policy was established that the SAR aircraft would be airborne prior to the take-off of the first mission aircraft and would remain airborne until after the last mission aircraft had landed.

The SA-16 aircraft have also filled in with special missions when other aircraft capability was short. Instances are the airlift of important persons to Bikini and, of special significance, a flight to Rabaul, New Britain with a flight surgeon and nuclear research specialists to look into the alleged radiation contamination of a Japanese vessel.

During HARDTACK the SA-16's flew 2168 hours. These flying hours have involved 79 orbit missions during nuclear test events, five (5) escort missions, 17 intercept missions of aircraft in distress, ten (10) Search and Rescue missions, twelve (12) medical evacuation missions,

L-19 FLYING SUMMARY

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	3	3	3	3	3	3
IN-COMMISSION RATE	70%	93%	96%	98%	84%	92%
MONTHLY FLYING TIME	124:00	121:00	138:00	103:00	62:00	20:00
AVERAGE HOURS/ASSIGNED A/C	41:20	40:20	46:00	34:20	20:40	N A
LANDINGS	904	562	541	391	287	67

FIGURE 18

and other s l missions. The details of the island resupply flights were discussed in the section devoted to airlift. See Figure 19 for a summary of SA-16 flying activities.

When the SA-16 aircraft first arrived in the Eniwetok Proving Ground, the mooring buoys at several of the weather island sites were unusable or in such a state of disrepair as to make their use hazardous. Immediate action was taken to replace or repair these buoys. In future operations care should be taken to see that these buoys are in operable condition prior to the beginning of operations.

Another problem arose in the availability of the Ponape homing beacon. This beacon was originally only turned on on request and operated only for a short time while the aircraft was in transit to Kapingamarangi and not turned on again until one (1) hour prior to the estimated time of return of the aircraft from Kapingamarangi. On one occasion, a flight was forced to return early to Ponape due to loss of all other navigational equipment and bad weather in the Kapingamarangi area. High frequency communication with Ponape radio was lost. The flight back to Ponape on this occasion was uneventful but had bad weather prevailed at Ponape it is doubtful that the SA-16 could have made a landing in a sheltered area and would have been forced to make a dangerous open sea landing due to fuel exhaustion. This situation was corrected through coordination with the District Administrator of Ponape. This same type of coordination should be effected at the earliest time or prior to the beginning of another test program in the EPG.

A limiting factor in SA-16 flights to resupply weather islands was the gross weight factor for water landings and take-offs. It was necessary

SA-16 FLYING SUMMARY

* 6 Aircraft Departed 10 Aug
1 Aircraft Departed 15 Aug

	MAR	APR	MAY	JUN	JUL	AUG
AIRCRAFT ASSIGNED	7	7	7	7	7	7 *
IN-COMMISSION RATE	81%	80%	81%	78%	84%	85%
MONTHLY FLYING TIME	556:10	368:45	392:25	370:45	425:00	56:00
AVERAGE HOURS/ASSIGNED A/C	79:25	52:40	56:05	52:55	60:40	8:00
RESUPPLY FLIGHTS (HOURS)	180:35	230:00	228:35	185:50	260:25	32:50
CARGO (POUNDS)	16,885	39,004	41,500	34,506	36,287	5,519
PASSENGERS	185	288	306	259	314	38
SHOT PARTICIPATION SORTIES	0	1	12	13	9	2
AVERAGE TIME/ASSIGNED PILOT	83:25	46:25	51:55	47:40	52:00	8
SAR ALERTS-INTERCEPTS	1	3	3	6	6	1
LANDINGS	317	208	223	212	234	9

FIGURE 19

to operate t.. ..-16's at maximum gross water landings and take-off weights on most of the flights to these sites. This was necessary to insure sufficient fuel for return flights and still carry enough pay load to make the flights practical. Continued operation under these conditions caused severe maintenance problems and caused two (2) of the aircraft to be returned for depot maintenance prior to completion of the test series.

During the NEWSREEL phase of HARDTACK, SC-54 aircraft and crews of the 76th Air Rescue Squadron based at Hickam AFB assumed SAR responsibility at Johnston Island. One (1) SC-54 aircraft was kept at Johnston Island during the build-up and operational phases of NEWSREEL. Usually, the aircraft and crews were rotated on a weekly basis. These aircraft participated in all practices and rehearsals and were airborne during the TEAK and ORANGE events.

An additional air support function required by the operation was the movement of personnel and cargo into and out of the Eniwetok Proving Ground by MATS. Although not under the operational control of Task Group 7.4, MATS was supported by the Air Terminal Element, Test Services Unit, which provided the terminal services requirements. Their responsibilities included the on-loading and off-loading of passengers and cargo, maintenance and refueling of aircraft and crew control and flight planning. As the heavy flight schedules resulted in aircraft arrivals and departures at all hours, this support function was an around the clock operation. At the peak of the testing series, during a one (1) month period, over 200 inbound and outbound flights were serviced while handling nearly 2,000,000 pounds of cargo and 2,500 passengers.

Another important phase of this element's responsibilities was the handling of the sample return aircraft.

For each nuclear detonation at least three (3) C-97 aircraft were in place at Eniwetok to return samples collected by the scientific projects to locations within the United States. Due to shot postponements, aircraft at times were detained at Eniwetok and an additional workload was imposed upon this element to keep the aircraft in flyable condition. These sample return aircraft were in excess of the normal MATS flights used for personnel and cargo airlift and occasionally there were as many as twelve (12) aircraft at one time being maintained by the Air Terminal Element. Limited working space, overcrowded parking ramps, additional aircraft maintenance caused by high humidity and salt spray and a small number of specialists available for trouble shooting contributed towards making the Air Terminal Element one of the busiest sections in the Task Group.

During the period starting 1 March and ending 18 August 1958, the element serviced 498 inbound and outbound flights while handling 13,181 passengers and 28,097,017 pounds of cargo. See Figure 20 for a summary of this element's activities.

In order for operational units to perform their missions they must always be supported by auxiliary units. Operation HARDTACK was not different in this respect and some of the success of the largest nuclear test series yet performed is owing to this support. The airlift supplied by the aircraft and elements discussed above placed men and materiel in the proper place at the right time. The airlift elements were called on for

FIGURE 23

MATS AIRLIFT

	FEB	MAR	APR	MAY	JUN	JUL	AUG	TOTAL
NO. OF FLIGHTS	—	91	82	95	105	80	45	
INBOUND PASSENGERS	—	2,464	986	656	668	731		
INBOUND CARGO (POUNDS)	—	9,800,400	10,721,900	472,936	960,410	417,574		
OUTBOUND PASSENGERS	—	471	877	1,670	1,638	1739	1281	
OUTBOUND CARGO (POUNDS)	—	166,226	3,269,116	524,512	848,740	412,235	489,965	

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a greater measure of support than they had been programmed. From beginning to the end of the operational phase of HARDTACK the five (5) C-54 aircraft of the Fixed Wing Element flew more than 100% of programmed flying hours. The helicopters, particularly the H-21's, are believed to have set an Air Force record for monthly utilization per assigned aircraft during this period. Search and Rescue served well in their dual role of providing protection for distressed aircrews and amphibious airlift services and were always the first aircraft airborne and the last to land from a nuclear test array. The Air Terminal Element furnished the terminal service , both traffic and maintenance wise that was necessary to keep the air logistic function operating on schedule. These elements made an essential contribution to the operation.

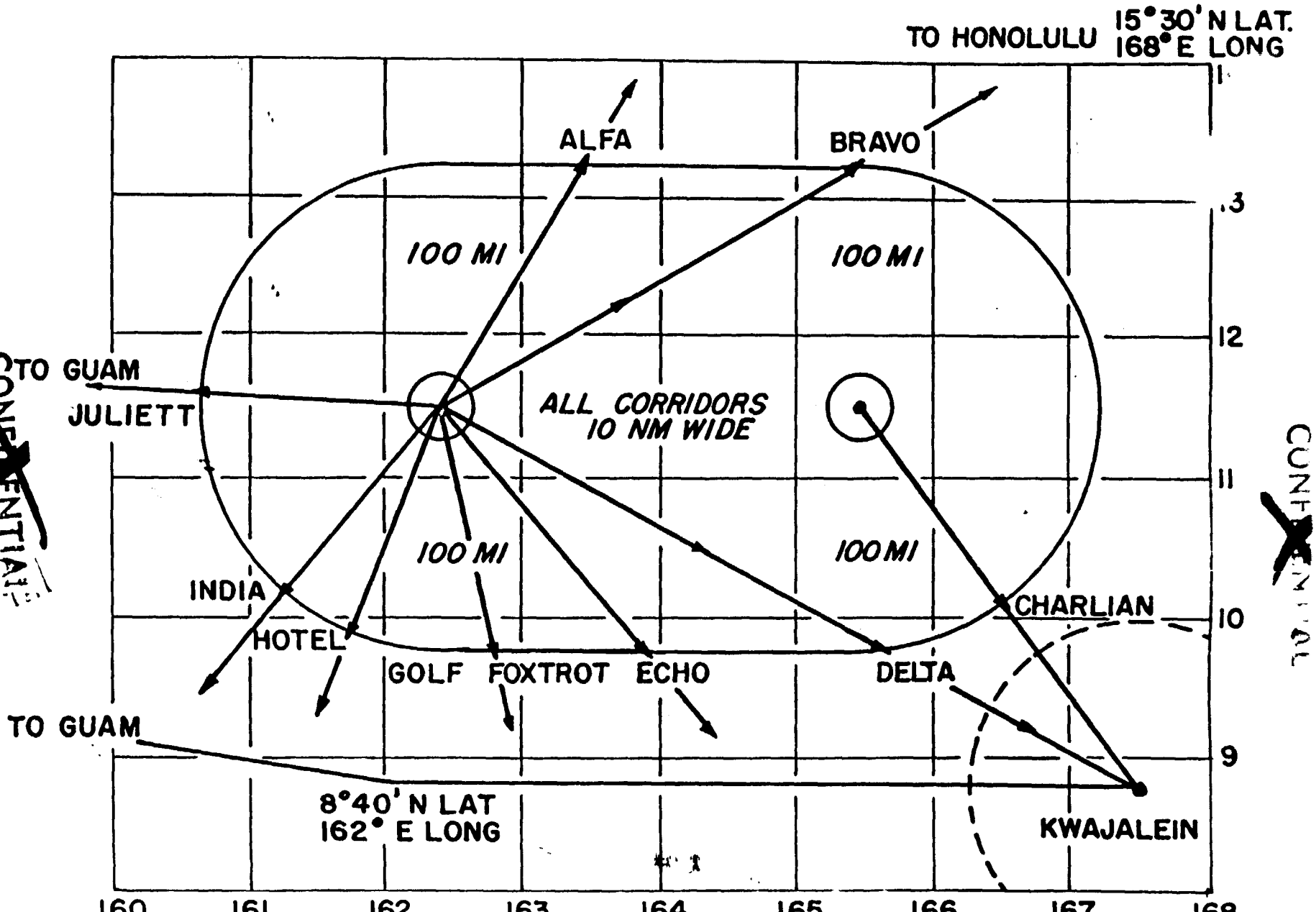
Chapter 6 - Aircraft Control

In Operation Order 1-58, dated 1 October 1957, Commander, Joint Task Force SEVEN delegated to Commander, Task Group 7.4 the responsibility for control of all aircraft flying in the Eniwetok Air Control Area. Aircraft flying within this area fell into three (3) categories: Test aircraft participating in test detonations, Joint Task Force SEVEN aircraft flying locally and aircraft entering or departing the area. These aircraft categories posed three (3) different control problems, which will be discussed in this chapter.

Task Group 7.4, in conjunction with the AACS and representatives of CAA at Honolulu and Wake, set up an air control area around the Eniwetok and Bikini Atolls. (See Figure 21) Control of traffic within this area was exercised by Task Group 7.4.

To handle the three (3) types of control mentioned above, there were set up within the Eniwetok Control Area three (3) different controlling facilities. These were the Eniwetok Air Operations Center, which was the master control center; a subsidiary control center aboard the USS BOXER and precise positioning control facilities using MSQ-1A and M-33 radar equipment in vans.

The Eniwetok Air Operation Center (EAOC) was established on 8 March 1958 and assigned the mission of controlling the movement of all aircraft in the Eniwetok Control Area on a 24 hour a day basis throughout the test period. This center served also as the Command Post for the Task Group Commander during test events. Aircraft were controlled by Officer Intercept Controllers (AFSC 1641-1644) utilizing the AN/USQ-12 positioning



ENIWETOK CONTROL AREA

equipment. In addition to the normal control facilities, the Intercept Controllers were aided in the AOC by Approach Controllers and a Search and Rescue Center.

The Bikini AOC was established aboard the USS BOXER on 11 March using the regularly installed radar and IFF gear aboard this aircraft carrier operated by Air Force Controllers. This control center was used for primary control on test events in the Bikini area and as an adjunct to the Eniwetok Operations Center to control transient aircraft and aircraft flying locally in the Bikini Area.

The MSQ-1A and the M-33s were used for positioning the effects aircraft on practice missions and test events. The ability to position aircraft within a matter of feet or tenths of a second on test events with these radars was necessary because of the criticality of the position of these aircraft at H-Hour and the need for very accurate after the fact information in order to interpret properly the effects data obtained.

While the effects aircraft were controlled and placed in proper position by the MSQ-1A and the M-33 radars, controllers in the AOC monitored the progress and positioning of the aircraft visually on their radar scopes and aurally on the aircraft's individual UHF control channel. To aid in this monitoring the controller drew the aircraft flight path submitted by the project personnel on his scope indicating time check points, abort points and track, and position of last possible abort. By closely monitoring the progress of the aircraft along this flight path, constantly checking its actual position versus its planned position at any time check point and knowing its make-up capability, the controller could advise the Commander as to the momentary position of the aircraft and suggested course of action. If, at any time, it became apparent that the aircraft could not be in proper position, the

commander was in position to divert it to a safe position and inform the Task Force Commander.

Aircraft whose positions were not as critical as the effects aircraft were directed to a pre-planned H-Hour orbit by the Air Operations Center Controller and timed around this orbit in order that they might be at the pre-determined H-Hour position at time of detonation. These aircraft were positioned by the Air Operations Center Controllers in much the same manner as the Controllers monitored the effects aircraft with the use of a pre-planned orbit and definite time check points. Since the effects of the detonation on these aircraft was not considered critical, they had no abort procedures; however, the positions had to be accurately maintained in order for them to receive the desired test results. This category of aircraft included Search and Rescue (SAR) aircraft, sampler controller aircraft, photographic aircraft and instrument carriers.

During the last six (6) minutes prior to a detonation the Commander of Task Group 7.4 kept a constant check on the accurate positioning of all aircraft in the test array. During this period he was in constant touch by "hot line" with the Commander, Joint Task Force SEVEN and the firing party. The Commander, Task Group 7.4 kept the Commander, Joint Task Force SEVEN and the firing party briefed on the safety of the aircraft positions. If necessary, this "hot line" was also his method for obtaining information about shot delays or cancellations.

Methods of control in the Bikini Air Operations Center aboard the USS BOXER were the same as those used in the Eniwetok Air Operations

Center, except that for Bikini events the launching and recovery of aircraft from Eniwetok was handled by the Eniwetok Air Operations Center. Control of the aircraft passed from one center to the other at a point approximately 100 miles east of Eniwetok. Additionally, information was relayed between the Commander, Task Group 7.4 in the Eniwetok Air Operations Center and his representative aboard the USS BOXER.

The control of Task Group 7.4 aircraft flying locally on non-shot days was exercised by the controllers in the Eniwetok Air Operations Center, assisted by Air Force Controllers operating in the Bikini Air Operations Center.

To carry out the responsibility of controlling aircraft entering and departing the Eniwetok Control Area it was necessary to make an agreement with Kwajalein on procedures to be followed in the transfer of control of aircraft between Kwajalein and the Eniwetok Air Operations Center. Additionally, the Wake FIR was extended southward to border on the Eniwetok Control Area and therefore similar arrangements had to be made with the CAA authorities at Wake. To insure control of all aircraft entering the area, it was stipulated that aircraft would not enter it until specific clearance to do so had been received from the Eniwetok ACC either direct or by relay through the Kwajalein Area Control Center or the Wake CAA Center.

To insure safety of crews and passengers from possible flash blindness or other effects of a detonation in case of radio failure on the aircraft, and to allow aircraft to clear to Eniwetok from distant stations like Hawaii and Guam on a D-1 Day, a NOTAM was issued to all

concerned requiring aircraft to clear for either Wake or Kwajalein with possible diversion to Eniwetok from a specified point outside the control area. This procedure proved satisfactory and allowed uninterrupted MATS service to Eniwetok during the entire test series.

Chapter 7 - [illegible]ications

Communications for Operation HARDTACK were planned and installed to provide: essential air navigational aids for safe and efficient operation of aircraft; rapid and dependable communications with agencies both outside and inside the Test Area; control and precision positioning of all aircraft participating in a test event. Other factors which had to be evaluated in planning communications and electronics (C & E) facilities were the heavy atmospheric radio noise on high frequencies, the very humid climate and the highly corrosive atmosphere present in the EPG.

During Operation NEWSREEL aircraft were controlled over a much greater range than during previous tests. This control situation was complicated by the complete loss of all sky wave radio propagation which occurred simultaneously with detonation of the high altitude devices. A more complete discussion of all Task Group 7.4 communications is presented in the following paragraphs.

The responsibility for providing and operating all ARTC communications and air navigational aids for Task Group 7.4 was delegated to the AACS Communications Element. ARTC traffic for flights outside the test area was transmitted to Kwajalein Center using one (1) voice circuit on the high frequency single side band system. Early difficulties in maintaining contact on this circuit made it necessary to establish a back-up radio circuit from Eniwetok Approach Control to Kwajalein Center. Air route traffic for weather islands, such as flight plans for resupply aircraft was transmitted through the Weather Island "Weather and Rad-Safe" net.

Air navigational aids consisted principally of a system of low frequency homers, supplemented by a GCA and TACAN at Eniwetok. The low frequency homers were located at Bikini, Eniwetok, Kapingamarangi, Uterik, and Kusaie.

The GCA at Eniwetok was an AN/UPN-11B incorporating modern radar developments such as moving target indicator and circular polarization for improved weather penetration. This facility provided valuable assistance particularly when working with the AOC in recovering jet effects aircraft after a test.

The TACAN set located on Sand Island operated without difficulty. This aid could only be utilized by the B-57B samplers and the Navy effects aircraft.

The Air Operations Center (AOC) at Eniwetok was responsible to the Task Group Commander for the safe positioning of all aircraft in the test array. To accomplish this mission, the AN/USQ-12 manufactured by the Hazeltine Corporation was employed. This facility was able to see and present the relative positions of aircraft at all times during a test operation. Basic components are eight (8) UPA/35 sccpes, 12 channels of UHF communications and associated hot line telephone systems. Seven air controllers may operate the equipment simultaneously. (The UHF transmitters and receivers are located in separate vans and operated through telephone tie lines). The AN/USQ-12 was not considered adequate for some of the precise positioning necessary for the effects program. Primary positioning of effects aircraft was in most instances conducted by the MSQ-1 or M-33 radars monitored by the AOC. Each effects aircraft required a clear UHF channel to its assigned positioning radar thereby seriously reducing the number of channels available for AOC operation.

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This inconvenience was overcome by the modification of the AOC communications console so that each controller could monitor any combination of all 12 UHF channels.

The Air Operations Center at Bikini was originally established on board the USS BOXER. Later the BAOC function was transferred to the Destroyer USS BENNER. UHF communications and the number of scopes available were sufficient but despite maximum cooperation and effort by Navy communications personnel, some important navigational aids such as TACAN and the homing beacon were either out for maintenance or unable to transmit due to interfering with scientific projects. The AOC and the BAOC utilized a hot line for coordinating aircraft movements and operations. This circuit was backed up by a high frequency circuit which was not completely satisfactory. The primary difficulty with this circuit was due to the low power being radiated by the BOXER's high frequency transmitter.

The telephone cable in the outside cable plant at Eniwetok was installed in a haphazard manner. The existing facilities were supplemented for each succeeding operation without a firm expansion plan. Also most all cables in use had at least 10% bad pairs as a result of electrolytic action. This shortage caused concern as to whether or not ample pairs would be available for the "hot line" telephones in the AOC and lines for control of the remote UHF transmitters located at building 638. It was necessary to modify 13 UHF transmitters to reduce the number of telephone lines required prior to their becoming operational. After modifying the equipment, satisfactory communications were established.

All requests for telephone service from units of Task Group 7.4 could not be fulfilled due to the non-availability of telephone cable pairs in some areas. A new 202 pr. cable programmed to run from Bldg. 90

to the main exchange was not installed and information was received that it would not be ready until some time in August. This shortage necessitated the implementation of controls over the number of telephones that could be installed in saturated areas. In most instances during the critical period, telephone extensions were added rather than installing new services.

Teletype and crypto facilities were provided on a joint basis as were all long distance point to point communications. The AACS Communications Element operated the Task Group 7.4 portion of these circuits and the teletype communication center in Building 90. Telecommunications with SMAMA were conducted on a weekly schedule with very little difficulty.

Communication and Air Control Facilities on board the USS BOXER were used by TG 7.4 for air communication and aircraft control during Operation NEWSREEL.

Original requirements for Task Group 7.4 Communications included the use of a voice telephone circuit from the CIC on the USS BOXER to Hickam AFB. This circuit could not be established since the USS BOXER was moved beyond the range of the AN/TRC UHF equipment for operational reasons. The loss of the AN/TRC equipment left only one high frequency single side band (SSB) telephone circuit from the USS BOXER to the Command Post on Johnston Island.

At our request Hickam Airways joined our HF net and satisfactory communications were maintained, during most of the test periods.

Aircraft participating in these tests were dispersed over a much wider area than on previous operations. Five of the test aircraft were more than 200 miles from the USS BOXER and three (3) high frequency circuits were necessary to control these aircraft. At the time of

detonation of the high altitude device all high frequency sky wave radio propagation was lost. No contact with Hickam Airways was possible and considerable difficulty was encountered in passing information to and from aircraft within range of ground wave signals due to the high atmospheric noise level. The HF equipment on the USS BOXER was World War II type equipment and could only radiate 100 watts of RF. This low power was not considered adequate for the net control station for dependable aircraft control.

Communications facilities in the EPG fall into two (2) distinct categories. They are, first the permanent facilities that remain operational throughout the interim period such as control tower point to point and the homer at Eniwetok. In the second area are weather Island faciliities, Eniwetok GCA, TACAN. To establish the facilities in the second category the material and manpower of the 1st AACS Mobile Squadron located at Johnson AFB, Japan were used by the AACS Communications Element. This organization must maintain a mobile capability and is well suited to establish these facilities on a mission basis.

The AN/USQ-12 air control system functioned without any major difficulty and was able to present and record by means of scope photographs of aircraft positions for all tests at Eniwetok. The USS BOXER although lacking in dependable high frequency radio voice communications maintained UHF and IFF contact with aircraft participating in Bikini Events.

The Eniwetok outside cable plant is in need of complete rehabilitation. The increasing demands for telephone and intercommunication service has far exceeded the number of operational cable pairs particularly in areas adjacent to the airstrip.

The e: of the radio black out which occurred simultaneously with detonation of the high altitude device must be considered in all future operations where similar conditions may be encountered.

Chapter 8 - Radsafe and Blast Damage Responsibilities

A rigorous program was conducted throughout HARDTACK to insure maximum data gathering support without sacrifice of human safety. This program dealt chiefly with the radiological safety of personnel but also embodied considerations of possible damage to equipment from blast, heat and water wave action. The program included the following:

1. Dosimetry for Task Group 7.4 personnel.
2. Pre-shot planning.
3. Cloud sampling.
4. Sample return.
5. Post-shot monitoring

The most difficult problem in this area was the control of exposure to radiation of air and ground crews associated with the nuclear cloud sampling program. In the end it was necessary to obtain replacement personnel in order not to exceed maximum permissable exposures on large numbers of people in this program.

Dosimetry provided for continuous monitoring of the exposure of each HARDTACK participant to ionizing radiation through the use of a film-badge. These film-badges were issued to all personnel and at a frequency dictated by the personnel's duties. Men engaged in activities not requiring regular exposure to radiation were issued film-badges at six (6) week intervals, while personnel working in hazardous environments received film-badges as often as twice weekly. The badges were collected and read and bi-weekly reports were published listing the total radiation exposures. Through this means, the radiological health of all personnel could be monitored and

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exposures exceeding the maximum permissable precluded.

Pre-shot safety planning was accomplished for each event to insure that men, material and facilities would not be subjected to avoidable hazards. Of prime consideration was the threat of radioactive fall-out resulting from the detonations. Prior to each test event a predicted fall-out area was established and only when this area was clear of inhabited locations was the detonation executed. Of the shot delays encountered during Operation HARDTACK, more than ninety per cent were due to undesirable fall-out indications. These fall-out areas were posted in the Air Operations Center so that controllers could keep aircraft clear of the danger areas. Pre-shot planning also dealt with damage predictions concerning blast, heat and water action. On two (2) events at Eniwetok and one (1) event at Bikini it was necessary to evacuate liaison type aircraft to preclude blast damage and on one (1) event it was necessary to require complete body covering for all personnel to preclude the possibility of burns. A constant program was pursued to insure that no one observed detonations with his naked eyes. The possibility of retinal burns constituted a continual threat through the entire operation. Through damage predication and the precautionary measures dictated by these predictions, no unplanned damage occurred to aircraft and only minor damages were inflicted on base facilities.

The most difficult Task Group 7.4 radiological problems of the operation existed in the support of the cloud sampling program. Prior to the operation and based on the scheduled number of detonations planned for HARDTACK, maximum permissable exposures of ten (10) roentgens equivalent man (rem) for cloud sampling and effects aircrews and five (5) rem for all

other personnel were established by the Commander, Joint Task Force SEVEN. As the test series progressed, additional events were introduced and the personnel exposures mounted rapidly toward the established maximum. Not only the aircrews but the aircraft maintenance personnel and the crews who recovered and packaged the collected samples were approaching their exposure limits. To alleviate this problem, the Commander, Task Group 7.4 requested and was granted permission to extend the maximum exposure limit of the maintenance and sample recovery crews from five (5) rem to eight (8) rem and ten (10) rem respectively. No extension beyond ten (10) rem was authorized; so additional cloud sampling aircrews were obtained and selected flying personnel at Eniwetok were trained to perform the duties of cloud sample observers. By careful scheduling of all cloud sampling aircrews and support personnel it was possible to complete the operation with no serious cases of over exposure. (See Figure 22 , Chapter 8, "Exposure of TAU Nuclear and Maintenance Personnel to Ionizing Radiation", and Figure 5, Chapter 4, "Cloud Sampler Aircrew Exposure".)

In support of the rapid delivery of radioactive cloud samples to laboratories in the Zone of the Interior, military couriers were instructed and briefed by the Task Group 7.4 Nuclear Research Officer, who also monitored the loading and securing of the samples aboard the return aircraft. He also established an isolation area within each of the sample return aircraft to insure the safety of the passengers and crew. This isolation area was established by marking the cargo floor of the aircraft at a location between the cloud samples and the passengers where the radiation intensity was ten (10) milliroentgens per hour. Personnel remaining outside this line could expect to receive no more than one (1) weeks tolerance dose of

SECRET

IONIZING RADIATION EXPOSURES

Test Aircraft Unit Nuclear Applications Personnel: *

1 April - 1 August 1958

[redacted]	6576 mr
[redacted]	8293 mr
[redacted]	3776 mr
[redacted]	6983 mr
[redacted]	4579 mr
[redacted]	4038 mr
[redacted]	1009 mr
[redacted]	3173 mr
[redacted]	2276 mr
[redacted]	7310 mr
[redacted]	0058 mr
[redacted]	2731 mr
[redacted]	3378 mr
[redacted]	2452 mr
[redacted]	6763 mr
[redacted]	6645 mr
[redacted]	2786 mr
[redacted]	7225 mr
[redacted]	7132 mr
[redacted]	7145 mr
[redacted]	0556 mr
[redacted]	3107 mr
[redacted]	3888 mr

PRIVACY ACT MATERIAL REMOVED

PRIVACY ACT MATERIAL REMOVED

* HARDTACK Maximum Permissable Exposure: 10,000 Milliroentgens.

FIGURE 22A

[redacted]

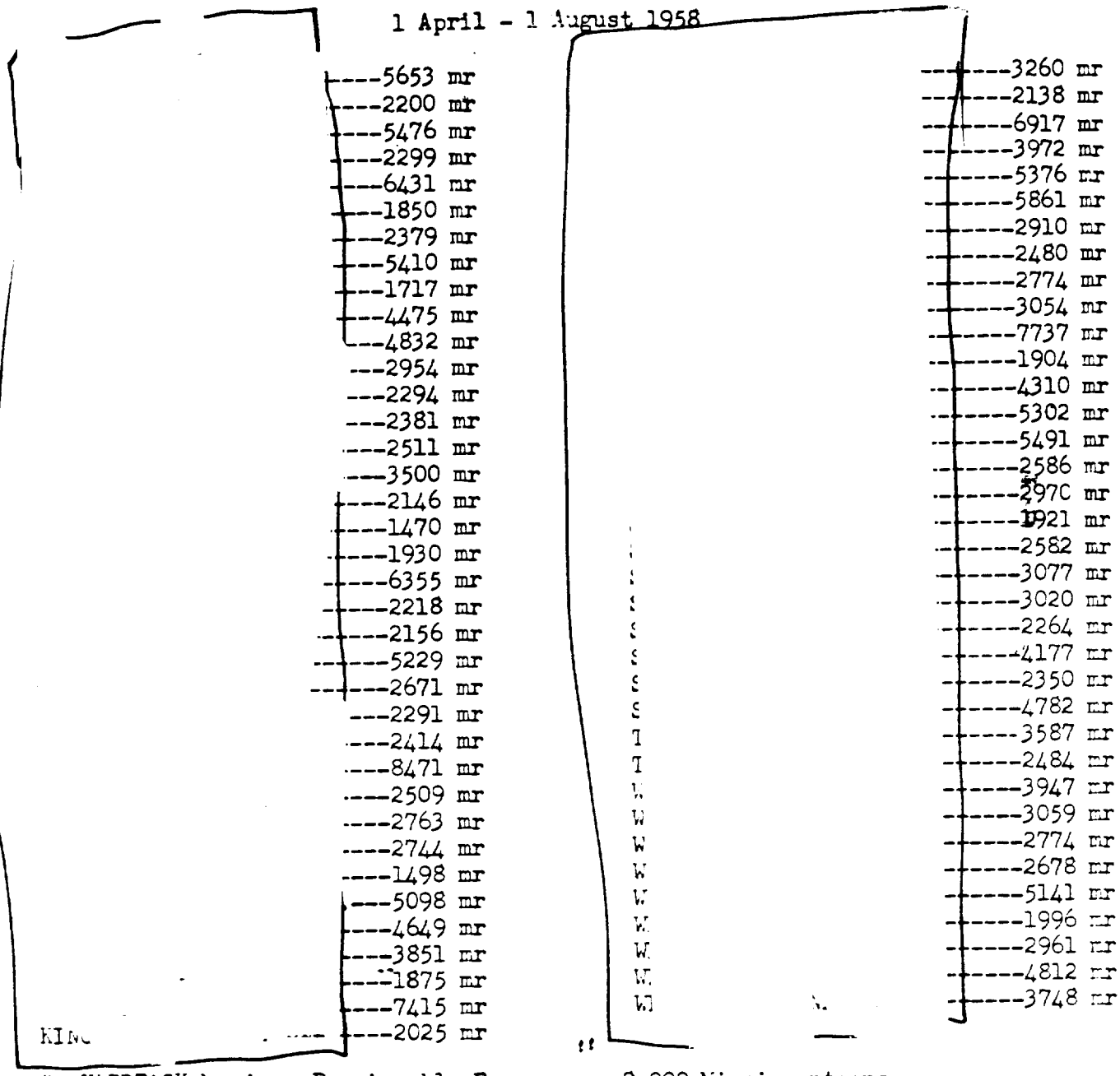
SECRET

IONIZING RADIATION EXPOSURES

PRIVACY ACT MATERIAL REMOVED

T·s: Aircraft Unit Aircraft Engineering Personnel:*

1 April - 1 August 1958



* HARDTACK Maximum Permissable Exposure: 8,000 Milliroentgens.

PRIVACY ACT MATERIAL REMOVED

FIGURE 22B

[redacted]

radiation during the approximately thirty hour flight.

Post shot monitoring was accomplished by various activities within the Task Group to insure the earliest possible detection of radioactive fall-out or damage produced by the detonations. Rad-safe teams conducted island monitoring on Eniwetok immediately following each event and continued their checks for forty-eight hours or until the danger of fall-out had passed.

Task Group 7.4 provided personnel to man four (4) off-atoll weather rad-safe sites. These sites at Kuasie, Kapingamarangi, Nauru and Tarawa maintained a continuous fall-out surveillance program to insure earliest possible detection of this hazard. The personnel assigned to these sites were trained in the United States and were selected carefully to insure a favorable relationship with the native population. Their equipment included a continuously recording geiger instrument and they submitted periodic radio reports concerning their observations. There were no cases of adverse fall-out encountered during the test series. Monthly inspection visits were made to these rad-safe activities to assist with instrument maintenance and calibration and to evaluate the collected data.

All multi-place aircraft flying in the Eniwetok area during or within twenty-four hours following an event were provided with a Rad-Safe Monitor whose duty was to keep the aircraft commander advised concerning radiation encountered on the flight. Those aircraft positioned in the test array were required to radio their safe condition immediately following shock wave passage.

Approximately one (1) hour after each detonation a helicopter was dispatched to transport a rad-safe re-entry team to or near ground zero to

establish a safe time for personnel to recover instruments and test data near the burst. At about six (6) hours after the detonation a second helicopter transported a rad-safe team around the shot atoll to accomplish a more detailed radiation check and to assess the damage to airstrips and helicopter pads.

Following test events, all aircraft returning to Eniwetok which could possibly be contaminated were monitored and those requiring decontamination were isolated. The aircrews were immediately sent to the personnel decontamination center, checked thoroughly and decontaminated when necessary. Contaminated aircraft were allowed to decontaminate themselves in isolation by radioactive decay when time permitted. This technique insured a minimum of radiation exposure to the decontamination personnel since the contamination intensities approximately halved themselves each seven (7) hours. After decay the remainder of the contamination was removed from the aircraft through normal washing with chemicals, water and high pressure hoses.

Many activities under Task Group 7.4 participated in the accomplishment of a successful and a safe nuclear test. Through the planning and administering of a conservative yet realistic radiological safety program, Operation HARDTACK was completed with no radiation injuries occuring within Task Group 7.4

The photographic program during Operation HARDTACK necessitated support from two (2) different sources. Documentary photography was accomplished by a provisional unit formed by military and civilian personnel from the 1352nd Motion Picture Squadron, Lookout Mountain Air Force Station, Los Angeles, California. The 1370th Photo Mapping Squadron (APCS-MATS) West Palm Beach, Florida, provided and operated three (3) C-54 and two (2) RB-50 aircraft to support airborne documentary and technical photography. The three (3) C-54's, two (2) RB-50's and assigned supporting personnel composed the Aerial Photo Element Provisional. (Reference Chapter 4.)

The Documentary Photography Element was responsible for continuing documentation of HARDTACK. This photographic effort provided motion picture photography for Field Command, Armed Forces Special Weapons Project (FC/AFSWP)(Military effects of Operation HARDTACK) and stock footage for the Department of the Navy and Army. Coverage for the AEC consisted of color transparencies, black and white still negatives of all detonations plus stills on the assembly and instrumentation of four (4) test devices. For the Air Force, selected sequences of the operation were photographed in 35 mm color using cinemascope lens technique.

The most extensive coverage by far, was that given to the WAHOO and UMBRELLA events. For WAHOO event, forty motion picture and still cameras manned and remote, in the air, on the ground and at sea were used. Documentary Photographic Element cameramen also operated the technical photographic camera racks on all three (3) C-54 aircraft. All camera equipment operated satisfactorily with only two (2) camera failures

which did not affect the overall documentation. A total of 7,500 feet of 35 mm Eastman Color Negative was exposed on this event.

The UMBRELLA event was the element's biggest effort during the entire operation. All available cameramen operated forty-four cameras of all types in the air and on the ground. For this event, documentary photo cameramen operated technical photo cameras mounted in the C-54's. All camera equipment operated satisfactorily, except one set of remote cameras in place on HENRY Island (MUI). These cameras were equipped with 17 inch lenses directed on three (3) target destroyers. Failure of these cameras to operate was due to a malfunction of their own electronic time circuit. The EGG signal tripped and operated the relay system satisfactorily but camera motor relays failed to respond.

Camera failure on HENRY Island (MUI) did not affect the overall documentation. Back up remote cameras on GLENN Island covered a portion of the test destroyers with excellent results. It was later determined that the HENRY Island sensitized stock loaded in magazines atop the remote cameras received sufficient fallout to ruin the film. A total of 8,359 feet of 35 mm Eastman Color Negative was exposed for this event.

Positioning of aircraft to provide aerial photography of the UMBRELLA and WAHOO were practically identical. One (1) RB-50 flew a race track pattern directly over surface zero at 25,000 feet, positioned to be 1,000 feet short of surface zero at Time Zero. The second RB-50 was positioned ten miles Northeast of surface zero at 2,500 feet and following detonation, turned into the water spray column. Two (2) photo C-54's were positioned Northwest of water zero at 20,000 feet horizontal

range, one (1,500 feet, the other at 10,000 feet. The third photo C-54 was positioned 20,000 feet Southwest of water zero at 9,000 feet. By this means, complete aerial photo coverage was effected.

On 22 June 1958, Project NEWSREEL documentation began at Johnston Island and by 22 July 1958, 70 per cent of all participating programs had been documented. Remote camera installations for motion picture and still photography were positioned and ready for rehearsal and functioned satisfactorily on shot events. Element camera teams documented activities at Waikele Branch, Naval Ammunition Depot, Oahu during the period 11, 12, 13, and 14 July 1958. Participating programs at Hickam Air Force Base, Wheeler Air Force Base, and Barbers Point Naval Air Station were documented during the period, post TEAK event. Four (4) K-24 type cameras with a supply of Ektachrome were positioned near launch pad for technical evaluation purposes as requested by AEC/A.

In addition to the required coverage for Operation HARDTACK and Project NEWSREEL events, considerable effort was expended in obtaining, for the Bureau of Ships, Department of the Navy, realistic action pictures for their own production, "Nuclear Defense at Sea". This effort required the positioning of cameramen on board four (4) destroyers, and covered various phases, such as gun crews manning battle stations, monitoring and decontamination teams in operation, washdown systems in operation, and operation of a rad-safe center on board the USS RENVILLE. In addition to the realistic action pictures, physical damage to destroyers, submarines, squaw and liberty ship were documented in detail wherever possible.

Aerial Documentary Photographic coverage of Operation HARDTACK was not as extensive as that required in previous operations. Prior to

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HARDTACK, each event was photographed from the air. During HARDTACK only nine (9) events were photographed from the air; seven (7) of which were of interest to the AEC and two (2) of interest to the DOD. A total of thirty-five (35) aerial photographic missions were flown.

Chapter 10 - Typical Nuclear Test Event

The following pages illustrate the preparation and execution of a typical nuclear test event from the standpoint of Task Group 7.4 Operations. The ROSE Event was selected for portrayal. The test will be covered from the preparation of the operation order to the debriefing and critique after the last aircraft had landed.

The test aircraft participation was decided upon prior to the operational phase of HARDTACK and was outlined in Annex B to Task Group 7.4 Operation Plan 1-58. The participating aircraft, the projects which they supported and the general purposes for their participation were outlined in the referenced document. Occasionally, changes to the test array as outlined in Operation Plan 1-58 were made. The only change for ROSE was the addition of a Task Group 7.3 P2V, whose mission was flying a rad-safe barrier partrol post H-Hour to the array.

By D minus three (3) days, a supplementary operation order was published for each test event. The order for ROSE, Task Group 7.4 Operation Order 18-58, was first published six (6) days prior to the actual detonation. Some difficulty was experienced in obtaining positioning data and a safety certificate for these planned positions prior to original publication date of the supplementary operation order. The positioning data and safety certifications were the responsibility of Task Group 7.1. The difficulty in obtaining this data from Task Group 7.1 was unavoidable in most instances due to "D" days for shots on which the projects wanted to participate being scheduled close together. Frequently there was insufficient time to reduce data gathered on one (1) shot in time to produce positioning criteria in a timely fashion for the next shot. On ROSE, this

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resulted in amendments and additions to the operation order. (See Figures 23, 24 and 25.)

General requirements for cloud sampling were documented by the laboratory concerned - in this case, the Los Alamos Scientific Laboratory - and given to the Sampling Element. Prior to the mission, any changes were discussed in conference between the Sampling Element Commander and the scientific representative of the laboratory. At this time, final sampling requirements were established.

The crowded conditions on the runways and taxiways at Eniwetok made the preparation of a written Mission Execution Chart necessary. This chart was published on D minus two (2) days by the Test Aircraft Unit. This chart established start engines, taxi, run-up, take-off and approximate landing times for the participating aircraft. See Figure 26 for the ROSE Mission Execution Chart.

On D minus one (1) day, a general briefing was given by the Test Aircraft Unit to all aircrews, air controllers, tower officer and other responsible agencies. Shot location, time hack, H-Hour time and a weather briefing were given. Also a review of the operation order, a "blacklite" display of the H-Hour aircraft patterns were shown and special requirements and instruction were given. Following the general briefing, each participating element conducted its own specialized briefing, going into much greater detail on their specific mission requirements.

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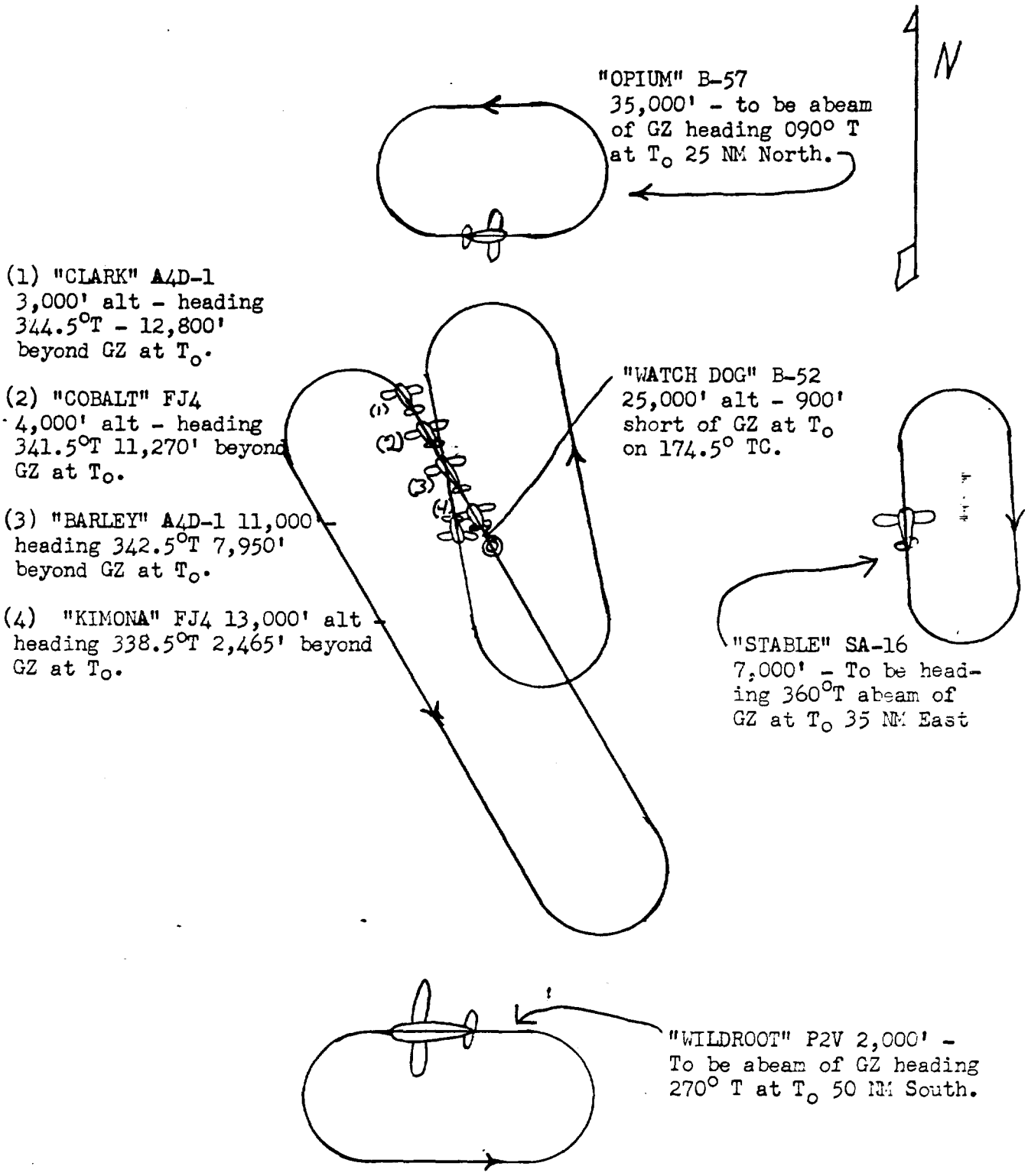
ANNEX A TO TASK GROUP 7.4 OPERATION ORDER 18-58:

POSITIONING INFORMATION

PROJ	MISSION	NO. OF ACFT	TYPE OF ACFT	CALL SIGN	ALTITUDE	CONTROL AGENCY	ORBIT POINT	PATTERN/REMARKS
5.1	Aircraft Effects Test	1	B-52	WATCHDOG		MSQ & EAOC Monitor	Information not available at time of publication. It will be forwarded to interested agencies at a later date.	
5.2	Aircraft Effects Test	1	A4D-1	BARLEY		M-33 & EAOC Monitor	Information not available at time of publication. It will be forwarded to interested agencies at a later date.	
5.2	Aircraft Effects Test	1	A4D-1	CLARK		M-33 & EAOC Monitor	Information not available at time of publication. It will be forwarded to interested agencies at a later date.	
5.3	Aircraft Effects Test	1	FJ-4	KIMONA		M-33 & EAOC Monitor	Information not available at time of publication. It will be forwarded to interested agencies at a later date.	
5.3	Aircraft Effects Test	1	FJ-4	COBALT		M-33 & EAOC Monitor	Information not available at time of publication. It will be forwarded to interested agencies at a later date.	
-	Search & Rescue	1	SA-16	STABLE ECHO	7,000'	EAOC	35 NM East	Aircraft will be positioned in a right hand race track pattern to be abeam GZ heading 360°T at T_o.
11.2	Sampler Controller	1	B-57B	OPIUM	35,000'	EAOC	25 NM North	Aircraft will be positioned in a 6 minute left hand race track pattern to be abeam GZ heading 090°T at T_o.
11.2	Sampler	1 2 1	B-57B B-57B B-57B	HOTSHOT HOTSHOT HOTSHOT	45,000' 40,000' 30,000'	EAOC EAOC EAOC	- - -	Aircraft will be vectored by EAOC to Sampler Controller for further direction. Upon completion of sampling, EAOC will control aircraft to FRED.
-	Rad-Safe Barrier Patrol	1 or 2	P2V	WILDROOT	2,000'	EAOC	50 NM South	Aircraft will be in an E-W 12 minute race track pattern and will head 270° at T_o. A/C will be vectored into shot area post H-Hour at 1,500 feet altitude upon direction of JTF-7 Rad-Safe

1. Add to Annex A of Task Group 7.4 Operation Order 18-58 (ROSE Event):

PROJ	MISSION	NO. OF ACFT	TYPE OF ACFT	CALL SIGN	ALTITUDE	CONTROL AGENCY	ORBIT POINT	PATTERN/REMARKS
5.1	Aircraft Effects Test	1	B-52	WATCHDOG	25,000'	TSQ & EAOC Monitor	North	Aircraft will be in a left hand race track pattern and will be off set 9,000' to the right of GZ and be on True course of 174.5°. A/C will be 900' short of GZ at T_O and will be 15,600' beyond GZ at TSA. ABORT: If A/C is more than 3 sec late at abort point (7.2 NM hr) a 1.5°/sec turn to a true course of 299.5° will be executed
5.2	Aircraft Effects Test	1	A4D-1	BARLEY	11,000'	M-33 & EAOC Monitor	SE	A/C will perform a 30 NM left hand race track pattern to be heading 342.5° and passing over GZ at H-13.25 seconds. At T_O A/C will be 7,950' HR beyond GZ. ABORT: A/C will abort if more than 5 seconds late at H-2 minutes. 180° left hand turn at 3°/sec will be made.
5.2	Aircraft Effects Test	1	A4D-1	CLARK	3,000'	M-33 & EAOC Monitor	SE	A/C will perform a 30 NM left hand race track pattern to be heading 344.5° true heading and will be 12,800' HR beyond GZ at T_O. ABORT: A/C will abort if more than 5 seconds late at H-2 minutes. Abort turn will be 180° left turn at 3°/sec.
5.3	Aircraft Effects Test	1	FJ4	KIMONA	13,000'	M-33 & EAOC Monitor	SE	A/C will perform a 30 NM left hand race track pattern to be on a true heading of 338.5° and will be 2,465 feet HR beyond GZ at T_O. ABORT: A/C will abort if 7 seconds or more late at H-2 minute position. 180° left turn at 3°/sec will be performed.
5.3	Aircraft Effects Test	1	FJ4	COBALT	4,000'	M-33 & EAOC Monitor	SE	A/C will perform a 30 NM left hand race track pattern to be heading 341.5°T and will be 4,000' HR beyond GZ at T_O. ABORT: If A/C is 7 or more seconds late at the H-2 minute position a 180° left hand 3°/second turn will be performed.



H-HOUR ARRAY FOR ROSE EVENT

FIGURE 25

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MISSION EXECUTION CHART FOR (ROSE)

H-HOUR - 0630 - 0645 - 0700

CALL SIGN	A/C TYPE	A/C NO.	A/C COMMANDER	TOW	START ENGINE	TAXI	POSITIONS 1	2	3	4	5	6	LPTO	FUEL REMAIN
STABLE ECHO	SA-16				0310	0315	0335		0420	0900		0930		
WATCH DOG	B-52	591	Sumner	0255	0330	0350	0355		0445	0635		0811	0515	
WILSON	WB-50						0430							
WILD ROOT	P2V				0515	0520	0530		0615	UNTIL	AOC RE	LEASED	0600	
BARLEY	A4D	831	Anderson		0526	0531	0541		0545	0632		0642	0609	
CLARK	A4D	827	Brady		0527	0532	0542		0546	0632		0638	0610	
KIMONO	FJ-4	310	LeBlanc		0528	0533	0543		0547	0632		0644	0611	
COBALT	FJ-4	467	Esmiol		0529	0534	0544		0548	0632		0640	0612	
OPIUM 1	B-57B		Conner-Guthals	0545	0550	0555	0600		0620	0900		0915	0625	
HOT SHOT 4	B-57B		Price-Bush	054	"	"	"		"	"		0910	0625	
" " 1	B-57B		Waits-Papworth	0725	0730	0735	0740		0800	0815		0825		
" " 2	B-57B		Hennessy-Trimble	0740	0745	0750	0755		0815	0830		0840		
" " 3	B-57B		Alder-Trapp	0755	0800	0805	0810		0830	0845		0855		
" " SPARE	B-57B		Krull-Hill											

LPTO - Latest Possible Take-Off

At midnight on D-1 day, the Air Operations Center began receiving weather checks. By H minus four hours, the Center was completely manned, including the Task Group Commander, Operations Officer, air controllers, and Communications Officer. At approximately H minus three hours, the Tower Officer was in place serving as an advisor and coordinator for test array aircraft. At 0310, STABLE ECHO started engines, taxied at 0315 and took off at 0335 hours. Each H-Hour array aircraft on the Mission Execution Chart followed at the assigned time until there were two (2) A4Ds, two (2) FJ-4s, one (1) B-52, one (1) SA-16, one (1) B-57B Sampler Controller, one (1) B-57B Sampler, and a P2V airborne. Each of these aircraft was under control of the Air Operations Center and their positions were monitored by the air controllers. The effects aircraft (B-52, A4Ds, and FJ-4s) were primarily controlled by MSQ and M-33 precision radars capable of very accurate positioning. The Air Operations Center provided back up positioning capability in the event of precision equipment malfunction. The AOC also had the overall responsibility for safe positioning of all aircraft. At H minus one hour, the voice countdown was broadcast over UHF "Guard" channel from ELMER Island and all aircraft had their radios positioned in the "Guard Receive" position, insuring that they were receiving the warnings prior to detonation. By H minus thirty minutes all aircraft airborne at H-Hour were in position. At H minus five (5) minutes, the Commander, Task Group 7.4 reported to the Commander, Joint Task Force SEVEN that all aircraft were safely positioned. All radio transmissions with the exception of emergencies and the voice countdown on Guard channel, were silenced from H minus three minutes until H plus two (2) minutes. At H plus two (2) minutes, the Air Operations Center called all aircraft for

a safety check and this information was once again relayed to CJTF-SEVEN. Following the detonation, the FJ-4s and A4Ds were cleared to return to base and land, their requirements having been met. The B-52 remained airborne for approximately another hour and thirty minutes to complete its testing following the detonation. Starting at H plus fifty-five minutes and following at fifteen minute intervals, three (3) B-57 sampler aircraft took off. The Air Operations Center vectored them to the airborne Sampler Controller who then assumed control and directed the aircraft in their penetrations of the nuclear cloud. As each aircraft collected its required sample, the Controller released them to the controller in the AOC who expedited their return to the airfield to prevent any unnecessary radiation exposure. The tower gave landing priority to the sampling aircraft and after landing, cleared them to the sample recovery area. In this area, the aircrew was quickly evacuated from the aircraft. The filter paper was then removed by sample recovery personnel and placed in lead "pigs" for return to the labratories in the ZI. After all the sampler aircraft and the controller had landed, the SA-16 aircraft was cleared to land. A report to the Joint Task Force Command Post was made by the Air Operations Center when all aircraft were safely on the ground. After landing, all effects and sampling aircrews were debriefed by the Test Aircraft Unit Operations Officer, and on the following day a critique was held for all aircrews and responsible ground agencies to determine problem areas generated by the event. See Figures 27 and 28 for photographs of the mission control boards in the Air Operations Center.

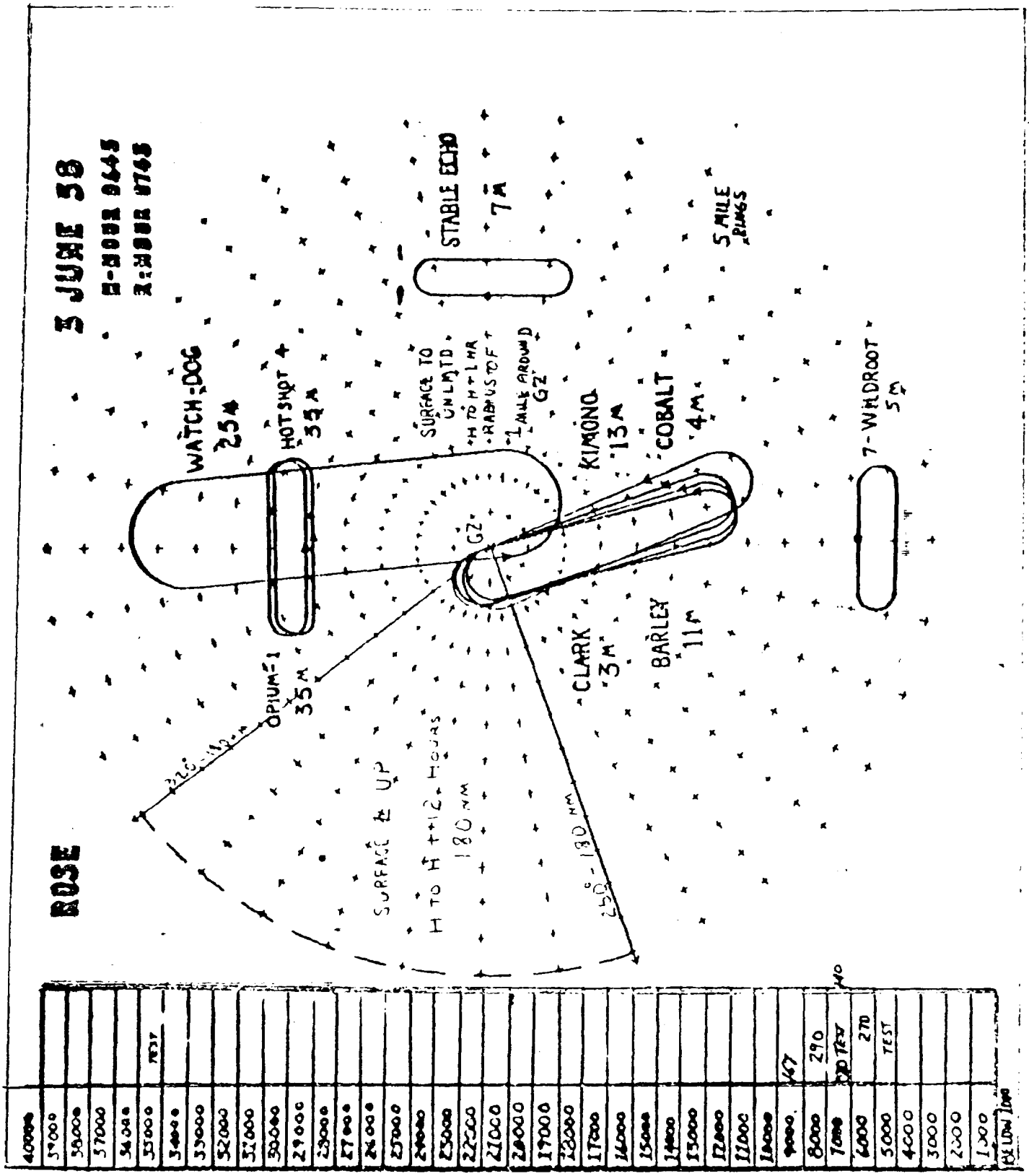

FIGURE 27

ROSE 5JUNE 58			1		2		3		4		5		6	
CALL SIGN	TYPE	ACFT	ETD	ATD	ETA	ATA	ETA	ATA	ETD	ATD	ETA	ATA	ETA	ATA
STABLE ECHO	SA-16	7	0335	0335	-	-	0420	0420	0900	0910	-	-	0930	0932
WATCHDOG	B-52	25	0355	0355	-	-	0445	0445	0635	0650	-	-	0811	0815
7-WILDROOT	P2V	5	0530	0530	-	-	0615	0549	-	-	-	-	KWAJ 1530	
BARLEY	A4D	11	0541	0541		-	0545	0545	0632	0647	-	-	0642	0702
CLARK	A4D	3	0542	0542	-	-	0546	0546	0632	0647	-	-	0638	0658
KIMONO	FJ4	13	0543	0543	-	-	0547	0547	0632	0647		-	0644	0704
COBALT	FJ4	4	0544	0544	-	-	0548	0549	0632	0647	-	-	0640	0700
OPIUM-1	B-57B	35	0610	0612	-	-	0624	0631	0900	0909	-	-	0915	0914
HOTSHOT-4	B-57B	35	0610	0614	-	-	0629	0631	0900	0909	-	-	0910	0911
HOTSHOT-1	B-57B		0740	0740	-	-	0800	0746	0815	0815	-	-	0835	0820
HOTSHOT-2	B-57B		0755	0755		-	0815	0811	0830	0848	-	-	0840	0852
HOTSHOT-3	B-57B		0810	0810	-	-	0830	0825	0845	0852	-	-	0855	0854

FIGURE 23

PART V

MATERIEL

Chapter 1 - Introduction and Summary.

The Materiel objective was to provide 100% logistical support for all Task Group 7.4 elements. Materiel agencies at all levels engaged in planning, programming, movements, distribution and roll-up of excesses. The Materiel activities encompassed the fields of Supply, Maintenance, Transportation and Construction.

During the months of December 1957 through May 1958, the required supplies and equipment were procured, shipped, received and broken out for use by the Task Group 7.4 Elements. The break-out of these items were greatly expedited by the arrival of the advance echelons of the various elements, and the Base Supply augmentation personnel. These arrivals, which began as early as December 1957, were timed to meet the operational readiness dates of the various elements. The Task Group 7.4 Logistics Liaison Office at Headquarters, SMAMA, assisted in procuring all essential items of supply and equipment and shipping in time to meet required in-place dates.

A minor delay in the Materiel build-up is attributable to the late designation of Air Force elements to participate in Operation HARDTACK as a part of Task Group 7.4. Although our supply and maintenance support concepts were finalized by the end of July 1957, it was not until October 1957 that the majority of the Air Force elements were designated. During 29-30 October 1957 a Materiel planning conference was held at Kirtland Air Force Base. This conference was attended by representatives of all the then-committed elements. The purpose of this conference was to discuss and finalize the materiel support concept and to prepare listings of quantitative support requirements. The period immediately following the materiel conference was one of intense activity which included finalization

of requirements for supplies, maintenance, aircraft parking, transportation, work and office space. During the months of November 1957 through January 1958, supply and equipment requirements lists were submitted by the elements, reviewed by the Task Group materiel office and forwarded to the Task Group Logistics Liaison Office at SMAMA, for requisitioning and shipment to the Eniwetok Proving Grounds. This office was the Task Group's single point of contact with the AMC supply and maintenance system. As a result of the late assignment of some elements to the Task Group, and the resulting delay in submission of support requirements some parts of the procurement program reached crash action proportions. A major factor in the timely solution of this problem was the fact that the key personnel in the Task Group Logistics Office at SMAMA had previous experience on Operation REDWING.

Results in the logistics support area were good; aircraft incommision rate was 83.3 %; AOCP rate was 1.9 %; and emergency supply support was good. The key to the efficiency of the logistics support of Operation HARDTACK was the Maintenance Control Unit which was manned by personnel of the Task Group plus a number of augmentation personnel from Task Group elements.

Of continuing concern was the monitoring of various aircraft modification programs. In some cases the late finalization of modification requirements resulted in crash programs. In addition considerable delay was encountered in negotiating with the modification activities in the firming up of realistic completion dates. By continual monitoring of the various modification programs, all aircraft were able to meet required Eniwetok Proving Grounds in-place dates.

The establishment and operation of the Task Group Maintenance Control Unit was begun during Operation REDWING. Utilizing the

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experience gained on Operation REDWING plus the guidance contained in AFM 66-1, Organizational and Field Maintenance, the Task Group Maintenance Control Unit functioned, throughout Operation HARDTACK, as a single control agency by which we were able to put to best use our limited supply and maintenance capability. The overall efficiency of the Materiel effort is reflected in the outstanding readiness rate of aircraft and related equipment maintained throughout the operation.

Further, during Operation REDWING, the then-organized Task Group, prepared a long range construction program which consisted of a number of projects for improvement of facilities in the Eniwetok Proving Grounds. This document was finalized in August 1958. Throughout the period from August 1956 to April 1958 this program was given continuous attention. As a result of continuous follow-up action, most of the essential projects were completed in time for Operation HARDTACK.

Chapter 2 - Supply.

Section A - Mission

Supplies and equipment as projected to be needed for an 120 day operation were procured and prepositioned in the Eniwetok Proving Grounds. The requirements were developed by each participating element to provide 100% logistical support during their presence in the EPG. Headquarters, Task Group 7.4 developed the requirements for special and general purpose vehicles, petroleum products, spare aircraft engines, and aircraft ground support equipment. All air and water shipments were received at the EPG by the Air Force Base Supply. These shipments were expeditiously distributed to advance echelons of the participating elements or integrated into base stocks as appropriate. The original spare parts requirements were not adequate to support the extended operation. Thus, it was necessary to procure additional quantities to support the extended HARDTACK operational phase and Operation NEWSREEL. The overall supply effectiveness throughout the entire operation was excellent.

Section B - Supply Organization and Function

The supply agencies constisted of a staff supply officer in the Group Headquarters, a materiel control officer working in the Maintenance Control Unit, Supply Liaison Branch at SNAMA, a unit supply in each element and an Air Force Base Supply activity, which was a part of the Test Base Unit.

The Task Group 7.4 Supply Liaison Branch consisted of seven (7) personnel at the Sacramento Air Materiel Area, McClellan Air Force Base, California. This unit works directly with the SNAMA Operation HARDTACK project monitors at the various AMC depots, and the Headquarters, Joint Task Force-SEVEN Liaison Officers at Travis Air Force Base, California, and Naval Supply Center, Oakland, California. This

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unit provides a central supply control point on a year around basis and insures continuity of supply procedures during both interim and operational periods.

The Air Force Base Supply (AFB 2872) was organized and operated in accordance with Air Force Manual 67-1. The Base Supply manning was augmented to provide the capability to process the 26,000 line items of incoming supplies and equipment. The augmentation personnel were required throughout the operation including the roll-up phase.

The Materiel Control Unit closely monitored the issue of supplies, expedited priority requirements and furnished supply assistance to the element supply agencies.

The staff supply officer monitored the overall supply effectiveness, initialed procedures and polices as needed to improve supply service, developed new requirements for the extended operational phase and Operation NEWSREEL, provided guidance and assistance and monitored the materiel roll up program.

Section C - Special Supply Procedures

Materiel requirements for Operation HARDTACK were developed as follows: Each participating element developed materiel requirements based on 120 days operation in the EPG. These requirements excluded POL and spare engines, refueling units, fire trucks, special and general purpose vehicles which were developed by Task Group 7.4. The element requirements were submitted as "A" and "B" kits. The "A" kits consisted of enroute and immediate requirements on arrival in the EPG. The "A" kit contained primarily aircraft spares, blank forms, limited office supplies plus aircraft ground support equipment not included in the "B" kit. The "B" kit consisted of 120 days aircraft spares, aircraft ground support equipment that could not be furnished by the ele-

ment and all other classes of proerty required in the EPG. The designation of all mission essential items at the time requirements listings were submitted permitted the Liaison Officer to utilize effectively the short lead time to insure shipment of these specific items. As a result, all essential item requirements were satisfied and 92% support was provided on all other requirements.

Late identification of some participating elements resulted in crash development of requirements for these elements. In these cases there was insufficient time for the Headquarters to screen thoroughly "B" kit listings for completeness, accuracy and adequacy of quantities. As a consequence some excesses were procured.

The format for submission of requirement could be improved as follows: Prepare the "B" kit in sections: Section 1, a listing of peculiar aircraft spares, Section 2, cost category 3 and all classes of expendable supplies except office supplies and common Army/Air Force blank forms; Section 3, all office supplies, furniture, machines and equipment, and Section 4, special purpose vehicles, general purpose vehicles, aircraft ground support equipment, test equipment and special tools. The "B" kit listing should, contain only items not available from the element and home station assets.

The provisioning of the 6th Weather Squadron was handled separately from all other elements. All requirements were obtained at or through OCAMA, segregated into site kits by the 6th Weather Squadron and shipped to the EPG. These requirements include all property necessary to sustain five (5) separate off-island camp sites. Upon conclusion of previous operations, this property was returned to supply stocks. This headquarters proposed that upon completion of this Operation, all reuseable property be retained and shipped to OCAMA for rehabilitation

and storage pending future overseas operations. This proposal was approved by Hq, AMC. Project BITTER PILL has been established to accomplish the rehabilitation and storage of the operations property.

16 foot Wherry Boats were obtained from the U.S. Navy to meet the requirements of the Weather/Rad-Safe sites. These boats were used to sweep the lagoon aircraft landing areas, ferry passengers and cargo between moored aircraft and shore, tow disabled aircraft to safety and to meet any emergency rescue requirements. The Wherry Boats were not entirely satisfactory for these purposes. They lacked stability to navigate in moderately rough lagoon waters. In addition the size and design of these boats precludes installation of two (2) outboard motors, required to tow an SA-16 aircraft. Features desired in the boats needed for use at the Weather/Rad-Safe sites are:

1. Padded gunnels.
2. A minimum of 50 horsepower.
3. Maximum stability.
4. Minimum draft.
5. Simplified maintenance.
6. Be capable of handling eight (8) passengers and/or 1200 pounds of cargo.

A spare aircraft engine program was developed during November 1957. Total spares were predicated on the expected flying time planned for a 120 day period. All engines except H-19, F-21 and portion of the C-54 engines were supplied by AMC in built-up configuration. Approximately 25% of the total spares programmed were prepositioned at Eniwetok as the initial requirements. An additional 25% was positioned at SMAMA as back-up stocks. SMAMA shipped a replacement engine upon notification of an issue by AFB 2872. The reparable engine was shipped from AFB 2872

to the appro depot. The depot removed the QEC from the reparable engine, built-up a new serviceable engine and shipped to SMAMA to replenish the back-up stock. The system worked very well, however, the orignial quantities proved inadequate due to the extension of the operational phase. Additional SA-16, RB-50 and WB-50 engines were added during the operational phase. (See figure 1).

All engines were cocooned by SMAMA prior to shipment. This provided good protection from the elements and enabled us to use outside storage. Two (2) suggested improvements to the program are: That all engines be inspected by SMAMA for completeness and serviceability prior to cocooning and/or shipping, and that all engine forms and records be attached outside of the cocooning. This would permit access to these documents without removal or opening of the cocooning.

Section D - Supply Operation in the EPG

Hq, JTF-SEVEN Administrative Order 1-58, Hq JTF-SEVEN, letter J-4/400.3, 15 May 1958, Subject: Delineation of Supply and Service Support in the EPG, and previous Administrative Orders contained vague terminology concerning the logistical responsibilities of Task Group 7.2 in support of Task Group 7.4. During the build-up phase it became apparent that Task Group 7.2 interpreted the JTF-SEVEN Administrative Order differently from Task Group 7.4. The referenced Hq, JTF-SEVEN letter was published to clarify logistical responsibilities and to eliminate duplicate stockage objectives and like facilities. The provisions of this letter are being gradually integrated beginning concurrently with the roll-up phase.

The Task Group 7.2 Supply support for this operation was generally satisfactory. Our total requirements for hot lockers and Class "X" clothing, however, were not filled until late in the exercise. Task

AIRCRAFT ENGINE CONSUMPTION

A/C	ENGINE	MAR	APR	MAY	JUN	JUL	AUG
C-54G	R-2000-4	1	5	1	2	2	0
B-57B	J-65-W5	0	0	1	2	6	0
B-57B	J57.P37	0	2	1	0	0	0
B-52	J57-P-29W	0	0	0	0	0	0
RB 36-H	J47-GE19	2	2	0	0	0	0
RB 36-H	R4360-53	0	0	0	0	0	0
L-20	R985-AN1	0	1	0	0	0	0
R/WB 50	R4360-35B	2	2	7	7	4	0
C-97	R4360-65	0	0	0	0	0	0
SA-16	R1820-76B	1	2	2	1	1	0
H-21	R1820-103	1	0	0	0	1	0
H-19	R1300-3	1	1	1	0	1	0
TOTAL		8	15	13	12	15	0

FIGURE 1

Group 7.2 has advised that stocks of Class "X" clothing are nearly exhausted, and that it is probable that Class "X" clothing will not be available for issue on future test operations.

In several instances common Army/Air Force vehicle spares and other common items were procured by Task Group 7.4 although Task Group 7.2 was the designated supply agency. Task Group 7.4 procurement was necessary in order to satisfy VDP, work stoppage and other urgent requirements.

The 26,000 line items of supplies and equipment received by AFB 2872 to support this operation were integrated into base stocks. The aircraft maintenance work stands, tugs, generators, and other items of equipment common to more than one type if aircraft were retained in a central pool. The equipment peculiar to a specific type aircraft was issued to the appropriate element. The "B" kit spares were retained in AFB 2872 stocks and issued on as required basis. The storage available to AFB 2872 became critical with the input of the 26,000 line items. This was solved by utilizing outside storage for items suitable for this type storage. Approximately 30 conex containers were used to provide additional inside storage space.

The existing organization as augmented adequately supported the operation. (See figures 2, 3, 4, and 5.)

The decision was made in late March 1958 to use Johnston Island as a new operating site. This phase of the operation was known as Operation NEWSREEL.

Task Group 7.4 was designated the sole agency to arrange total JTF-SEVEN logistical requirements at Hickam AFB, TH. The bulk of supply and maintenance requirements at Hickam AFB were available from local and EPG assets. 136 line items of WB-50 spares were procured from the

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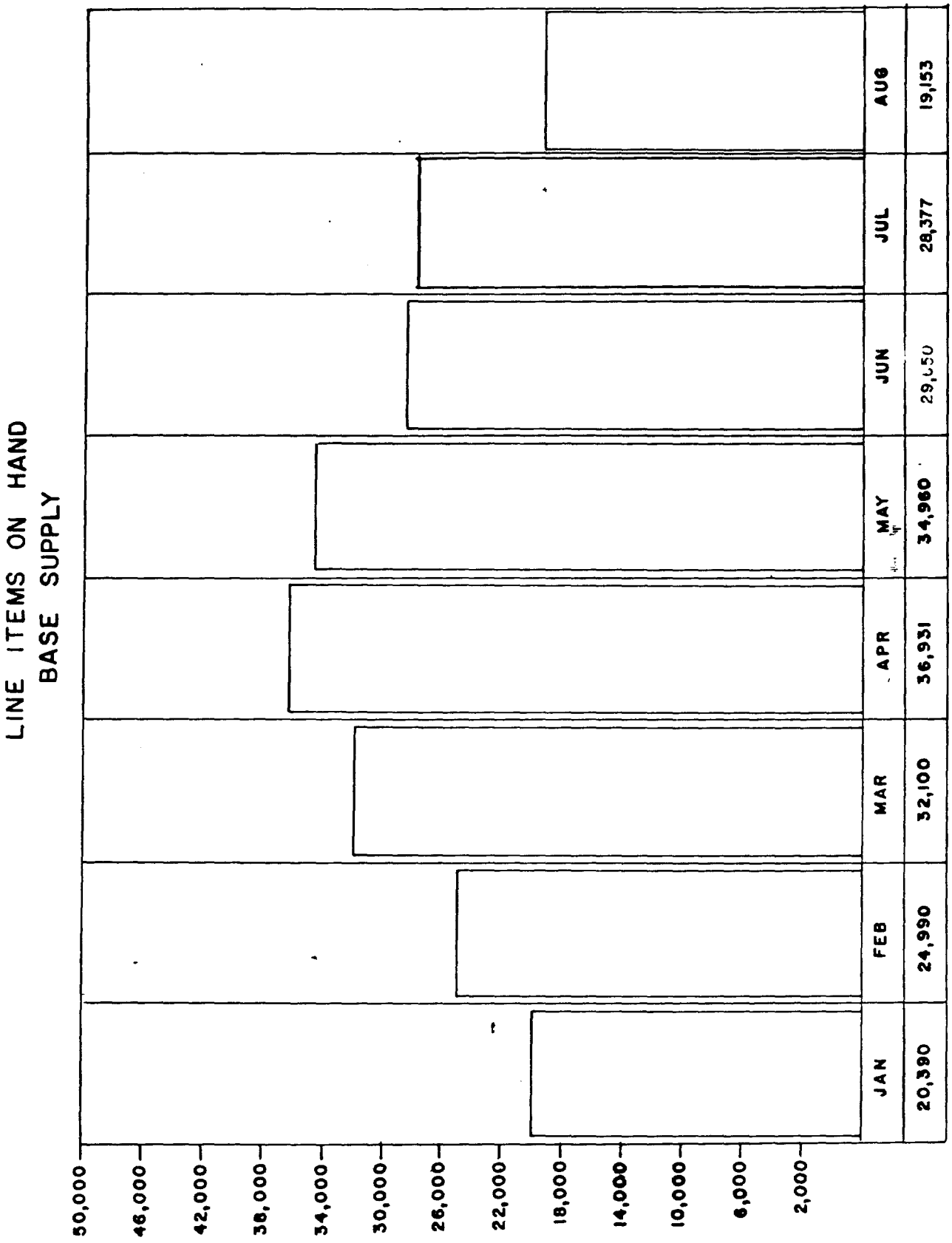

FIGURE 2

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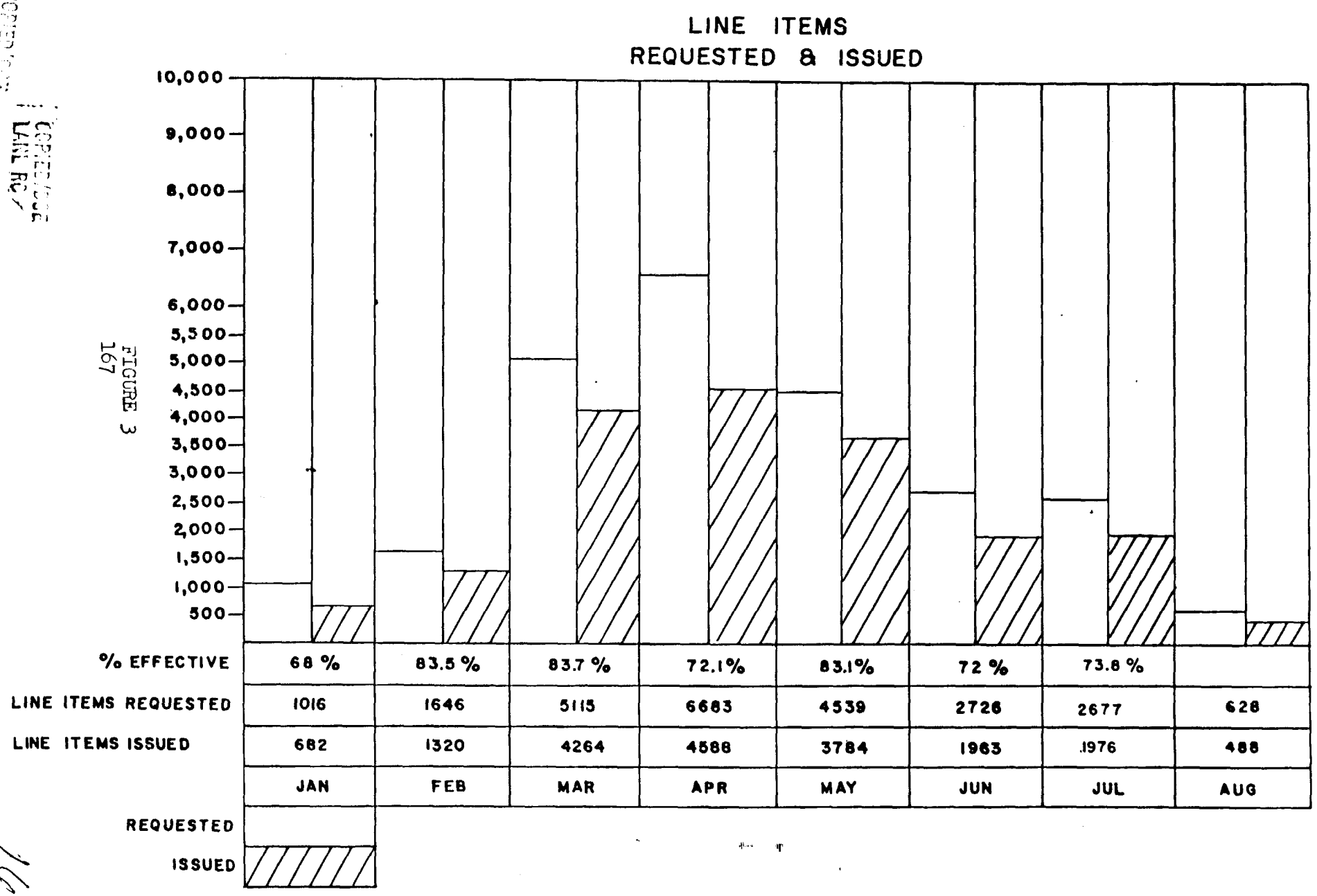

FIGURE 3
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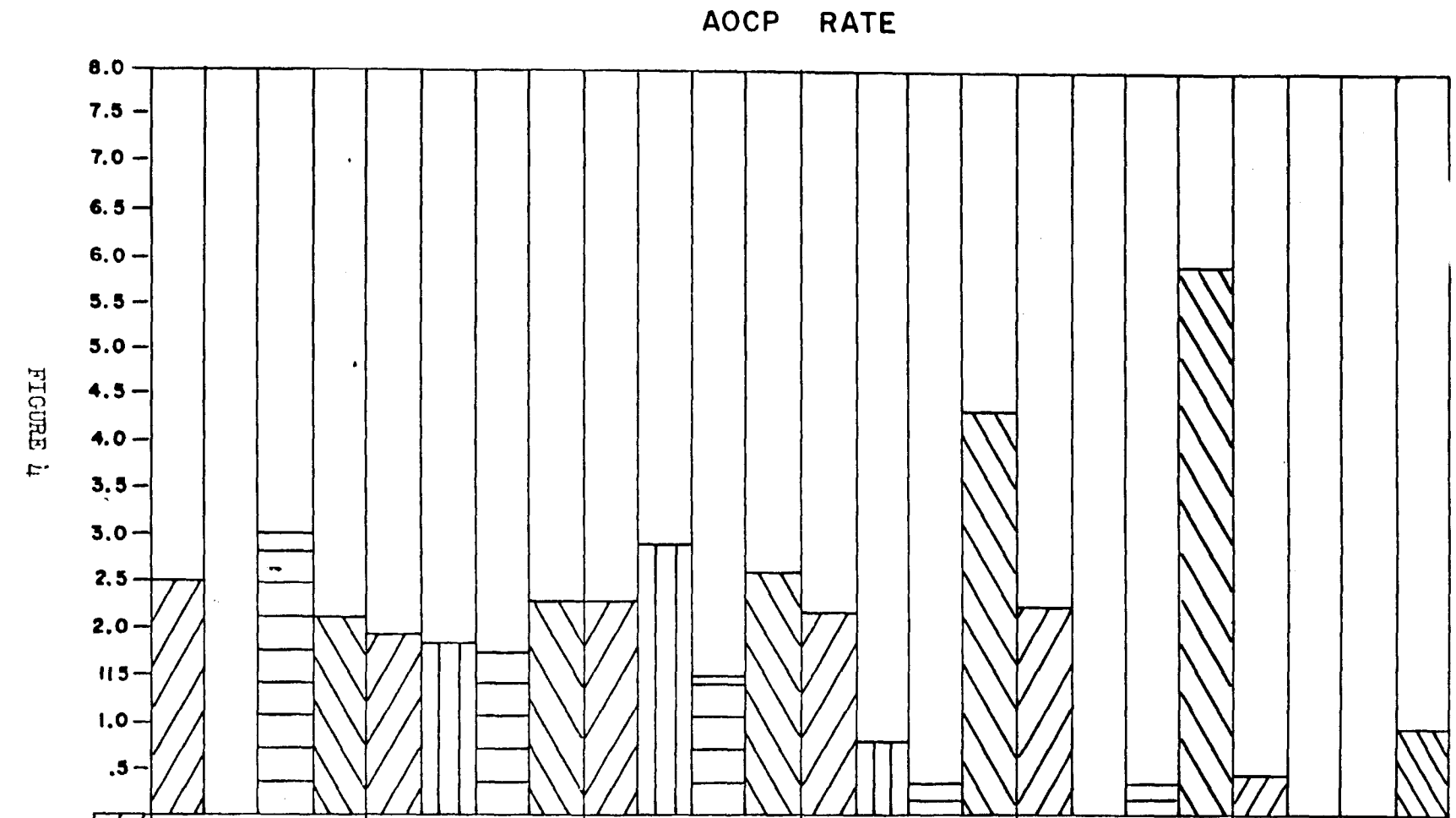
FIGURE 4



	MAR	APR	MAY	JUN	JUL	AUG
TOTAL	2.5 %	1.9 %	2.3 %	2.2 %	2 %	.3 %
TAU	0 %	1.8 %	2.9 %	0.8 %	0 %	0
TSU	3.0 %	1.7 %	1.5 %	0.29 %	0.2 %	0
TBU	2.1 %	2.3 %	2.6 %	4.3 %	5.8 %	1 %

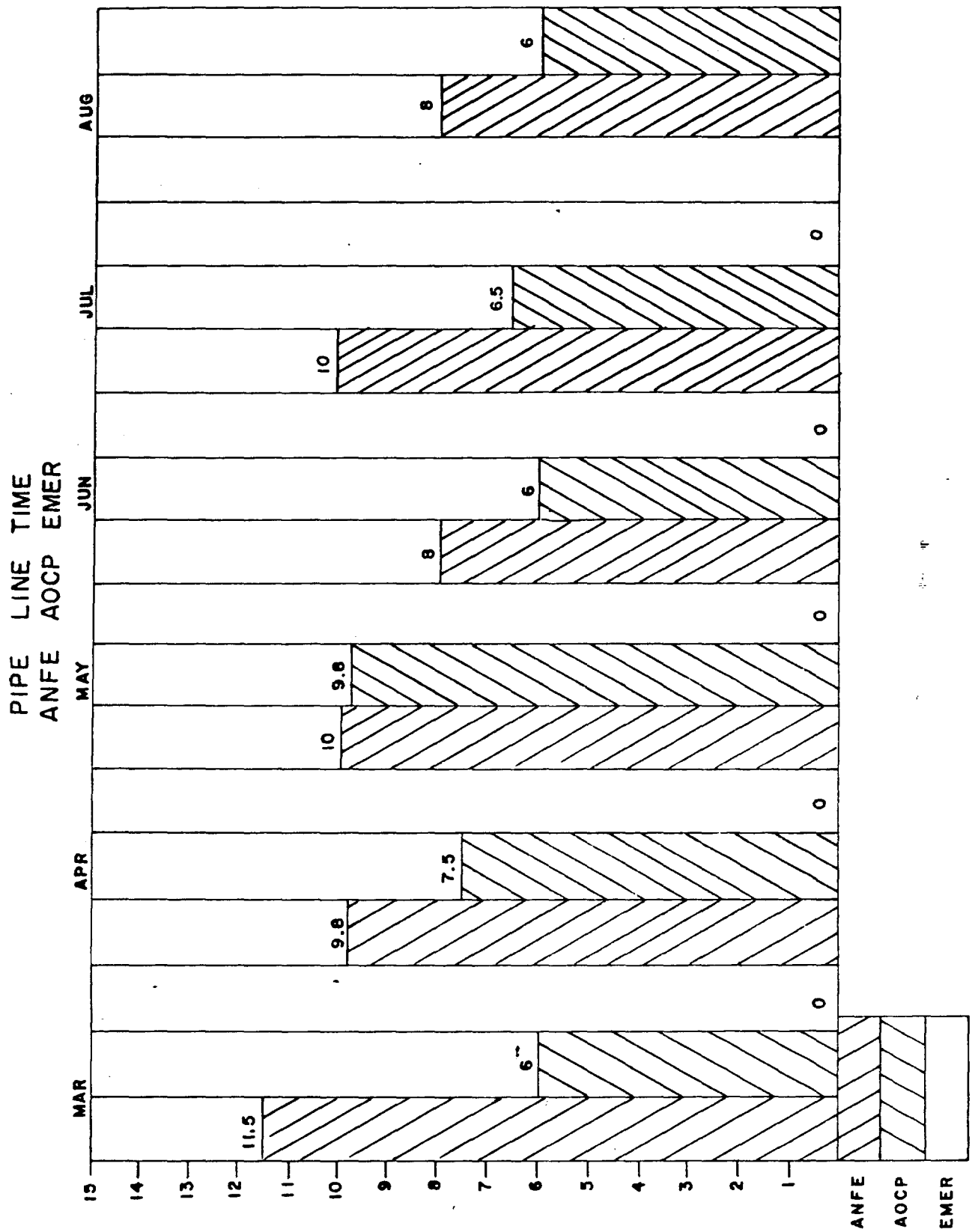


FIGURE 5

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States and prepositioned at Hickam AFB to support the WB-50 aircraft. The residual property was turned into AFB 5260 as it became excess at Hickam. The roll-up and disposal of this property was accomplished by Hickam AFB.

Task Group 7.4 logistic responsibilities at Johnston Island itself consisted of furnishing approximately 100 separate items of aircraft ground handling equipment, peculiar weather station equipment and certain other selected items. Air Force peculiar spares, except those required from MATS aircraft were furnished from the EPG. The MATS spares were furnished by the 1502nd Air Transport Wing, Hickam AFB, TH. The equipment items for Johnston Island were obtained from the EPG and Hickam AFB except for 22 line items, which were requisitioned from the States for delivery direct to Johnston Island. The Johnston Island Base Command accomplished roll-up at that site. There was no stock record account at this location and all property furnished from EPG (AFB 2872) was on a hand-receipt basis. The shipping documents were prepared for the disposal of this property by AFB 2872 and forwarded to Johnston Island. The documents were married to the items and shipment effected.

Section E - Supply Effectiveness

The mission category and precedence assigned to Task Group 7.4 coupled with the services of the AMC special project supply system provide an adequate foundation for accomplishing the supply support mission. All local procurement action was handled by the SMAMA Procurement Directorate. All central procured and General Supplies Stock Fund items were obtained from the appropriate Air Force prime depots, and Task Group 7.2. An Operation HARDTACK supply and Maintenance Project Monitor was designated at each depot to insure accelerated processing of all requirements. Hq, AMC also designated a

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Command Operation HARDTACK Project Monitor to assist in all serious problem areas. This system provided the necessary management tools to accomplish the mission of providing complete supply and maintenance support for all USAF Units participating in nuclear tests in the EPG.

The special supply procedures and the supply organization employed were adequate to support this operation. The experience gained will provide a basis for future refinement and improvement.

Section F - Roll-Up

26,000 line items of supply and equipment were received by AFB 2872 in support of the operation. These items were in addition to the "A" kit and organizational items that accompained participating elements. Limited roll-up was commenced mid-way through the Operation. One (1) man was employed full time begining late April to identify duplicate depot shipments and other excesses. An average of 890 tons of excess and reparable property was disposed of each month from May through 18 August 1958. Disposition of all material was predetermined in order to accelerate the roll-up program.

Arrangements were made with AMC to ship all vehicles in an "as is" condition to a single destination. This arrangement greatly accelerated the roll-up program. Local fabrication of three (3) standard size packing boxes was accomplished during June and July. These boxes plus the conexs and containers saved from incoming shipments provided the majority of container requirements. A total of 98 personnel from participating elements were retained to assist TBU in the roll-up program.

A total of 1,961 line items were shipped to the ZI during the operational period (See Figure 6). Since the cut-off date of this report is the same as the last shot date (18 August 1958), final roll-up figures are not included.

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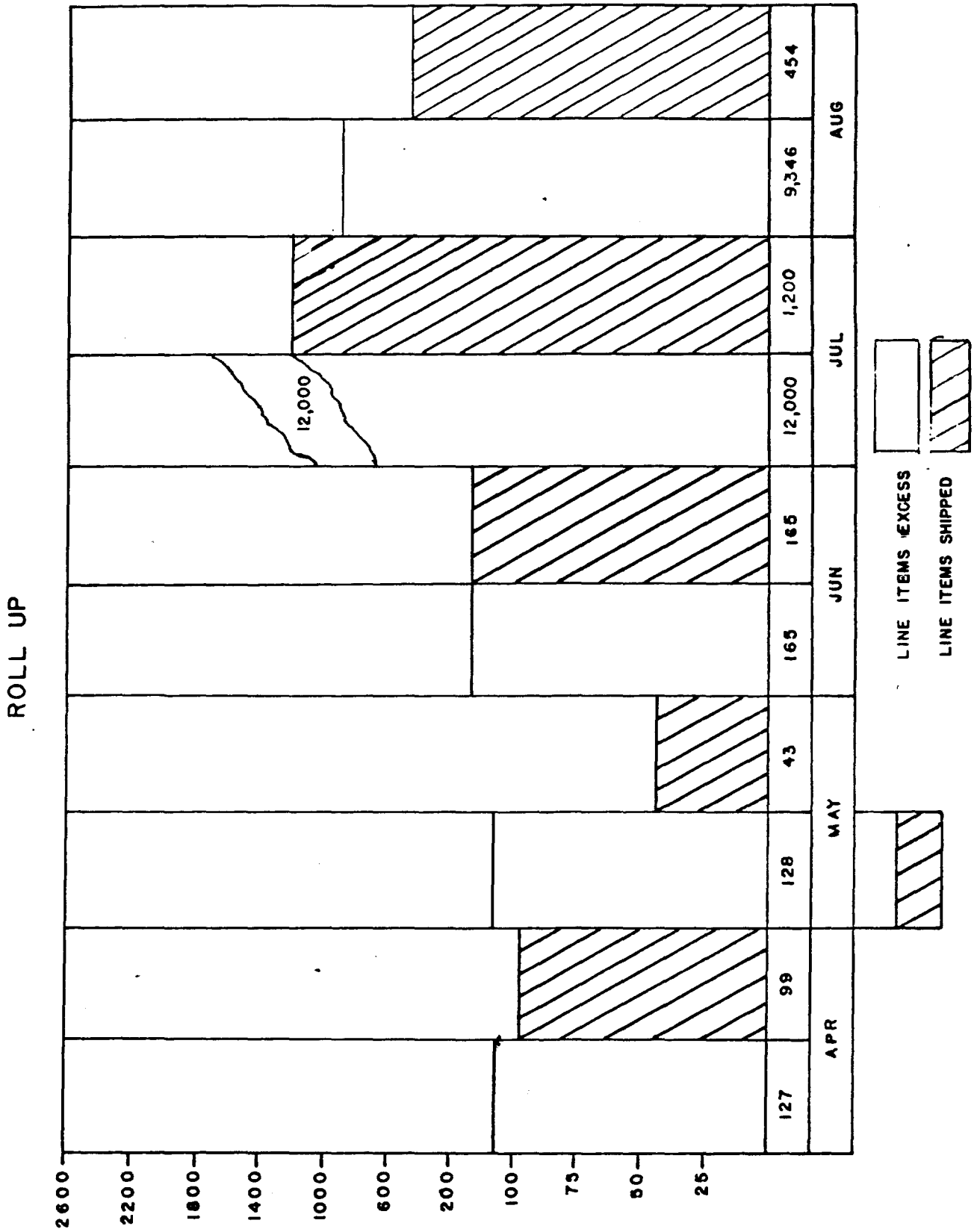

FIGURE 6

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Chapter 3 - Su .y of POL Products.

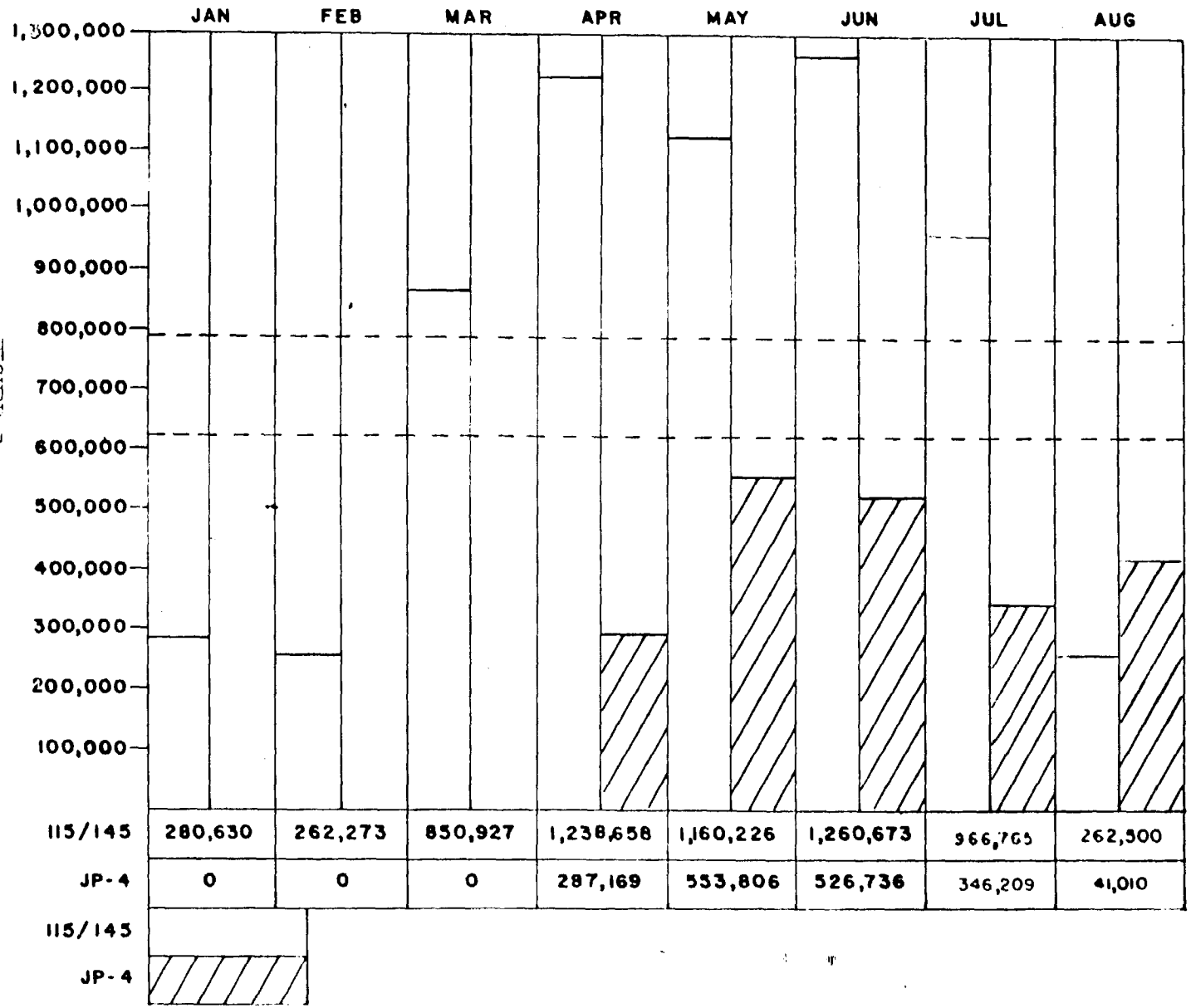
The Petroleum products were available as required to satisfy Operation HARDTACK requirements. Limited bulk storage facilities, however, necessitated daily monitoring of stock balances and frequent adjusting of petroleum tanker schedules to insure the maintenance of minimum operational requirements. (See figure 7 and 8, fuel consumption).

The existing bulk storage capacity is 614,500 gallons JP-4; 774,500 gallons AvGas; 78,000 gallons MoGas and 158,000 gallons of diesel. No difficulty was experienced in maintaining adequate stocks of MoGas and diesel; however, during periods of intensified flying stocks of JP-4 and AvGas became critical. The daily issues, stock balances, projected daily requirements and petroleum re-supply tanker schedules were reviewed daily to identify actions necessary to preclude depletion of stocks. The storage space did not always permit the isolation of tested fuel and on occasions it was necessary to contaminate tested fuel with new fuel in order to accept delivery of maximum quantities from the tanker. Arrangements were made with the petroleum testing laboratory at Pearl Harbor, TH, to test our fuel samples and to report results expeditiously. The support rendered was excellent we were able to avoid using untested fuel, although on occasions fuel was serviced into aircraft within hours after receipt of the analysis results.

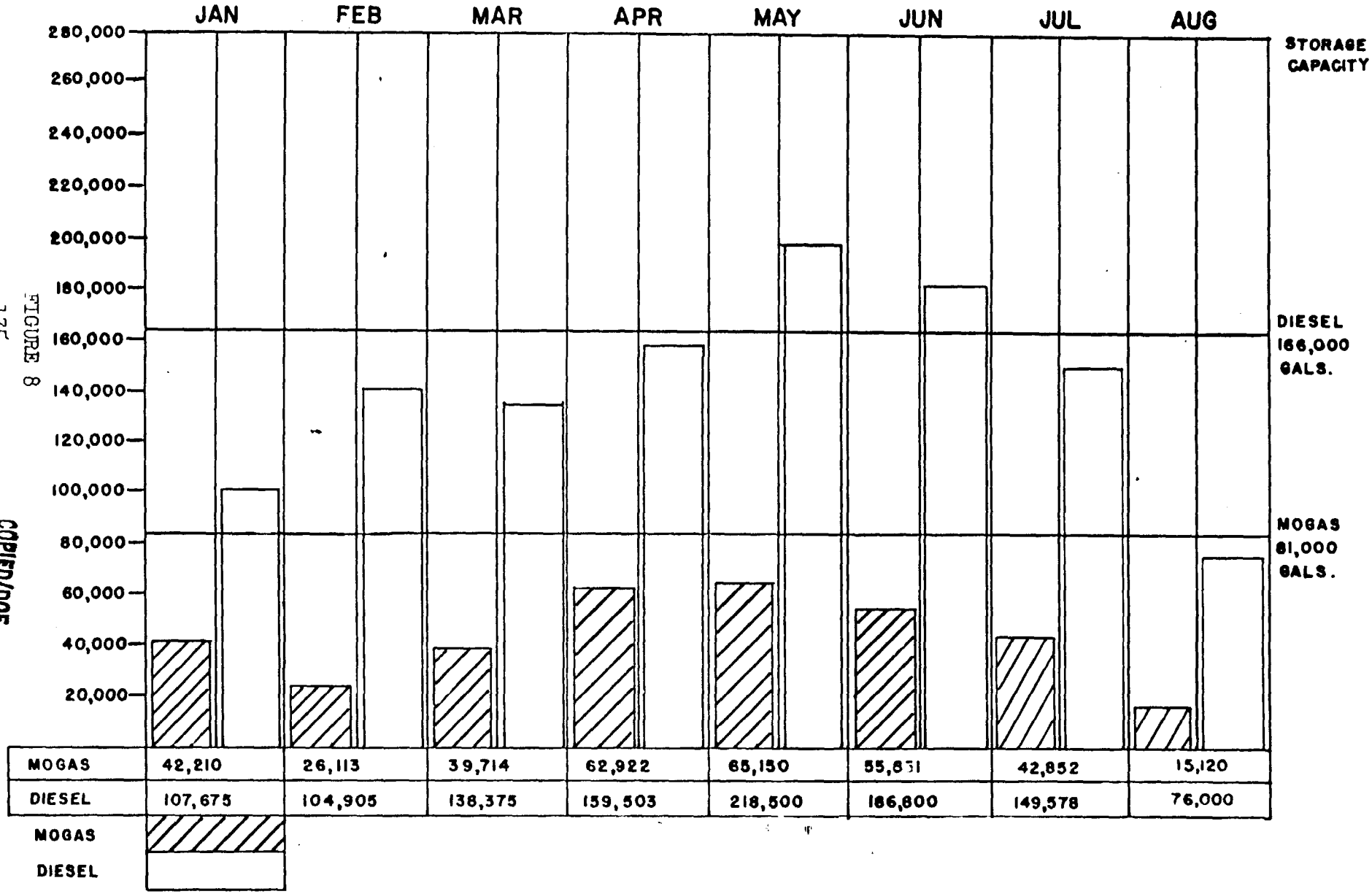
As part of the support of the Weather Islands, (Kusaie, Rongelap, Kapingamarangi, Tarawa, Nauru, Wotho, Utirik, Ujelang), it was necessary to preposition drummed MoGas and diesel fuel. Quantities estimated were adequate and were in place in time to meet our operational requirements.

FIGURE 7

FUEL CONSUMPTION



MOGAS AND DIESEL COMSUMPTION



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
MOGAS	42,210	26,113	39,714	62,922	65,150	55,831	42,852	15,120
DIESEL	107,675	104,905	138,375	159,503	218,500	186,600	149,578	76,000

MOGAS
DIESEL

FIGURE 8

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In addition to the quantity of fuels placed on the Weather Islands it was necessary to preposition a quantity of drummed AvGas at Ponape. The fuel was used to refuel SA-16 aircraft enroute to Kapingamarangi on island resupply missions. Because of extension of the test operation and a number of unanticipated flights, fuel stocks at Ponape were exhausted by June 1958. Through negotiations with the Weather Bureau at Ponape we were able to secure AvGas at a cost of $.47 per gallon. Although this cost was high, it was a cheaper solution than shipping a small quantity of drummed AvGas to Ponape.

The programmed modifications to the bulk storage facilities will aid the fuel management, but during future tests, daily monitoring of fuel status and expeditious testing by the fuels laboratory will probably still be required.

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Chapter 4 - Maintenance

Section A - Mission

The maintenance mission was to maintain assigned aircraft, ground support equipment, special purpose vehicles, and some ground and all air communications equipment in a maximum state of readiness. There were a total of seventy-eight (78) aircraft of sixteen (16) different types and 342 units of aircraft ground support equipment included in the Task Group 7.4 inventory. An additional work load was created in providing turn-around maintenance for participating U.S. Navy aircraft, based at Kwajalein, MATS and transient traffic. (See figure 9,).

Section B - Organization and Function

The basic structure of organization and function closely paralleled the standards contained in Air Force Manual 66-1. There were, however, some minor deviations instituted in order to tailor the maintenance efforts to the unique mission. The maintenance organization included a staff maintenance officer in the Task Group Headquarters, a Maintenance Control Unit and an organizational maintenance section in each element.

The Staff Maintenance Officer formulated requirements for both augmentation personnel and support equipment required in the EIC. The gross requirements developed by participating elements were correlated and reduced to a minimum net quantity compatible with the anticipated work loads.

The Staff Maintenance Officer served as adviser to the Director of Materiel; standardized maintenance policies and practices; maintained statistical data, monitored reports and distributed technical publications.

The Maintenance Control Unit assigned directly to Task Group Headquarters, was activated concurrent with the arrival of the Advanced

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AIRCRAFT ON HAND

TYPE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
L-20A	6	6	8	8	8	8	3	7
L-19E	0	0	3	3	3	3	8	3
H-19B	3	6	6	6	6	6	3	3
H-21B	8	8	9	9	9	9	8	8
B-36-H	0	0	2	2	0	0		
P-2V	0	0	1	1	0	0		
A4-D	0	0	0	2	2	2		
FJ-4	0	0	0	2	2	2		
SA-16A	0	0	5	5	5	5	5	5
SA-16B	0	0	2	2	2	2	1	1
RB-50E	0	0	1	2	2	2		
WB-50D	0	0	7	10	10	10	2	
C-54D	5	5	5	5	5	5	5	5
C-54G	0	0	3	3	3	3	1	1
C-97	0	0	0	1	0	0		
B-52D	0	0	1	1	1	1		
B-57B	0	0	0	10	10	10	5	5
B-57D	0	0	0	6	6	6	3	3
TOTAL	22	27	53	78	74	74	44	41

FIGURE 9

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Echelon on 5 February 1958. This unit was established as a focal point to correlate the overall maintenance effort. This unit maintained current status of aircraft, aircraft ground support equipment, scheduled maintenance specialists and controlled flow of work into Field Maintenance Shops. In addition, priority requisitions were validated in those instances where the required item was not in local stocks. The methods and procedures employed insured the most effective and efficient utilization of personnel and equipment throughout the entire operation.

The Element Maintenance activities performed the specific functions of directly supervising and performing maintenance to the aircraft and other equipment.

Section C - Aircraft Maintenance

All organizational maintenance and some of the field maintenance was accomplished in the open. The single existing hangar was used as an aircraft repair facility to the maximum extent practicable. It was, however necessary to provide ten (10) 20X40 portable buildings to satisfy minimum shop, supply and technical administrative requirements. The hangar and detached smaller buildings provided minimum inside space to accommodate base shops.

Salt water corrosion presented a continuing problem in the EFG. A vigorous corrosion control program, including frequent fresh water washing, was practiced on all aircraft. This program retarded but did not eliminate salt water corrosion. There were many and varied aircraft malfunctions directly attributable to corrosion, although a significant effort was expended to minimumize corrosion effects.

During the entire operation there were forty-four (44) reciprocating engines and seventeen (17) jet engine changes. The number of engine changes were well within proportion to hours flown.

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There were two outstanding problems stemming from design or materiel failure. One such problem was a B-57D aircraft landing gear failure. The pilots of two separate B-57D aircraft experienced difficulties inflight, in extending the nose gear to "down and locked" position. The nose gear of one aircraft collapsed upon landing. Inspection revealed cracks in the barrel of the nose gear actuator, resulting in a loss of hydraulic fluid. At this time all B-57D aircraft were grounded except for actual cloud sampling missions. An emergency unsatisfactory report was submitted to WRAMA and four (4) spare actuators and three (3) actuators removed from aircraft were flown to NAMAP, Tachikawa Air Base, Japan for Depot Inspection. The depot inspection detected cracks in three (3) of the seven (7) units tested. NAMAP provided depot inspected replacement actuators for the B-57D aircraft, permitting the lirited flying status to be rescinded. Additional depot tested units were expeditiously procured from WRAMA to replace the B-57B actuators. Later, a similar deficiency was found to exist in the B-57B&D main gear actuators. An emergency Unsatisfactory Report was submitted to WRAMA and concurrent crash action taken to procure depot inspected replacement actuators. The replacements items were received and installed expeditiously.

The other problem involved SA-16 aircraft of the SAR Element. Two (2) SA-16 aircraft developed extensive hull damage that was beyond our capability to repair. These aircraft were evacuated to depot repair facilities. The damage consisted of hull wrinkling in the bow below the pilot compartment. One (1) aircraft was evacuated to a depot repair facility and replaced. The other aircraft was evacuated to SAMAP for repair and return to the EFG. The water landings at near maximum gross landing weight and the long down wind take off distances, peculiar to some inland sites contributed to the wrinkling of the hulls.

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As a result of a requirement to fly weather reconnaissance missions in the Johnston Island area in support of Operation NEWSREEL, it was decided that the Weather Reconnaissance Element (Provisional) periodic maintenance capability would move to Hickam AFB, TH.

Plans, which were formulated in June 1958, provided that weather reconnaissance missions would be launched from Eniwetok and terminated at Hickam AFB and vice-versa. Missions were so scheduled that an aircraft due for a periodic inspection would land at Hickam AFB and go into the periodic maintenance facility for necessary inspection and maintenance.

The home base of the Weather Reconnaissance Element (Provisional) was Hickam AFB where permanent type facilities, i.e. hangars, work space, etc, were available. Two (2) officers, 139 airmen and equipment were moved from Eniwetok to Hickam AFB during July 1958 to establish the periodic maintenance facility. Periodic inspection of the first WB-50 aircraft commenced on 16 July 1958.

Section D - Special Purpose Vehicle and Aircraft Ground Support Equipment Maintenance

The total units of Special Purpose Vehicles and Aircraft Ground Support Equipment maintained was three hundred and forty-two (342). These units were maintained in a common pool to facilitate operational control and maintenance.

Salt water corrosion was unvoidable and required the expenditure of considerable maintenance man hours to minimize the effects. Some equipment failure is attributable to corrosion.

Another continuing problem was the lead time required to procure replacement parts and spares from local purchase sources. Many local purchase items were obtainable from a single source and in some cases

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the manufacture required 90 days to fabricate and deliver. Thus, controlled cannabilization was practiced in order to maintain acceptable equipment readiness rates. The spare parts support of special purpose and aircraft ground support equipment could be improved by earlier determination of spares to be pre-positioned and timely initiation of supply actions.

A small number of units sustained minor damage in shipment, which was corrected as the units were prepared for operation. The instances of injury to units due to mishandling or carelessness in the EPC were rare.

A vehicle and aircraft ground power equipment inspector was dispatched from Sacramento Air Materiel Depot at the end of the test phase to determine serviceability and disposition of excess equipment. The result of this inspection was the salvaging of approximately forty (40) units of special purpose vehicles and aircraft ground powered equipment. The balance of units were returned to SMAMA for repair and return to stock. A high percentage of this salvaged equipment was a direct result of corrosion.

Section E - Communications

During the early part of the operation, daily, weekly and monthly preventative maintenance schedules for the communications and AN/USC-12 radar equipment within the ACC was devised. Fortunately, with but one exception, enough backup equipment was available so that outages were held to an absolute minimum. The bulk of maintenance was accomplished on an as required basis, we did, however schedule maintenance to the extent that back-up equipment and operational commitments would permit.

The Field Maintenance Communications Shops maintained the airborne communications and radar equipment as well as the vehicle radio sets. In the interest of expediency, malfunctioning units were removed from

the aircraft immediately replaced with serviceable units from pre-issue stocks. The malfunctioning unit was repaired in the base shop and placed in serviceable pre-issue stock. Aircraft affording accessibility to radar and communcations units during flight were issued a spare set to be installed should a malfunction occur.

The radio and inter-communication systems were installed and serviced by the Field Maintenance Communication Shops with assistance from Task Group 7.2 Signal Section. This system consisted of inter-com boxes in all the Element Engineering Offices, Field Maintenance Shops and Base Supply Expeditor Section. Radios were installed in the Maintenance Control Officers' vehicle and five (5) flight line pick-ups.

Section F - Execution

The aircraft readiness rate attained and sustained exceeded the Air Force standard (See figure 10).

The personnel skills and equipment provided each activity was adequate to execute the maintenance mission. The varying techniques, personnel skills and organizational structures in each element necessitated some adjustment to weld together all activities and achieve a coordinated and effective maintenance capability. The succession of a D-1 status over a period of several days precluded performing major maintenance. The release from a D-1 status was followed with intense maintenance activity, on a 24 hours day basis on occasions.

Frequently, the field maintenance shops personnel worked double shifts to meet the requirements of the participating elements. On D-1 nights, maintenance specialists maintained an around the clock vigil to accomplish last minute correction of malfunctions. Pre-issue stock items were kept at a maximum level on D-1 and D days, thus affording miriimum replacement time.

AIRCRAFT IN COMMISSION RATE

	MAR	APR	MAY	JUN	JUL	AUG
OVERALL RATE	73.6 %	82.8 %	85.5 %	86 %	85 %	86.8%
RATE BY AIRCRAFT						
B-57B		97 %	94%	94%	90 %	98.1%
B-57D		88%	91 %	78 %	94%	95%
B-36	47 %	68 %				
B-52D		64 %	91%	82 %	84 %	
WB-50A	67 %	73 %	81%	68%	82 %	
C-54G	79%	66 %	80%	84%	91 %	93%
SA-16	77%	77 %	83%	79 %	81 %	85.5%
RB-50		85	94 %	86 %		
C-54D	85 %	80%	79%	71%	72%	74%
H-19	74%	71%	70 %	74%	91 %	79%
H-21	71%	73 %	66%	76%	76 %	85.1%
L-19	87 %	93 %	98%	95 %	89 %	94%
L-20	85 %	75 %	79 %	84 %	75 %	78%
P2-V	97 %	95 %	98 %			
A-4D		100 %	96 %	97 %		
FJ-4		100%	98 %	97%		

FIGURE 10

The maintenance personnel of all units worked long hours under adverse conditions to meet the mission requirements. (See figure 11 and 12 Maintenance Man-Hours Expended).

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FIGURE 11
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MAINTENANCE MAN HOURS EXPENDED
INDIRECT TIME

SHOP	MAR	APR	MAY	JUN	JUL	AUG
AERO REPAIR	1107:30	891:30	875:00	952:50	597.00	960:00
AIRFRAME REPAIR	490:00	655:30	1006:30	746:50	521:00	717:00
AUX EQUIP	1819:30	2062:30	1720:30	1027:30	631:00	318:00
GROUND POWER EQUIPMENT	2097:00	2052:00	2526:30	1133:00	1140:00	468:00
COMM & ELECT	4360:30	5323:30	5362:00	5645:50	3274:05	1651:00
CORROSION CONTROL	323:30	602:00	421:00	250:50	116:00	117:00
ELECTRIC	652:00	876:00	960:30	1150:00	919:00	421:00
ENGINE BUILD-UP	710:30	1232:00	1046:00	511:00	1149:00	397:00
HYDRAULIC	536:30	1102:30	850:30	695:50	751:00	502:00
INSTRUMENT	569:30	395:00	452:30	188:00	403:00	181:00
MACHINE	352:00	474:30	468:00	381:00	413:00	234:00
PAINT	111:00	525:00	568:00	707:00	735:00	289:00
PARACHUTE	385:30	521:00	562:00	1014:00	723:00	397:00
PROPELLER	731:30	470:00	751:00	856:00	850:00	554:00
WELDING	279:30	536:00	737:00	722:50	503:00	475:00
WOOD MILL	363:00	458:00	711:00	698:50	287:00	440:00
LOX	1145:00	718:00	387:00	545:00	385:00	93:00
TOTALS	16,034:00	18,895:00	19,405:00	16,932:50	13,400.5	8,214:00

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MAINTENANCE MAN HOURS EXPENDED
DIRECT TIME

SHOP	MAR	APR	MAY	JUN	JUL	AUG
AERO REPAIR	644:30	951:00	1055:00	1058:00	598:00	883:00
AIRFRAME REPAIR	1323:30	1370:30	1560:00	1582:00	1323:00	1414:00
GROUND POWER EQUIPMENT	920:30	1279:00	859:30	2864.50	2404:00	282:00
COMM & ELECT	1506:	2281:00	2985:00	1626.50	842:00	156:00
CORROSION CONTROL	699:30	206:00	200:30	2568.50	1642.50	929:00
ELECTRIC	963:00	1028:00	1007:30	317:00	436:00	55:00
ENGINE BUILD-UP	1012:00	1377:30	2151:00	1112.50	861.50	439:00
HYDRAULICS	297:30	268:00	320:30	1781.00	1026:00	807:00
INSTRUMENTS	444:00	871:30	854:00	381:00	353:00	186:00
MACHINE	714:30	881:00	919:00	1254:00	510:00	335:00
PAINT	952:00	807:00	802:30	813:00	720.50	454:00
PARACHUTE	927:00	1027:00	1189:30	551.50	506:00	399:00
PROPELLER	281:00	1114:30	888:00	460.50	507:00	807:00
WELDING	586:00	516:30	353:30	695.50	620:00	650:00
WOOD MILL	743:00	827:00	425:30	281.50	124:00	213:00
LOX	229:30	765:00	1085:30	324:00	452.50	248:00
AUX EQUIP	1469:00	1338:00	1510:30	1681.50	887:00	251:00
TOTALS	13,659:30	17,508:30	18,167:00	19352.50	13,814:20	8,508:00

FIGURE 12
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Chapter 5 - Transportation.

Section A - Mission

The mission of the Transportation Section, Task Group 7.4 on Operation HARDTACK was as follows:

1. Provide General Purpose Vehicle Support.

2. Provide Special Purpose Vehicle Support.

3. Arrange for movement Task Group personnel (approximately (1200), via MATS from the CONUS to the EPG.

4. Arrange for movement of priority air cargo via MATS to the EPG.

5. Arrange for movement of Special Purpose Vehicles and other heavy items via surface lift to the EPG.

6. Arrange for booking of Task Group 7.4 personnel and cargo on Inter-Intra and off atoll flights.

7. Arrange for movement of passengers and priority cargo to the CONUS on a roll-up schedule after completion of Operation HARDTACK.

8. Arrange for roll-up movement of Special Purpose Vehicles, trailers and other heavy items to the CONUS via surface lift.

Section B - General Purpose Vehicle Requirements

General Purpose Vehicle Requirements for Operation HARDTACK were firmed up in February 1957 and forwarded to Hq, JTF-SEVEN for approval. A total of 137 vehicles were requested. Types requested were 1/4 ton (jeeps), 1/2 ton trucks (pick-up), 3/4 ton weapons carrier, 1 1/2 ton trucks, and 2 1/2 ton trucks. A list of 116 vehicles were tentatively approved by JTF-SEVEN in June 1957 with substitues of 1/2 ton pick-up trucks for 3/4 ton weapons carriers.

The above requirements submitted for Operation HARDTACK were based on the previous operation and allowances were made for new elements that were expected to be added.

In late April 1957, the 6th Weather Squadron requested they be allocated additional vehicles including two (2) Dukws. These additional requirements were forwarded to JTF-SEVEN and they were approved.

Final approval was received from JTF-SEVEN for 119 General Purpose Vehicles in January 1958. These vehicles were made available through Army Supply channels and were shipped to the EPG in the last quarter of 1957. The Test Base Unit Installations Officer made arrangements with the Army to commission these vehicles as they were required.

The Transportation Officer was represented by the Assistant Staff Supply Officer in the Advance Echelon. This officer drew the general purpose vehicles from the TBU and issued same to the various elements. This phase of the operation was carried out as planned and the elements received their allocation of vehicles very shortly after arriving in the EPG.

Task Group 7.4 personnel were issued Military Drivers license and operated its own vehicles. Task Group 7.2 dispatched and provided maintenance support for these vehicles.

Some of the units that had requested jeeps decided at the last minute that they would like to have 1/2 ton pick up trucks. It is believed it would be to the advantage of the next operation to have more pick-up trucks and less jeeps. (A breakdown of general purpose vehicles by organization is shown in figure 13).

Section C - Special Purpose Vehicle Requirements

144 pieces of special purpose equipment were programmed for the Operation. These vehicles were requested by letter to ARDC through AFSWC. At the time, these vehicles were requested the 4935th Air Base Squadron had serveral vehicles excess as also did the 4951st Support Squadron (Test). 18 of the 4935th vehicles were marked for

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HARDTACK

GENERAL PURPOSE VEHICLE ASSIGNMENT

	1/4 TON JEEP	1/2 TON P/U	1 1/2 TON	2 1/2 TON 6 X 6	TOTALS
HQ. T.G. 7.4	14	8			22
TAU	14	12	2	2	30
TBU	12	16	4		32
TSU	12	19	2	3	36
					120

HQ. T.G. 7.4	14	8			22
4926 TH	8	7		1	16
4080 TH(SAC)	1	1	1		3
WADC	2	1		1	4
NASWF		1	1		2
AFCRC (C-97)	1				1
4925TH(B-36)	1	1			2
AFOAT-1	1	1			2
4951 ST	9	10	3		22
4952 ND	2	3			5
24TH HELRON	1	2			3
HQ. TSU	3	1			4
64 TH ARS (SAR)	2	3	1	1	7
AIR PHOTO	2			1	3
DOC PHOTO		1			1
57 TH WX	1	3	1	1	6
6 TH WX SQ	3	6			9
MATS TERMINAL	1	2			3
AACS		3	1		4
PACAF		1			1
TOTALS	52	56	8	5	120

FIGURE 13

Operation HARDTACK and eight (8) of the 4951st vehicles were marked to remain at Eniwetok for the Operation. The net requirement to ARDC was reduced to 126 vehicles. Part of these vehicles came from ARDC excesses at other stations and the remainder came from Mallory AFD, which was the prime depot for vehicles.

A deadline date of 1 January 1958 was set for delivery of all special purpose vehicles to the Cakland Port. All vehicles made the deadline date and were shipped to arrive in the EPG by February 1958, which was well before the start of the Operation.

Arrangements were made with the NAS, North Island, California to borrow a 15,000 pound fork lift with special attachment for mounting aircraft engines. This vehicle was shipped on the aircraft carrier, USS BOXER from San Diego, California. A panel truck used by the SAC Unit for denitregenation of high altitude crews and four (4) decontaimination trucks were also shipped on the USS BOXER.

The special purpose vehicles were kept in common pool and were issued to the units to fill their day to day requirements. Maintenance Control Unit controlled the dispatch of these vehicles. (Figure 14 shows the number of vehicles on hand by type).

Section D - Movement of Passengers and Freight to EPG

When Task Group 7.4 Logistic Conference was held in October 1957, the Task Group Transportation Officer distributed instructions to all units setting forth requirements for forecasting movements of passengers and cargo by both air and water. The first report was received in November and then continued up through March and then discontinued since most of the Units were in place in the EPG by this time. These reports proved very helpful in the Transportation Section, Task Group 7.4 in forecasting requirements for air and surface lift.

SPECIAL PURPOSE VEHICLES USED

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
TRACTOR, TOWING AIRCRAFT	0	5	6	6	6	5	3	
TRACTOR, WAREHOUSE (TUG)	12	29	40	40	35	33	30	
TRACTOR, 2 1/2-10 TON	6	11	16	16	16	16	2	
WRECKER, M-246	1	1	1	1	2	1	1	
TRAILER, 25' & 40'	4	4	7	8	8	8	8	
REFUELING UNIT F-6 5000 GALLON	2	11	12	12	11	10	11	
REFUELING UNIT F-3 750 GALLON	2	4	9	13	12	12	10	
FORKLIFT 1-7 1/2 TON	12	15	26	26	23	21	20	
CRANE, GARWOOD 20 TON	0	0	0	0	1	1	0	
CRANE, ROUSTABOUT V-10	0	2	3	3	3	2	2	
CRANE, HYSTER 18,000 LB.	1	2	3	3	1	0	1	
STREETSWEEPER ROTARY PICKUP	0	0	0	0	0	0	0	
MAGNETIC SWEEPER	1	1	1	1	1	1	1	
FIRE TRUCK O-10	3	3	3	3	2	2	2	
FIRE TRUCK O-11A	2	3	6	6	5	5	4	
FIRE TRUCK 530B	2	2	2	2	2	2	2	
TRUCK PUMPER 2 1/2T M-61	2	2	2	2	2	1	1	
TRUCK, DECON M3A3	0	0	1	3	3	3	3	
TOTALS	50	95	138	145	133	123	101	

FIGURE 14

The movement of air freight was slow during the months August 1957 through November 1957 and averaged only ten (10) tons a month. In December, the air tonnage picked up. January, February, March, April and May were peak months averaging 85 tons per month.

The movement of Task Group 7.4 passengers via MATS was accomplished in an orderly manner. About 100 airmen of the 4952nd Support Squadron were shipped in November and December 1957 to augment the 4951st Support Squadron (Test). In January 1958, the Advance Echelons of the various elements started to move and peak months were February and March. Elements were responsible for movement of their personnel from home station to the Aerial Port at Travis Air Force Base, California. Some of the elements used aircraft of their own Command in moving personnel to the port. Others used commercial transportation. Personnel from Hq, Task Group 7.4, 4926th Test Squadron (Sampling), and 4952nd Support Squadron were moved to Travis AFB in groups of 20 by C-47 aircraft furnished by AFSWC. A total of 1200 Task Group 7.4 personnel were moved to the EPG via MATS.

In the Westbound Air Cargo, it will be noted there is a peak in the months of January, February and March, which was the shipping of "B" kits for the elements and other support equipment for the start of the Operation. Also note another build-up in Westbound Air Cargo shipments in May and June. This was due to the shipment of replacement aircraft engines by air from the depot to the EPG., (See figure 15, Air Cargo Westbound.)

The Chart on Westbound Air Passenger Movement shows a peak in January, February and March which is when the majority of the 1200 passengers moved by MATS had reached the EPG. Then another build-up is indicated on the chart in June and July in the Westbound Air Passenger

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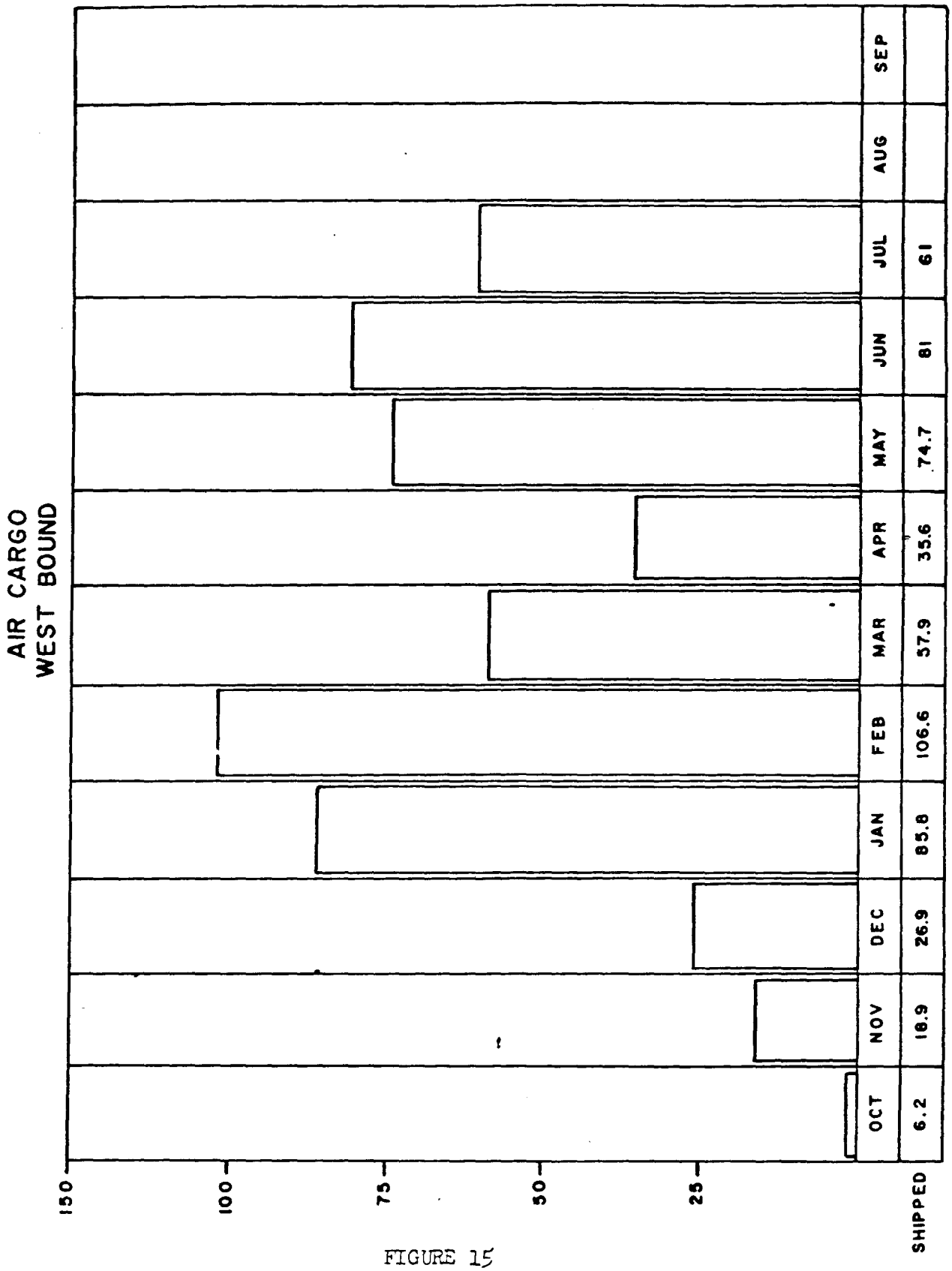

FIGURE 15

Movement. This build-up was due to replacements arriving in the EPG for augmentation personnel who were sent home at the end of their six (6) months period. Due to the extension of the operation through July and August, it was necessary to replace these personnel in June and July. (See figure 16, Air Passenger Movement Westbound).

The major part of the water cargo was the 120 special purpose vehicles which arrived at the port in January and were shipped in January and February. Water cargo reached a peak in January, February and March when the bulk of the heavy items of support equipment were shipped. (See figure 17, Water Cargo Westbound.)

Section E - Air Transportation. (Inter, Intra-Atoll and Off Atoll)

A position was created by JTF-SEVEN called a Senior Transportation Control Agent (STCA). This position was held by a civilian employed by Task Group 7.5. This person was placed directly under the JTF-SEVEN Transportation Office and responsible only to that office with no obligation to any Task Group. The duties of the STCA was to receive requirements for movement from the Task Groups and to make decisions as to priorities of movement.

Each Task Group designated an Officer as a Transportation Control Agent. (TCA). This Officer's responsibilities was to receive requirements for movements from the subordinate units and book them with the STCA. The STCA consolidated all his bookings from the TCA's and then made a decision as to what passengers and cargo would go.

No problems were encountered on the scheduled lift to Bikini. There were sufficient flights scheduled daily to take care of everyone who had reason to go. Three (3) flights were scheduled daily at first and after two (2) months, the number of flights was reduced to two (2) due to lack of patronage.

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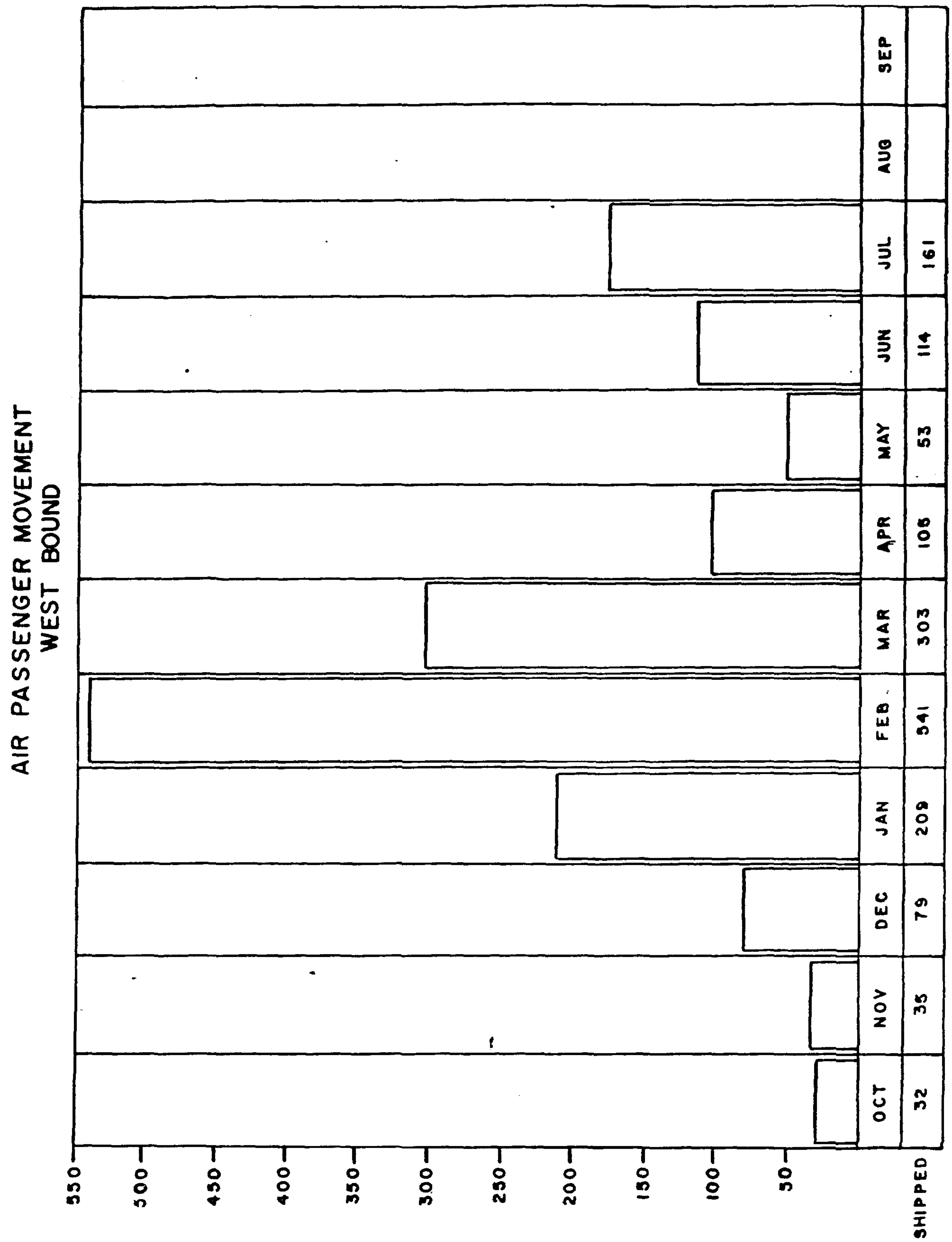

FIGURE 16

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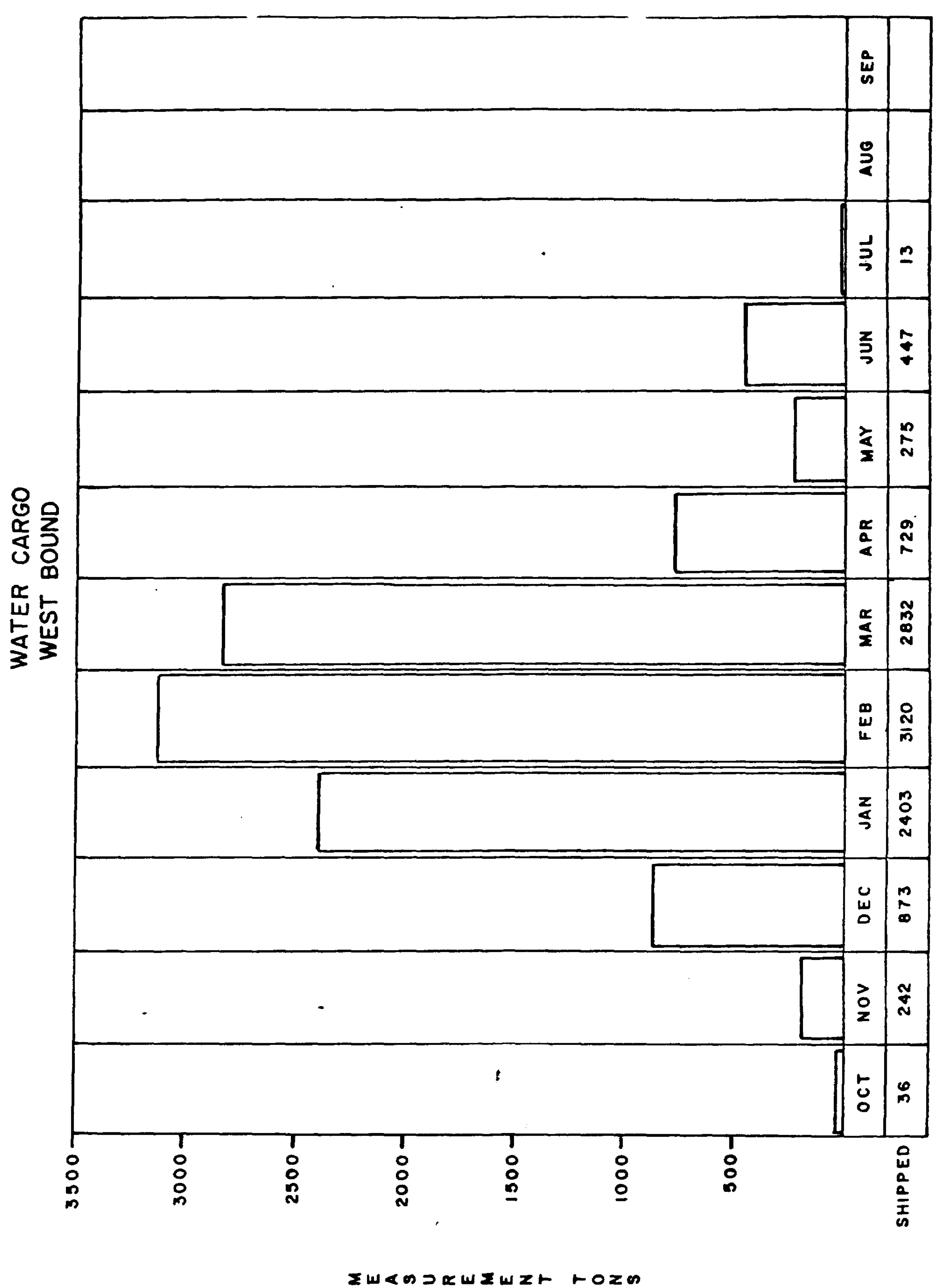
WATER CARGO
WEST BOUND
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
SHIPPED 36 242 873 2403 3120 2832 729 275 447 13
3500 3000 2500 2000 1500 1000 500
MEASUREMENT TONS

FIGURE 17

Flights to the Weather Rad-Safe Islands were scheduled once a week with a flight departing daily for a different island. Flights to Nauru and Tarawa were serviced by C-54 aircraft but were limited to the number of passengers they could take due to a large crew of eight (8) and the number of persons who could be billeted at the camp site. A total of seven (7) passengers were permitted on these flights.

On the SA-16 flights to Kapingamarangi (weight limit 1777), Utirik (weight limit 2107), Kauaie (weight limit 2291), Rongelap (weight limit 2225), Wotho (weight limit 2634) and Ujelang (weight limit 3078), the total weights for passengers and cargo was limited as noted above. This usually meant a total of five (5) seats for passengers and the aircraft was filled out with freight including such items as rations, housekeeping supplies, PX supplies, film and mail.

On 75% of the flights scheduled both C-54 and SA-16 aircraft, to the Weather Rad-Safe Islands there were more official passengers booked than could be transported. Priorities were determined by the STCA and he decided which passengers would go. Passengers that could not go one week were slipped to the next and as a result many cancelled out.

On approximately 1 June 1958, Commander, Task Group 7.4 placed a policy in effect that personnel off duty would be permitted to travel to the Weather Rad-Safe Islands and to Kwajalein and Guam on a "space available"-basis. This was controlled through Task Group 7.4 (TCA) and seats were evenly distributed among the Task Groups according to strength. These spaces were limited to deserving airmen and officers.

Section F - Roll-Up Shipment of Cargo and Passengers to CONUS

The majority of the passengers indicated on the figure as moving Eastbound in January through April were PCS returnees to the CONUS from the 4951st Support Squadron (Test). About five (5) personnel were

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returned each month during this period due to emergency or morale leave. One (1) each film courier was booked each week to return exposed film to Lookout Mountain Laboratory in Hollywood, California. In April and May, the C-97 and B-36 aircraft support crews were booked to leave after their aircraft had departed. In May and June, augmented personnel of the 4952nd Support Squadron started to the States. Starting in July and reaching a peak in August, the main body of the operation was returned to the states via MATS. On 1 July 1958, the MATS Industrial Funding System was placed in operation. This had very little effect on our operation. This meant that all TDY personnel and cargo moved by MATS in support of Operation HARDTACK was billed to a JTF-SEVEN fund citation by MATS. A stamp was provided by JTF-SEVEN to validate all personnel orders and shipping documents. (See figure 18, Passengers Air Eastbound.)

There was very little air cargo moved Eastbound in January, February and March, but starting in April, a steady build-up is indicated on the chart reaching a peak in July, August and September. The major part of the tonnage moved in April, May and June was reparable aircraft engines, being returned to the depot for overhaul. In July, 20 tons of cargo was shipped to Hickam. This cargo consisted of "B" kits for B-36, C-97 and WB-50 aircraft. The roll-up of air shipment on high priority hi-value items started in late July and continued through August and September. (See figure 19, Air Cargo Eastbound.)

The roll-up of heavy surface lift was started in June when several special purpose vehicles were declared excess. Surface lift reached a peak in August and September when the USS BRCSTRCM, heavy lift vessel was brought in to return the remainder of special purpose vehicles to the CONUS. Unfavorable winds made it necessary to ship six (6) SA-16

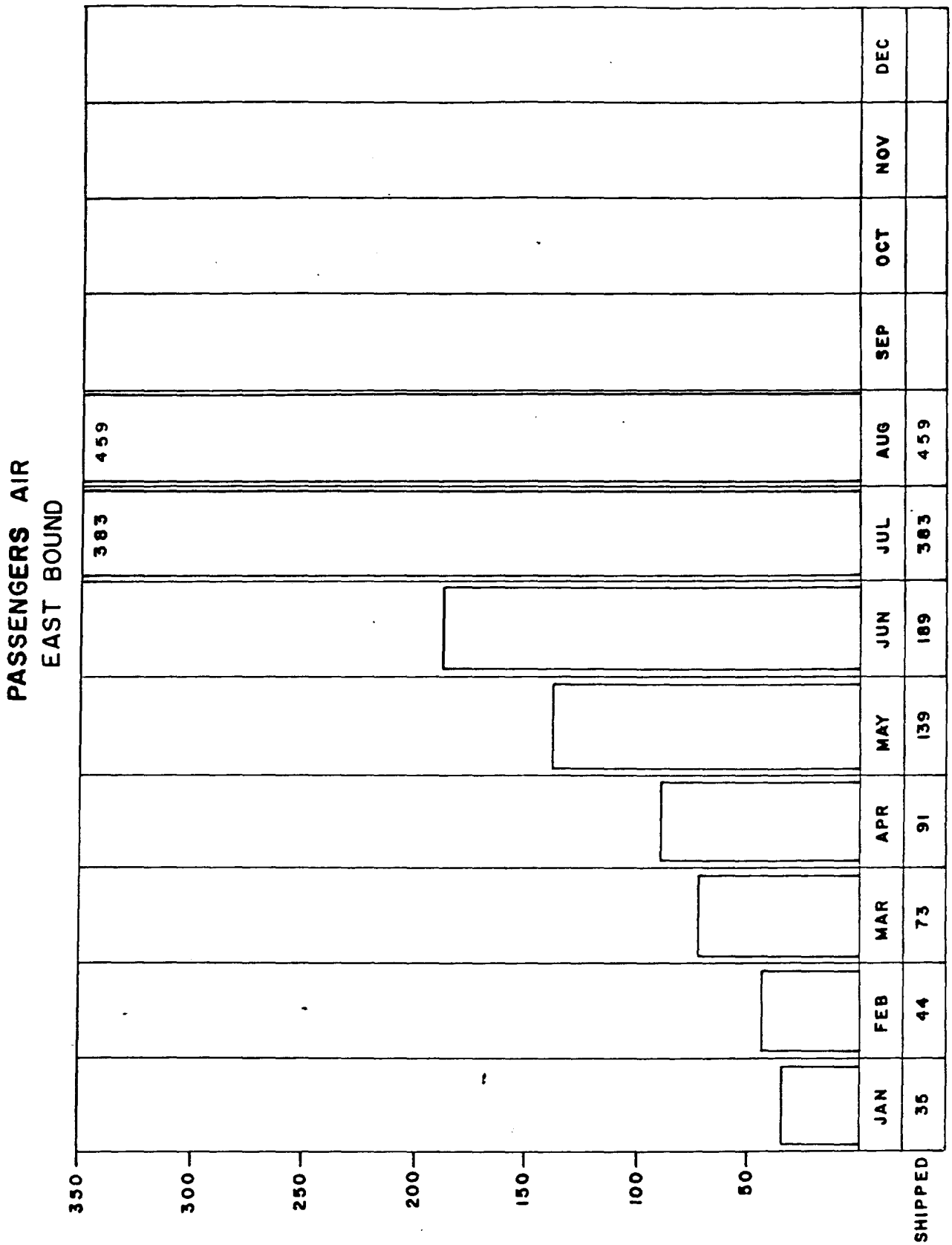

FIGURE 18

200

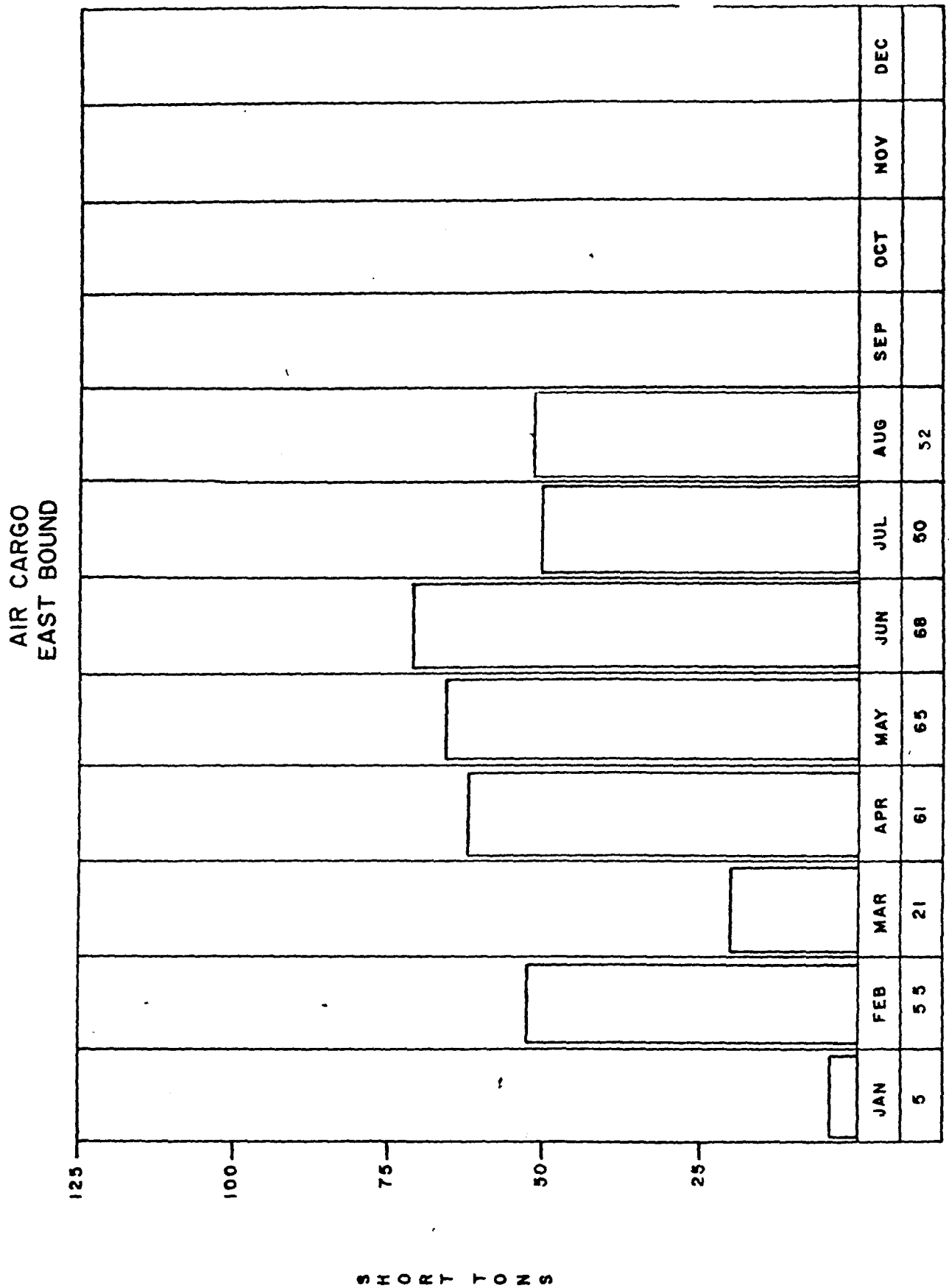

FIGURE 19
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LANL RC

aircraft from Hawaii to the CONUS via surface lift. Special arrangements were made with JTF-SEVEN Surface Transportation Section to ship these aircraft aboard the aircraft carrier USS BOXER as opportune surface lift.

Four (4) H-21 helicopters, three (3) H-19B helicopters, five (5) F-6 Refueling Units and 84 tons of general cargo was shipped to Japan via surface lift in late August and early September 1958. (See Figure 20, Water Cargo Eastbound.)

Section G - Summary

A total of 119 general purpose vehicles were issued to Task Group 7.4. They were distributed among the major units and the Task Group Headquarters, according to their requirements as follows:

Hqs. TG 7.4	22
TAU	30
TBU	32
TSU	36

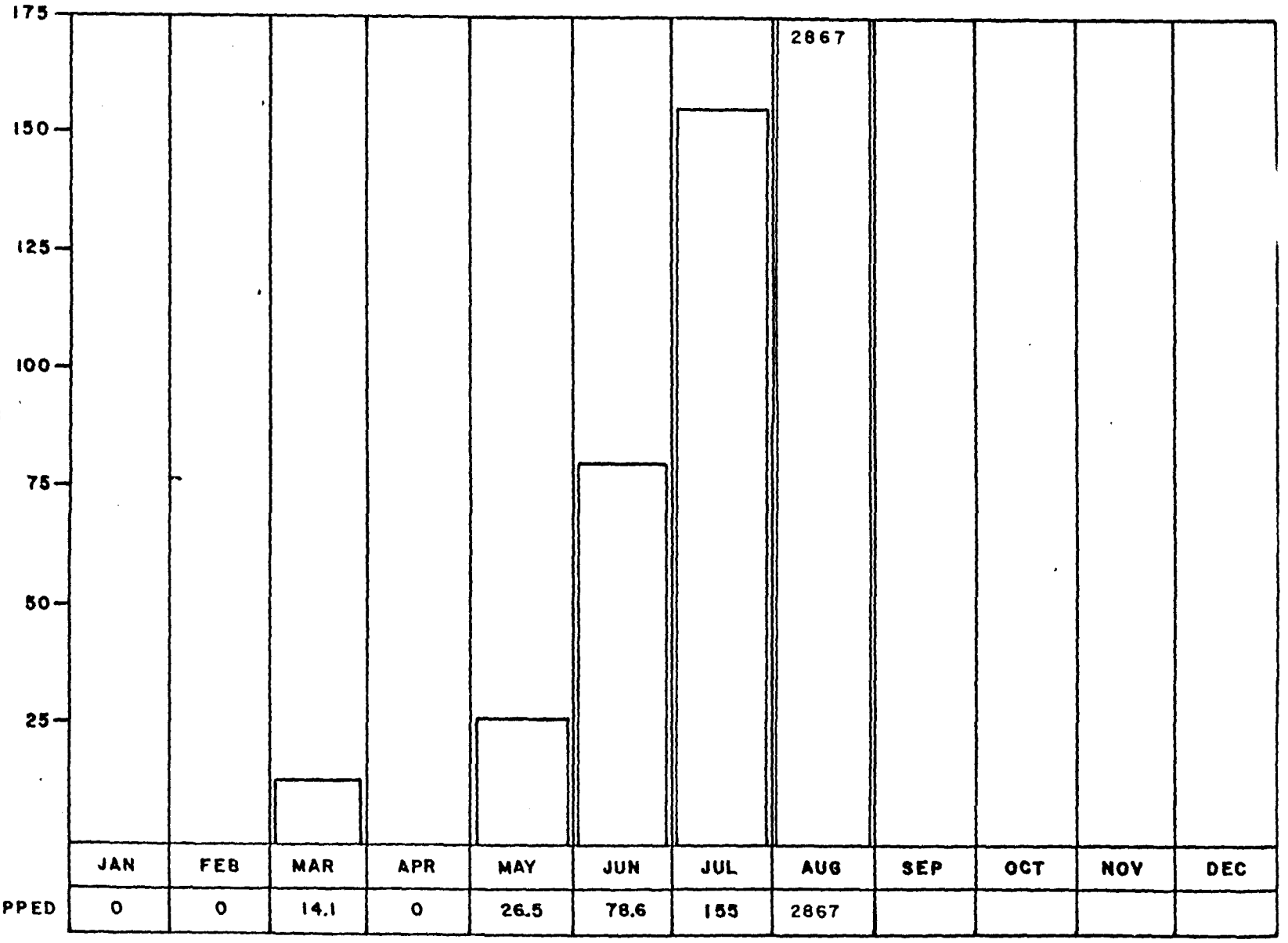
A few minor adjustments in allocations between units were made the first month of the operation.

Special Purpose Vehicle support was provided to the Task Group by arranging for shipment of 144 pieces of equipment to the EPG in January 1958. 50% of these vehicles were issued on a permanent basis and the remainder dispatched on call as required by Maintenance Control Unit.

The movement of approximately 1200 paggengers from their home station in the ZI to the arrival Port of Embarkation at Travis AFB was accomplished by Unit aircraft and commerical transportation. The transportation Section Task Group 7.4 arranged for booking of these personnel on MATS with JTF-SEVEN Liaison Officer at Travis.

Approximately 350 tons of air cargo was shipped out of Travis AFB

WATER CARGO
EAST BOUND



MEASUREMENT TONS

FIGURE 20
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to the EPG during the period 1 January 1958 through 30 April 1958. The majority of this cargo was aircraft support kits and spare aircraft engines, which was shipped direct from SMAMA.

All Special Purpose Vehicles, van type trailers and other heavy equipment was moved to the Port of Embarkation, Naval Supply Center at Oakland, California via rail, commerical truck or drive away. This equipment was shipped via MSTS surface lift to the EPG.

Transportation of Task Group 7.4 personnel and cargo to Bikini and the Weather Rad-Safe Islands was arranged by the Task Group 7.4 Transportation Control Agent who was the Task Group 7.4 Transportation Officer. The Task Group 7.4 (TCA) received requests for movement by phone and forwarded them to the JTF-SEVEN (STCA) by phone. Service to Bikini was twice daily. Service to the Weather-Rad Safe Islands was weekly.

Movement of passengers to the CONUS from the EPG was accelerated in July and August. When a total of over 900 persons were shipped via MATS. These personnel were booked through the Army Transportation Section. MATS scheduled one to three flights a day with a capacity of 57 persons per aircraft to move these personnel.

The shipping section of the 4951st Support Squadron (Test) arranged for receiving high-value cargo to be shipped by air. The Transportation Officer, Task Group 7.4, and the Shipping Officer, Test Base Unit, screened this cargo to restrict it to priority cargo. The majority of roll-up air cargo was shipped in August and September 1958.

The majority of the heavy roll-up items such as vehicles, van trailers and large crates were shipped on the USS BROSTROM which departed the EPG in late August 1958. This cargo was turned over to the shipping section of the 4951st Support Squadron (Test) who in turn

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transferred it to the Transportation Section, Task Group 7.2. Task Group 7.2 Transportation Section moved it to Parry Island by barge where it was stored until surface lift was arranged.

Chapter 6 - Construction.

During the operational phase of Operation Redwing, Headquarters Task Group 7.4 prepared and submitted to Commander, JTF-SEVEN as complete a long range construction program as could be foreseen at that time. A final refinement of this construction plan was submitted to Commander, JTF-SEVEN by our letter, Subject: Task Group 7.4 Development Plan (Revised), 15 August 1956.

Our construction program was combined with the programs of the other Task Groups, into a single JTF-SEVEN program, which was forwarded to the Chairman, United States Atomic Energy Commission, for further processing.

Throughout the period September 1956 to March 1958 continuous follow up action was taken to insure the completion of construction projects prior to the beginning of Operation HARDTACK. This follow up action included joint action with Holmes and Narver, the AEC Contractor in the EPG and the USAEC, to finalize and approve construction drawings, and to establish target dates for completion. The major project involved was the extension of the existing runway, widening of taxi-ways and turn around areas, and addition of ramp parking space.

In spite of continuous action to effect the timely completion of the airfield complex, some work, i.e. runway lighting, runway marking, etc, was yet to be accomplished at the beginning of the HARDTACK operational period.

Continued attention to the EPG construction requirements is essential to the timely completion of projects. It is extremely important that as many constructions projects as possible be completed during the off-year between test operations.

In June 1957, the Commander, JTF-SEVEN advised of a planned construction conference to be held in the EPG during the Spring of 1958. Accordingly, considerable thought was given to additional construction requirements, over and above those listed in letter, Headquarters, Task Group 7.4, Subject: Task Group 7.4 Development Plan (Revised), 15 August 1956. In addition, the Test Base Unit (4951st Support Squadron (Test) was advised to begin considering its requirements for additional construction in the EPG.

In March and April 1958 several conferences were held in the EPG, attended by representatives of Headquarters, Task Group 7.4, Test Base Unit, Test Aircraft Unit and Test Services Unit. From these meetings was formulated an overall construction plan which included all construction items not scheduled for completion in FY58, plus a number of new projects. All of these projects were re-considered as to validity and were listed in the order of priority for completion. (See figure 21). This listing was submitted to the Commander, JTF-SEVEN, by our letter, Subject: Task Group 7.4 Construction Plan for the Period Ending 1 July 1962, dated 12 April 1958.

During the JTF-SEVEN Construction Conference, held in April 1958, the construction programs of all Task Groups was presented to and justified before representatives of JTF-SEVEN. Upon completion of this conference, JTF-SEVEN consolidated all requirements, in the agreed order of priority for completion, and forwarded them to the Chairman, USAEC, by letter, file Comd/600.1, dated 28 June 1958.

CONSTRUCTION PROGRAM THRU FY62

PRIORITY	TITLE
1.	Expand POL Farm.
2.	New Hangar, With Two (2) Lean-To Additions.
3.	Rehabilitate Old POL Farm and Replace Office Buildings.
4.	Maintenance Run-Up Pads and Blast Fences.
5.	Replace Control Tower.
6.	Replace Rawinsonde Weather Facility.
7.	Additional Communications and Electronic Shop Space.
8.	Replace AACS Supply and Maintenance Building.
9.	Replace Quarters for Commander, Task Group 7.4.
10.	Rehabilitate Field Maintenance Shop, Building #82.
11.	Construct Aircraft Tire Warehouse.
12.	Construct Airlift Support Building.
13.	Replace Building #632 with a Squadron Flight Line Maintenance Building.
14.	Construct a Seaplane Beaching Ramp.
15.	Replace Building #631, Carpenter Shop.
16.	Replace Building #90G, Generator Shed.
17.	Replace Building 91A, Old Crash Fire Station.
18.	Construct Ten (10) 128-Man Barracks.
19.	Construct Unit Supply Building.
20.	Construct Headquarters Building for TBU, TAU and TSU.
21.	Pave Area Around Building #679.
22.	Install Additional Ramp Power.

FIGURE 21

Cont'd next page

PRIORITY	TITLE
23.	Extension to Building #89 for Base Weather.
24.	Replace Buildings #640, 633, 606, 607, 608, 609 and 611.
25.	Construct a MATS Passenger Terminal.
26.	Pave MATS Cargo Area.
27.	Construct Fire Watch Tower on Building #685.
28.	Pave Runways on JANET and YVONNE.
29.	Construct a Crash Boat Pier.
30.	Construct Pier for POL Sea Lines.

FIGURE 21