EXTRACTED VERSION

OPERATION WIGWAM

Report of Commander, Task Group 7.3

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NOTICE

This is an extract of **Operation WIGWAM, Report of Commander, Task Group 7.3,** which remains classified **Secret/Restricted Data** as of this date.

Extract version prepared for:

Director

DEFENSE NUCLEAR AGENCY

Washington, D. C. 20305

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Operation WIGWAM
Underwater Nuclear Detonation
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SQUAWS

346Y.2

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The chief objective of Operation WIGWAM was to determine with satisfactory accuracy at what ranges, under various conditions, a submarine or surface vessel would be destroyed by a deep underwater atomic explosion. The second objective was to determine the hazards to the delivery vehicle and its supporting forces.

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FOREWORD

This report has had classified material removed in order to make the information available on an unclassified, open publication basis, to any interested parties. This effort to declassify this report has been accomplished specifically to support the Department of Defense Nuclear Test Personnel Review (NTPR) Program. The objective is to facilitate studies of the low levels of radiation received by some individuals during the atmospheric nuclear test program by making as much information as possible available to all interested parties.

The material which has been deleted is all currently classified as Restricted Data or Formerly Restricted Data under the provision of the Atomic Energy Act of 1954, (as amended) or is National Security Information.

This report has been reproduced directly from available copies of the original material. The locations from which material has been deleted is generally obvious by the spacings and "holes" in the text. Thus the context of the material deleted is identified to assist the reader in the determination of whether the deleted information is germane to his study.

It is the belief of the individuals who have participated in preparing this report by deleting the classified material and of the Defense Nuclear Agency that the report accurately portrays the contents of the original and that the deleted material is of little or no significance to studies into the amounts or types of radiation received by any individuals during the atmospheric nuclear test program.

JOINT TASK FORCE 7
TASK GROUP 7.3
WASHINGTON 25, D.C.

FF3/7.3/30:ajs
A9
Ser: 00417
22 July 1955

From: Commander Task Group 7.3
To: Commander Joint Task Force SEVEN

Subj: Report of Operation WIGWAM

Ref: (a) CJTF SEVEN ltr J-3/S-118-55W dated 15 March 1955

Encl: (1) Subject report

1. In accordance with reference (a), Commander Task Group 7.3 Report of Operation WIGWAM is furnished herewith.

John Sylvester

JOHN SYLVESTER

ABSTRACT

The deep underwater test of an atomic weapon (Operation WIGWAM) was conducted by Task Group 7.3 under Joint Task Force SEVEN as a Joint Atomic Energy Commission–Department of Defense effects test. The Chief of Naval Operations was the Executive Agent of the Joint Chiefs of Staff for the conduct of the test.

The chief objective of Operation WIGWAM was to determine with satisfactory accuracy at what ranges, under various conditions, a submarine or surface vessel would be destroyed by a deep underwater atomic explosion. The second objective was to determine the hazards to the delivery vehicle and its supporting forces.

One nuclear device was detonated on 14 May 1955 at 1259 hr 59.871 sec PDT at latitude 28°44'N, longitude 126°16'W at a depth of 2000 ft. The depth of the water was approximately 15,000 ft.

[redacted] The equivalent yield was apparently the expected value of 30 kt, but the underwater pressure field generated was equivalent to that generated by the detonation of 40 million pounds of TNT.

As originally planned, three specially constructed submersible structures were to be suspended at a depth of 250 ft at various ranges from the YC zero barge. Rough weather, however, damaged the array elements to such extent that only two targets could be submerged at the time of detonation, and the third target had to be left on the surface.

Preliminary estimates appropriate to WIGWAM conditions are as follows:

	Range from Surface Zero, ft
Typical Submerged Submarine	
Assured lethal hull splitting damage (kill probability of 1.0)	7000
Surface Vessel	
Lethal hull splitting	3500
Shock damage to render ship ineffective	7000
Aircraft	
As recommended in NavAer 00-25-536, Guide to the Effects of Atomic Weapons on Naval Aircraft, 1 July 1954 (Secret RD)	

It is considered (1) that sufficient scientific information has been gained to meet all the objectives of the test and (2) that any further information needed on the response of targets of different design can be gained from tests using scaled models and tapered high-explosive charges. Hence it is recommended that no additional tests of atomic devices at deep submergence be conducted.

From information available at this time, the cost of DOD participation in Operation WIGWAM was $15,234,176.37, including an estimated $5,639,291.49 of normal service operating expense.

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CHAPTER 1

HISTORICAL BACKGROUND

Active interest in conducting a deep underwater test of an atomic weapon was first evidenced in 1946 when preliminary planning was completed for the conduct of such a test as a part of Operation CROSSROADS.

By executive order the test was canceled. Subsequently, Project HARTWELL, in its report on the security of overseas transport, strongly recommended the development of an atomic depth charge and the conduct of a deep underwater test to measure its lethal power.

In 1951 the PELICAN Committee, composed of outstanding civilian scientists, was convened to:

1. Prepare preliminary studies and investigate the problems involved in the explosion of an underwater atomic device at deep submergence.

2. Make recommendations as to the general nature and scope of such a test.

On 10 April 1952, the committee published its report, which contained the following principal recommendations:

1. For tactical evaluation of an atomic depth charge the lethal range should be known with greater precision and with more confidence than current knowledge permitted.

2. To attain the objective stated, a full-scale atomic test at deep submergence should be conducted utilizing free-field pressure-time instrumentation, full-scale surface vessels, and submarines and dummy submarine structures of known characteristics in order to improve the understanding of the basic free-field and damage processes and to improve the ability to predict the effects of various bomb sizes on submarines under different conditions of hull thicknesses, strength, depth, and standoff, under various oceanographic conditions, in anticipation of future developments.

On 15 July 1952, the Chief of Naval Operations requested the Chief, Armed Forces Special Weapons Project (AFSWP), to form an *ad hoc* committee of professional officers to study specific problems connected with a deep underwater test of an atomic weapon. It was considered particularly desirable that the committee make a study of the problems of an underwater test in order to determine:

1. The feasibility of conducting a test from a standpoint of seamanship and expense.

2. Whether or not, in connection with the PELICAN report, sufficient information on the effects of underwater detonations can be determined or predicted from a test of lesser magnitude than that proposed.

3. The date and geographical location for conducting any test proposed by the committee.

On 4 October 1952, the *ad hoc* committee arrived at the following conclusions:

1. A deep underwater test of an atomic weapon was feasible from the standpoint of seamanship under selected conditions of wind and sea.

2. The magnitude of the test could be reduced slightly from that indicated in the PELICAN report without serious prejudice to the objectives of the test.

3. As recommended in the PELICAN report, a nuclear device of about 20 kt equivalent yield detonated at 2000 ft submergence in deep water should be used in the test.

4. The best sites for conducting the test lay in the Panama, Cape Mala, Galapagos Islands area bounded roughly by latitudes 2°S and 8°N and by longitudes 77°W and 93°W. The best date for conducting the test in this area was February 1955.

Based on these conclusions of the *ad hoc* committee, the Chief of Naval Operations recommended to the Joint Chiefs of Staff (JCS) that a deep underwater test be conducted in the spring of 1955. On 8 December 1952, the JCS recognized the necessity for the test and designated the Chief of Naval Operations as their executive agent to conduct the test. On the following day, the chiefs of the three services informed the Secretary of Defense and the Chairman, Military Liaison Committee to the AEC, of their action and that they had directed the Chief, AFSWP, to commence planning and preparations for the test. On 16 December 1952, the Chief, AFSWP, initiated the formation of a planning group to carry out this directive.

The purposes of the test as originally determined by the AFSWP Plans Group were as follows:

1. To obtain data on which to base the optimum yield of atomic depth bombs or charges being designed and developed.

2. To ascertain the lethal range of atomic depth bombs or charges against submarines and surface ship targets from the points of view of both hull-splitting and internal shock damage.

3. To determine the relative effectiveness of the atomic depth bomb or charges against surface ships in convoy and task-force formations as compared to an air or surface burst.

4. To obtain information on which to base safe delivery tactics of the atomic depth bomb or charge.

By 20 April 1953, approval for the conduct of the proposed test had not been received from the Secretary of Defense. On that date the Secretary of the Navy proposed to the Secretary of Defense that, in the event it should be necessary to reduce expenditures of funds for atomic testing, it might be possible to conduct a modified test of a greatly reduced scope to obtain information from which the maximum range at which hull-splitting damage to a typical submerged submarine at a single depth could be assured.

The proposed modified program consisted of a series of scaled HE experiments to determine the qualitative relations of charge size, target orientation, and depth. These experiments were to be coordinated with a deep underwater atomic test, using only two submerged targets located at one depth and at ranges determined by preliminary experiments. Associated measurements other than target response were also to be made to investigate the various other phenomena associated with a deep underwater atomic detonation. The total estimated cost of this reduced program was $9,350,000. This test program was considered by the Secretary of the Navy to be the minimum necessary to provide the basic rudiments of information required for offensive and defensive tactical planning.

On 15 June 1953, the conduct of a deep underwater test of an atomic weapon on the reduced scale as outlined in the foregoing paragraph was approved by the Secretary of Defense.

On 16 November 1953, the Deputy Assistant Secretary of Defense (R&D), stated that the civilian scientists serving as consultants to his office had recommended the inclusion of a third submerged target for the test. He directed the Chief, AFSWP, to initiate the request for the necessary funds. On 24 November 1953, the Assistant Secretary of Defense (R&D) was requested to obtain authorization for an increase in the scope of the test to include a third submerged target.

On 8 December 1953, the Secretary of Defense approved the increase in scope of the test to a new total cost of $12,280,000, excluding normal service support costs.

The objectives of the test as now planned were as follows:

1. To determine and evaluate the response of three targets submerged to the same depth, but at various ranges, so as to obtain information from which a prediction could be made of the maximum range at which lethal hull-splitting damage to a typical submerged submarine could be assured.

2. To determine the peak pressure and pressure-time fields.

3. To evaluate the surface effects with particular regard to their influence on delivery tactics.

4. To determine the equivalent yield of the weapon used, the dispersion of radioactive contaminants, and the oceanographic factors affecting transmission of the shock wave.

CHAPTER 2

OPERATIONS

2.1 PLANNING

The basic planning for Operation WIGWAM was performed by the Plans Group of AFSWP. This group was later ordered to Task Group 7.3 (TG 7.?) to form the nucleus of the test organization.

During the planning phase, the initial requests for ships, aircraft, and personnel to support the operation were submitted by this group. Likewise, invitations were forwarded to each of the three Services to submit project proposals for participation in the scientific programs. As was to be expected by the nature of the operation, the major portion of the operational as well as the technical support was furnished by the Navy. The Air Force provided certain aircraft for specialized purposes, and the Army, although declining the invitation to submit project proposals, offered the assistance of the Army Technical Services in furtherance of the operation.

Further planning indicated that, Operation WIGWAM being basically a naval operation, only the Navy Task Group of Joint Task Force Seven (JTF 7) would be required. The services of the remaining task groups were not employed, therefore, and TG 7.3 was the only subordinate echelon of JTF 7 involved.

A planning draft of CTG 7.3 Operation Plan 1-55 was issued on 2 March 1955 and submitted to CJTF 7 for approval and to the prospective task unit commanders for comment and recommended changes. On 25 March 1955 the final plan was issued. Each of the unit commanders, in turn, prepared a detailed plan covering the particular aspects of their task units.

2.2 ORGANIZATION

In planning for Operation WIGWAM it became increasingly apparent that the forces assigned to the final operational phase should be those which had conducted the preoperational training exercises discussed in Sec. 2.5. Accordingly, the Chief of Naval Operations was requested to assign the same fleet units throughout both phases of Operation WIGWAM commensurate with the over-all Pacific Fleet requirements.

With the cooperation of the Commander in Chief, U. S. Pacific Fleet, the above requirement was adequately fulfilled. Only one ship was exchanged between the start of the preoperational phase and the completion of the operation, and the turnover from one commanding officer to the other was so thorough that continuity was maintained throughout.

Further planning indicated that the majority of tasks associated with Operation WIGWAM were those in which naval units were engaged as a normal course of duty. It was highly desirable, therefore, both from a practical point of view and for economy purposes, that existing naval commanders be assigned additional duty with TG 7.3, rather than set up billets

especially for the operation. The Chief of Naval Operations approved this procedure, and the organization, as shown in Fig. 2.1, was established for planning purposes on 25 March 1955 and for operations on 22 April 1955, at which time CTG 7.3 Operation Plan 1-55 was made effective as an operation order.

The organization for Operation WIGWAM proved satisfactory in all respects, and the decision to utilize the same forces throughout was well justified in the light of operational difficulties encountered. It is difficult to envisage what the outcome of the operational phase might have been had ships been assigned which were wholly unfamiliar with, and untrained in, the operational techniques peculiar to Operation WIGWAM.

2.3 SITE

One of the major problems associated with the conduct of the operation was the selection of a test site. It was determined that such a site should meet, if possible, all of the following criteria:

1. Adequate depth of water so as to minimize effects from bottom reflection.
2. Isolation from commercial fishing areas, sea lanes, and land masses.
3. Reasonable distance from the naval shipyard or base at which the array elements were fabricated and assembled.
4. Equable and forecastable weather and sea conditions with good visibility.
5. Surface and subsurface movement away from commercial fishing areas and land masses.

Beginning in 1952, the PELICAN Committee and the AFSWP *ad hoc* committee on feasibility considered approximately 400 sites for suitability, bearing in mind the above criteria. As a result of their studies and those of the Operation WIGWAM Planning Group, which included one oceanographic cruise to a recommended Caribbean area by the Woods Hole Oceanographic Institute, it was decided that the area which most nearly met all the criteria lay in the sector south to southwest of San Diego, Calif., at a distance of 200 to 600 miles from that base.

It then became necessary to determine more precisely the specific area within this sector in which to conduct the test. To this end, the Scripps Institution of Oceanography was requested to undertake intensive oceanographic and pelagic studies of the general area. In addition, special meteorological and sea and swell studies were conducted, using facilities and personnel of the Fleet Weather Central, San Diego, and the U. S. Navy Hydrographic Office.

Commencing in the spring of 1954, a series of cruises was made into the area by various of the Scripps vessels in cooperation with the Inter-American Tropical Tuna Commission. The purpose of these cruises was to investigate and document currents, current shear, dispersion, distribution of temperature and density, plankton, fish, bottom topography, surface waves, and weather.

As these cruises continued it became apparent that:

1. Adequate depth of water was to be found throughout the general area.
2. Isolation from commercial fishing areas, sea lanes, and land masses was most favorable in the northwest portion of the general area.
3. Weather and sea conditions were acceptable throughout the general area, with the highest probability of continuing favorability being in the southwest portion of the sector.

Growing concern on the part of the Department of State and the AEC as to the possible reactions to the test on the part of the Government of Mexico and our own tuna fishing industry emphasized the necessity for accurately determining a location for the test that was isolated from commercial fishing areas and one in which the current structure was such that the radioactive debris from the detonation would not move into, or near, commercial fishing areas before decay and dispersion had reduced its activity to background. To this end, a tentative site was selected at 28°00'N and 124°00'W, this site appearing to be sufficiently west of the predicted line of current divergence that all surface and subsurface currents would move in a southerly to southwesterly direction away from commercial fishing areas and the coast of Southern California and Mexico. This site also agreed with a State Department desire that the

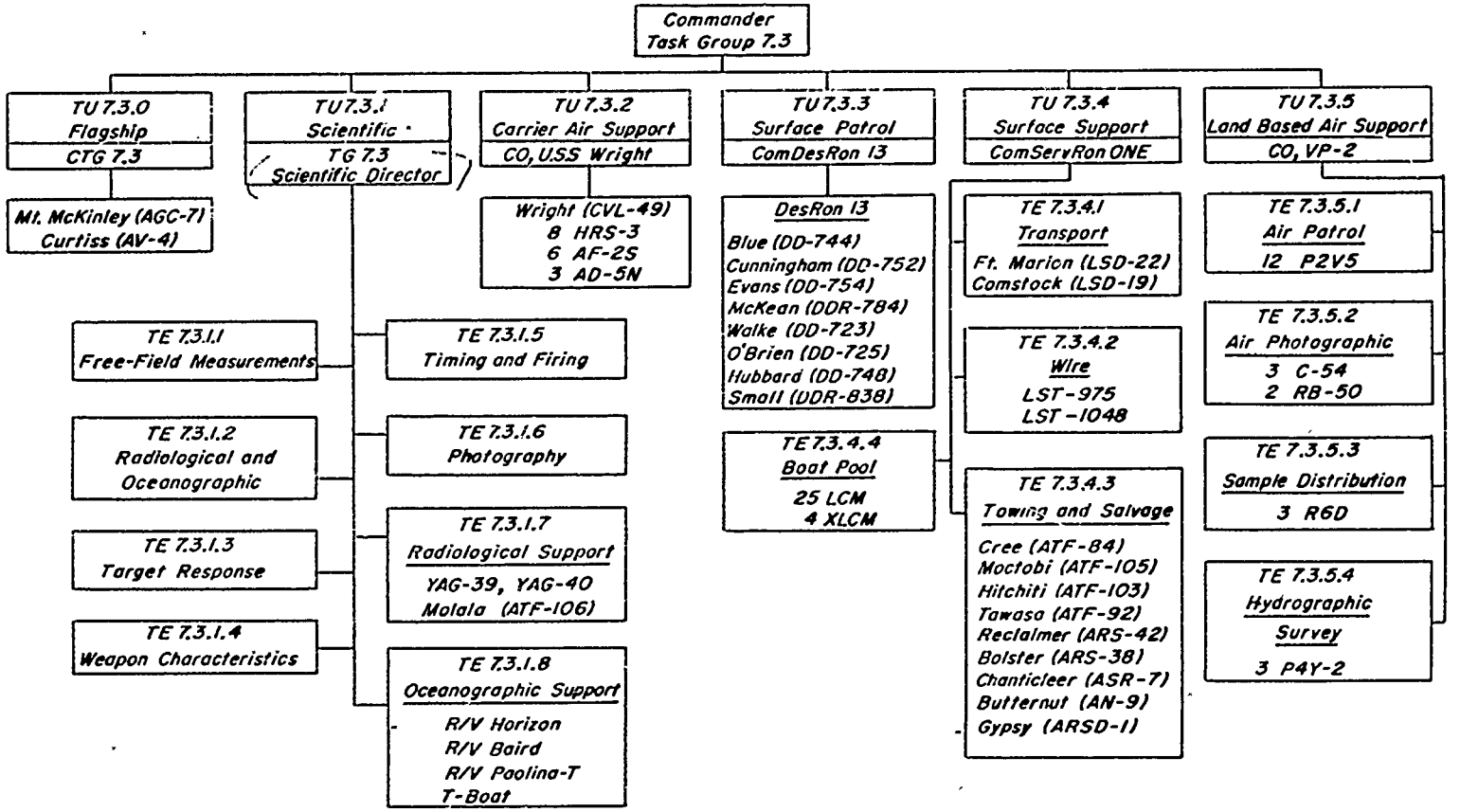

Fig. 2.1—Organization chart for Task Group 7.3.

test be carried out at a point closer to the mainland of the United States than to the mainland of Mexico.

The final oceanographic surveys conducted just before the test showed that the actual line of divergence was to the west of that predicted, and it was necessary to move the proposed test site to longitude 125°00'W.

After arrival in the test area, it became necessary to further relocate the test area in an effort to avoid continuing bad weather. The position at detonation was 28°44'N and 126°16'W.

The area ultimately selected for the conduct of the test was eminently satisfactory with respect to all the criteria except that pertaining to weather and its attendant condition of sea and swell. The paucity of weather data for the area concerned makes it difficult to determine whether the excellent weather encountered in the spring of 1954 was typical or atypical when viewing the poor weather conditions prevailing at the time of the test.

Currents in the test area were as predicted, no food fish were in evidence, plankton hauls were unusually low, and no oceanographic or pelagic information was developed subsequent to the test which conflicted with the criteria for site selection established prior to the test.

2.4 SUBMARINE TARGETS

2.4.1 Design

Full-scale submarine targets were carefully considered in planning for Operation WIGWAM. However, available hulls were found to be unsatisfactory for the following reasons:

1. Lack of similarity. Available hulls, constructed during World War II, were found to be radically dissimilar in hull-strength characteristics, not only between one hull and another but also among various plates within a single hull. The use of such dissimilar hulls as gauges for the purpose of Operation WIGWAM would undesirably complicate the problem.
2. Excessive weight. It was intended that at least one of the submarine targets suffer lethal hull-splitting damage. The floodable volume of available full-scale fleet submarines is so great that their use would have posed practically insurmountable handling problems in connection with their support and recovery after the test.
3. Cost. Operating submarines could not be made available. Fitting submarine hulls for the test would have been far more expensive than building special targets.

Therefore it was decided to design and construct three special submarine targets (SQUAWS) for this test. These targets were designed so as to:

1. Provide three target "gauges" as identical in all respects as it was possible to make them.
2. Be of simple design to permit accurate model scaling for HE tests and low construction costs.
3. Have a minimum displacement in order to reduce support and recovery problems during and after the test.

The following data apply to these targets which are essentially $\frac{1}{5}$ scale of the SS-563 class structure prototype:

Length, over-all, 132 ft $2\frac{5}{8}$ in.
Diameter of pressure hull, 14.5 ft
Designed collapse strength, 650 psi
Breadth, extreme, 20 ft $5\frac{3}{8}$ in.
Depth, bottom of ballast keel to superstructure deck, 22 ft $11\frac{1}{8}$ in.
Displacement:
Surface condition, 425.8 tons
Submerged condition, 704 tons
Pressure hull plating, 1-in. high-tensile steel, 50,000-psi average yield strength

Details of the construction of the SQUAWS will be found in the report of Project 3.8.

2.4.2 Handling

The targets were constructed by the Long Beach Naval Shipyard, and the first SQUAW was operationally tested off Long Beach during August 1954. The second and third targets were tested in turn upon their delivery to San Diego during the following two months. Commander Service Squadron One, in his role as prospective Surface Support Unit Commander, took charge of all operational tests of the SQUAWS, aided by the Program III Director and the Task Group Towing and Salvage Officer.

Several SQUAW suspension schemes were considered in planning for Operation WIGWAM, ranging from the use of surplus C-2 cargo ships, rigged for direct lift, to the utilization of 40-ton rubber salvage balloons. The target-support system was considered to require the following characteristics:

1. The suspension assembly and the target should be capable of being rigged as a unit in port prior to the departure for the operation. The hazards generated by sea swell and chop almost precluded any heavy connecting work at the site and made this feature a most desirable one if time were to be conserved in the operating area.
2. The suspension assembly should not interfere with the instrumentation bundles used in target measurements. If the assembly were to foul and cut the instrument leads, it might spoil an otherwise successful instrumentation effort.
3. The suspension assembly should withstand surge loads caused by swells with amplitudes up to 10 ft since, even if weather were ideal during the operation, a possibility for a surface wave generated by the burst existed and had to be provided for. This consideration eliminated the use of ships as a means of support since undesirably high dynamic loads would be placed on suspension wires or chains.
4. The suspension assembly should employ available components and be simple in concept rather than require a great amount of new construction. This, of course, was justified for reasons of economy.
5. The suspension assembly should be compatible with the submergence scheme and be capable of easy handling.
6. The suspension assembly should be capable of supporting a fully bilged target and should lend itself readily to posttest salvage operations.

The rig that was believed to best meet the above characteristics is shown in Fig. 2.2. Eight 80-ton submarine salvage pontoons were rigged four to a set with a 2½-in. die-lock chain suspending the SQUAW and streamed aft of the SQUAW in surface tow. This assured that the chains and air-hose bundle, led forward from the nose of the SQUAW to the stern of the YFNB instrumentation barge, would not foul the instrumentation while under way. When the ballast tanks of the SQUAW were flooded, the target sank away to a position directly beneath the pontoons in a double bifilar suspension.

To assist in training personnel in handling the SQUAWS, a short movie was prepared by Lookout Mountain Laboratory (Program VI). This film portrayed the details of the rigging and the valve-operating procedures and was especially valuable in the orientation of shipboard personnel.

2.5 PREOPERATIONAL TESTS

In addition to individually testing the three SQUAWS, several other operational tests were conducted prior to deployment from San Diego.

Extensive tests of the towing characteristics of the SQUAWS were conducted at the David W. Taylor Model Basin (DTMB) on $\frac{1}{13}$ scale prior to taking the first full-scale target to sea. These tests indicated that the SQUAWS were stable for speeds up to 6 knots while on the surface and remained stable while submerged for speeds up to 2 to 3 knots. They further indicated towing-wire sizes which would sustain the array under various wind and sea conditions.

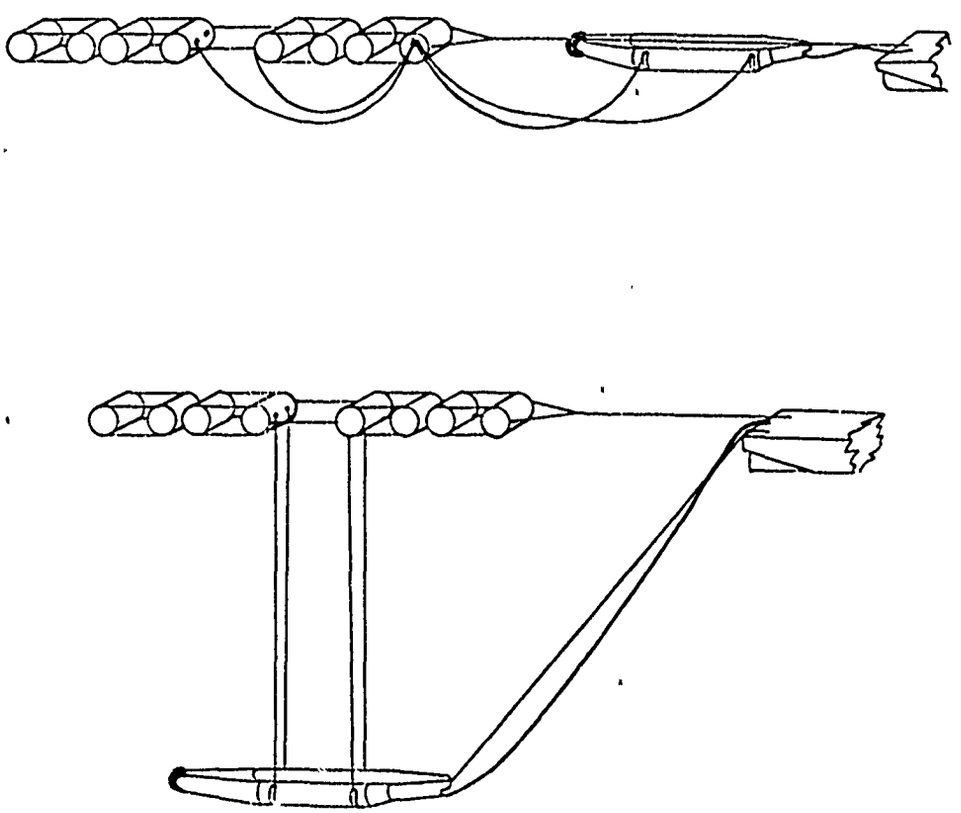

Fig. 2.2—Target-suspension system for SQUAW. Top, surfaced. Bottom, submerged.

The second operational trial involving the target complex was conducted on 1/3 scale by Commander Service Squadron Four off the Virginia capes during May 1954. The model was towed on the surface, submerged with one compartment flooded, submerged while bilged, and successfully controlled under sea conditions that scaled extreme storm conditions for the Operation WIGWAM elements, thus proving the rigging philosophy and justifying firm planning for the full-scale operation.

In order to reduce the catenary in the array towing wire it was decided to buoy the wire at 200-ft intervals. Net buoys provided by the Bureau of Ordnance were used for this purpose, and, during December 1954, LST-975 and LST-1048 conducted wire-laying tests off San Diego. These tests proved highly successful and gave evidence to the fact that one of the most perplexing problems facing the task group, that of streaming some 5 miles of buoyed towing wire, had been resolved.

On 12 January 1955 the Operation WIGWAM array, consisting of SQUAWS, associated submarine salvage pontoons and instrument barge YFNB's, towing wire, instrument-boat LCM's, and YC zero barge, was taken to sea in the fleet operating area off San Diego for a towing test of the array prior to deployment for the operational phase of WIGWAM. The operation was conducted by CTG 56.1 (Commander Service Squadron One). At the conclusion of the towing trials, the instrument and air-hose bundle was discovered to have pulled out of the bow of SQUAW-12, requiring a full-scale salvage operation at White Cove, Santa Catalina Island. The complete operation of taking the array to sea, including the hookup, instrumentation, towing, and disassembly, was considered generally successful.

As a result of the January handling trials it was considered necessary to conduct further tests in an effort to perfect the drogue which was trailed off the zero barge. Various sizes of parachutes were tested at sea during the following several months, the most successful of which was a specially designed "ring-slot" parachute. This drogue provided the necessary drag to slow down the array and further assisted in stabilizing the rolling and pitching of the YC.

During April 1955, a radar tracking exercise and a communications and telemetering interference test were conducted off San Diego. These tests were conducted by CTG 7.3 and proved highly beneficial to all participants. They brought to light many items which required correction prior to the actual test.

2.6 SURFACE OPERATIONS

2.6.1 General

Surface operations were conducted essentially as specified in CTG 7.3 Operation Order 1-55. Operations commenced on 2 May, when the first units deployed from West Coast ports, and continued until 24 May, at which time the last ships returned to San Diego.

The personnel performance of all units participating in the operation is considered to have been uniformly excellent. Expert ship handling and outstanding seamanship under adverse weather conditions were demonstrated on numerous occasions and were essential to the success of the operation. The avoidance of serious personnel casualties is gratifying.

2.6.2 Participating Surface Units

(a) Flagship Unit. This unit consisted of the USS Mt. McKinley (AGC-7) and the USS Curtiss (AV-4). In addition to serving as flagship for CTG 7.3, the Mt. McKinley provided accommodations for scientific participants. The USS Curtiss received and transported the weapons and nuclear components and provided shipboard laboratory facilities for the Scientific Task Unit. The Curtiss served as flagship for CJTF 7 from 7 to 15 May and provided accommodations for scientific participants and official observers.

(b) Scientific Unit. Included in the Scientific Unit was the Radiological Support Element, consisting of the two ex-Liberty ships, George Eastman (YAG-39) and Granville S. Hall (YAG-40), and the USS Molala (ATF-106), which was specially outfitted for radio remote control of

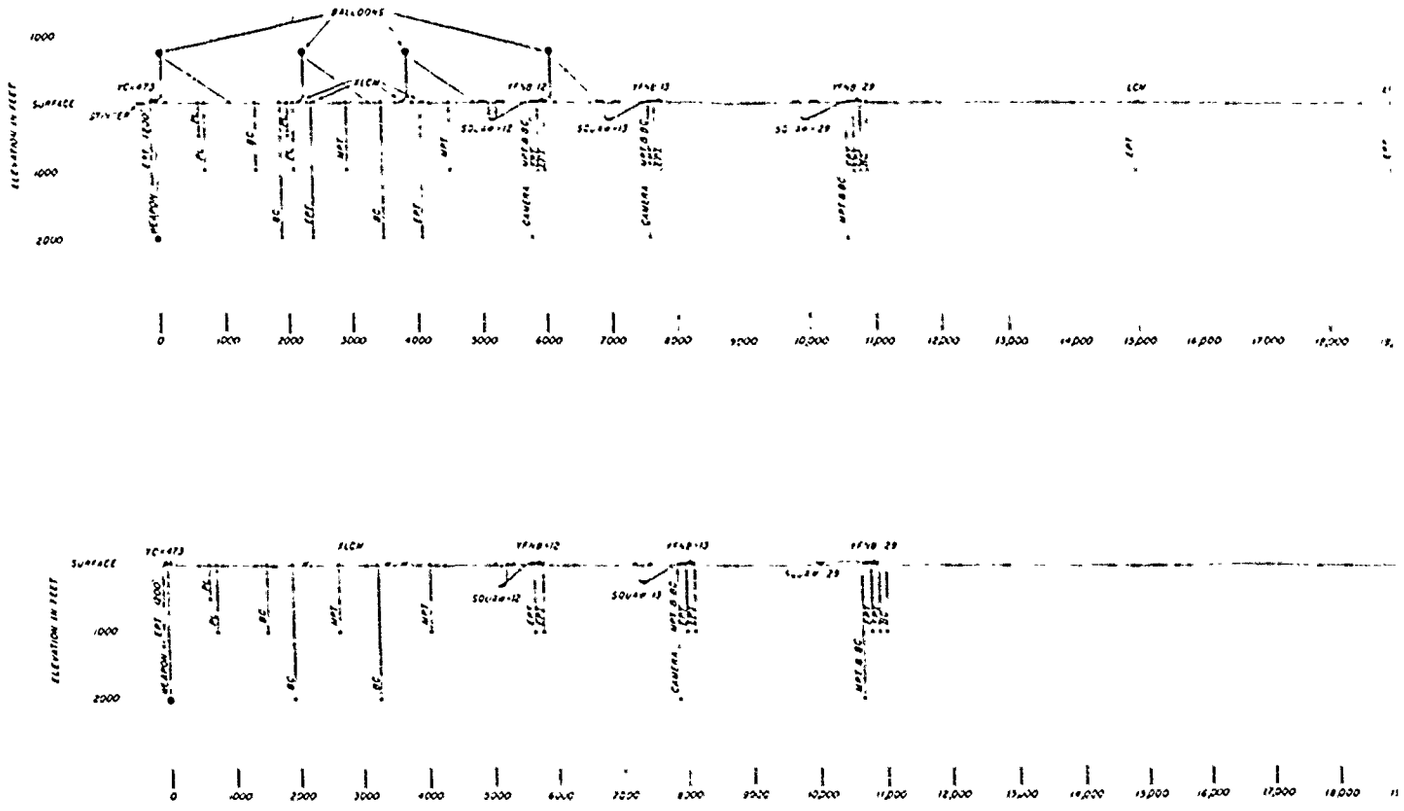

Fig. 2.3—Operation of WIGWAM acoustic array. Top, as planned. Bottom, actual.

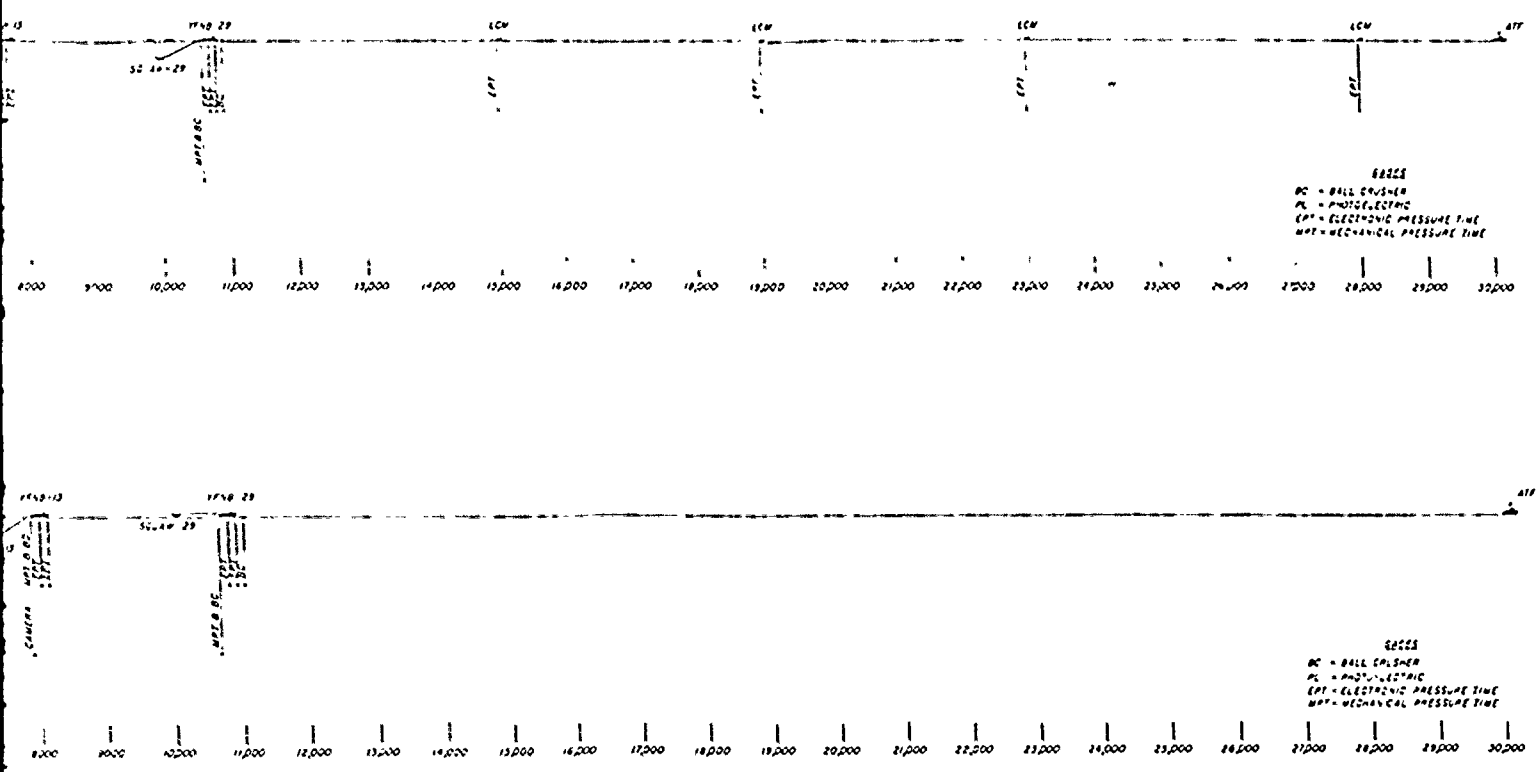

Fig. 2.3—Operational SIGMAN arrays. Top, as planned. Bottom, actual.

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the YAG's in the event it became necessary to evacuate these ships. The requirement for remote control, however, did not materialize, and the YAG's remained manned throughout the operation.

Additional surface ships were provided by the research vessels of the Scripps Institution of Oceanography. These ships conducted a general survey of the area of operations prior to D day in order to recommend the most suitable location for the test and conducted a radiological and oceanographic survey of the test site after H hour.

(c) Surface Patrol Unit. The eight ships of Destroyer Squadron Thirteen comprised this unit. The squadron commander was designated as Commander Surface Patrol Unit with the primary task of conducting a surface search and antisubmarine patrol around the test site. In addition, this unit provided plane guard services, escort for the USS Curtiss, transportation for CJTF 7, screen for the towed elements upon sortie, two DDR's for radarscope photography, and one DD to track rasonde balloons; the unit conducted a postdetonation search for debris and scientific equipment.

(d) Surface Support Unit. This unit, operating under Commander Service Squadron One, conducted the preoperational handling tests of all array elements and assembled and towed the array at the test site. Although prepared for postdetonation salvage operations, this mission was not required. The USS Gypsy (ARSD-1) was outfitted for heavy lift at the Long Beach Naval Shipyard, but her services were not utilized. Small boat transportation was provided by this unit in the operating area, using the services of the Task Group Boat Pool.

2.6.3 Narrative

Deployment from West Coast ports commenced on 2 May 1955 when YAG-39 and YAG-40 departed from San Francisco. The Molala departed San Diego on 3 May and rendezvoused with the YAG's for training exercises prior to joining the main body.

On 3 May the Surface Support Unit departed San Diego, and, escorted by six destroyers of the Surface Patrol Unit, proceeded to a predesignated rendezvous point. On 4 May the destroyers formed a scouting line and swept the area surrounding the expected detonation point. The following day they established a surface patrol with a radius of 30 miles about the site.

The remaining heavy ships departed San Diego on 5 May, one destroyer providing a screen for the Curtiss continually until the nuclear components were offloaded to the YC on 13 May. All units, less the destroyers on patrol and one destroyer which remained in Long Beach to provide transportation for CJTF 7, joined on 6 May and proceeded in company thereafter to the test site.

As originally planned, all elements of the array were to be positioned as shown in Fig. 2.3. Each of the three targets was to be suspended from eight submarine salvage pontoons at a depth of 250 ft by means of $2\frac{1}{2}$-in. die-locked anchor chain. Many of the instrument gauges were to be suspended from LCM's and buoys within the array, and helium balloons were to be raised above various array elements for air overpressure measurements. Likewise, a drogue was to be used astern of the YC to aid in stretching the array.

During transit from San Diego, however, continued high winds and seas took an exacting toll of the array elements. One by one the SQUAW units deteriorated. Breaks in instrument leads were first discovered, followed in turn by air-hose ruptures, pontoon bilging, and chains parting; the targets were still being towed on the surface.

By 9 May, the day on which it had been planned to commence assembly of the complete array, three chains of SQUAW-29, the forward port chain of SQUAW-13, and both after chains of SQUAW-12 had parted. Many of the pontoons had holes and were listing badly; several had actually been carried away in the heavy seas.

On 10 and 11 May the weather abated sufficiently to permit launching boats, and a general rehabilitation program was inaugurated. The after starboard chain of SQUAW-12 had parted by this time. All remaining chains to SQUAW-29 were burned off, and the pontoons were disconnected. In lieu of broken chain on the other two SQUAWS, $1\frac{5}{8}$-in. wire was rigged. Wire was also run completely around several of the pontoons in an effort to maintain a submergence

capability. Only by heroic efforts of personnel of the Towing and Salvage Element and Boat Pool Element under extremely adverse conditions was it possible to prepare any of the SQUAWS for insertion into the array.

While making preparations for launching LCM's on 10 May, at about 1545 the backwash from an unusually large swell lifted the stern gate of the Fort Marion within 2 ft of the closed position. The stern gate was being lowered at the time and was within 1 ft of being fully open. The next swell lifted the stern of the ship rapidly, causing the water to rush out the stern of the well and forcing the stern gate to open rapidly and slam down hard. This blow parted both the port and starboard $1\frac{1}{8}$-in. wire, lowering pendants and stranding the $1\frac{3}{4}$-in. wire preventer. After the LCM's were launched, another swell caused the stern gate to raise about halfway and then slam down, parting both $1\frac{3}{4}$-in. wire preventers and allowing the stern gate to drop to the vertical position. At about 1600 the gate wrenched itself free and fell off. At the time of the casualty the ship was on course 350°T at 4 knots heading into 6- to 12-ft swells. Wind and sea were from 035°T, with the wind velocity 10 knots. Loss of the stern gate, however, did not deter the Fort Marion from continuing her mission in support of Operation WIGWAM, an accomplishment that indicates excellent qualities of seamanship on the part of the personnel concerned.

Assembly of the 5-mile array was commenced on 12 May. The two LST's streamed their wire and buoys, helium balloons were inflated, and instrument-boat LCM's from the Fort Marion were launched preparatory to insertion into the array. Only one of the LCM's scheduled for stations between YFNB-29 and the tow tug could be secured in position due to the delay caused by the casualty to the Comstock described later, and this boat broke loose from the array on 13 May and was taken in tow by the Butternut. Of the four instrument LCM's attached to the tow wire between the zero barge and YFNB-12, one broke loose at 0945 on 14 May, and the instrumentation on the other three was inoperative.

On 13 May the remainder of the array was assembled and took course 000°T, speed about 0.5 knot. SQUAWS 12 and 13 were submerged and positioned at ranges of 5200 and 7300 ft, respectively, from the YC, and SQUAW-29 remained on the surface at 10,100 ft. During the day the weather again worsened, with additional damage occurring to the array elements. The balloons raised from the zero barge, YFNB-12, and instrument LCM A-2 were cast loose to prevent further damage to installed antennas. The wires by which the after portion of SQUAW-12 was being supported parted, leaving the entire target suspended only by the two forward chains and with an up angle of 34°. The towing wire between the SQUAW-13 pontoons and its YFNB parted, and attempts to rig a wire between the two were unsuccessful, leaving the entire array under tow through the 2-in. wire to the submerged SQUAW. An 8-in. manila line was hurriedly rigged but soon parted because of the heavy strain. A second 8-in. manila line was then rigged, along with a 9-in. manila line, and these lasted until the morning of 14 May when they too parted, as did the line to the last remaining helium balloon. At about 0900, 14 May, an 8-in. manila line, with grapnel attached, was made fast to the pontoons, and this one line was all that maintained the integrity of the array until the shot, some 4 hr later.

A second stern-gate casualty occurred on 14 May. At 1013 while launching LCM's, a heavy sea lifted the stern gate of the Comstock to within 8 ft of closing and then dropped away, parting both port and starboard wire preventers and the port 1-in. easing-out wire. While attempting to raise the gate, the $\frac{5}{8}$-in. endless-wire relieving tackle and starboard easing-out wire parted. The gate thereafter trailed astern from the hinges until the return to San Diego. The Comstock is likewise to be commended for performing her assigned duties well under most adverse sea conditions.

At 1300 PDT, 14 May 1955, the first deep underwater nuclear detonation in history occurred.

Concurrent with arrival of the shock wave, SQUAW-12 collapsed, the last remaining chains parted, and the target sank. YAG's 39 and 40, having previously deployed to downwind stations, were to have conducted radiological surveys of the contaminated water area. YAG-39, however, suffered shock damage which caused temporary disability to her boilers and rendered her incapable of completing her mission. Accompanied by Molala as escort, YAG-39 departed the area on 15 May and returned to San Francisco. YAG-40, although temporarily incapacitated

on arrival of the shock, effected quick repairs and completed several runs through the contaminated area before being released on 17 May to proceed to port.

The remainder of 14 May was consumed in conducting radiological surveys, taking adrift pontoons in tow, and getting personnel back on board their respective YFNB stations. The array course was changed to the northeast in an effort to clear the contaminated area and to make way toward San Diego. Efforts to bring SQUAW-13 up were unsuccessful, indications being that the air was having no effect on blowing the ballast tanks. Gauge readings from YFNB-13, however, showed the pressure hull to be dry.

On 15 May the remainder of the array was disassembled. During the tow-wire and buoy retrieving phase, heavy swells caused the starboard bow ramp-hoisting wire on LST-975 to part. The port ramp-hoisting wire parted shortly thereafter when a strain was put on this wire while attempting to rerig the starboard wire. The bow ramp thereupon fell to the extreme down position and broke off. LST-975 continued to retrieve the tow wire, however, and completed the task, taking on board some 19,000 ft of wire and 94 buoys in 9 hr, a feat considered noteworthy even under ideal conditions.

Upon completion of the array disassembly, the tows were detached to proceed to West Coast ports. YFNB–SQUAW-29 and YFNB-12 proceeded to San Diego at about 6 knots, and YFNB-13, with SQUAW-13 supported by only one pontoon, eased toward White Cove, Santa Catalina Island, at about 1 to 2 knots, where it was planned to salvage the SQUAW for postshot analysis.

Effort was thereupon concentrated on tracking (see Fig. 2.4) the contaminated-water area and recovering instruments which were still suspended from flotation buoys. The destroyers were secured from their perimeter patrol and commenced a search to the south. Several valuable pieces of scientific equipment were recovered, and the area was cleaned of floating debris by gunfire.

On 17 May the pontoon supporting SQUAW-13 carried away, and the 2-in. wire to the bow of the SQUAW parted. Sonar was employed and indicated that the target was still being suspended by the instrument bundle, and the tow continued toward White Cove.

On 18 May the remaining Navy ships departed the shot area, leaving the Scripps Institution of Oceanography ships to continue to monitor and track the contaminated water. The Scripps ships remained in the area until 24 May, at which time they too returned to San Diego.

On 21 May at about latitude 32°00′N, longitude 121°00′W, SQUAW-13 broke loose from the instrument bundle and sank.

All units were released from operational control of CTG 7.3 by 28 May, at which time the task organization was dissolved.

2.7 AIR OPERATIONS

2.7.1 General

Air Operations were conducted in accordance with CTG 7.3 Operation Order 1-55. Air units as listed in Fig. 2.1 were utilized for all missions. Missions were conducted as scheduled and planned. Operations began on 15 April when the Hydrographic Survey Element commenced hydrographic missions for the purpose of assisting in determining the hydrographic and aerological conditions then existing and to be expected in the test area. Air operations were completed on 23 May when hydrographic missions were secured. Extensive air operations were conducted for a period of approximately 14 days with the majority of flights being flown by VP-2 (P2V-5 aircraft) and HMR-362 (HRS-3 helicopters). During this period the AD-5N's of VC-35 completed 17 carrier flights. Air units participating in the operation, in addition to successfully completing all assigned missions, completed the entire operation without accident to aircraft or personnel.

2.7.2 Participating Air Units

(a) Tactical Air Control Detachment. An air control detachment of five officers and

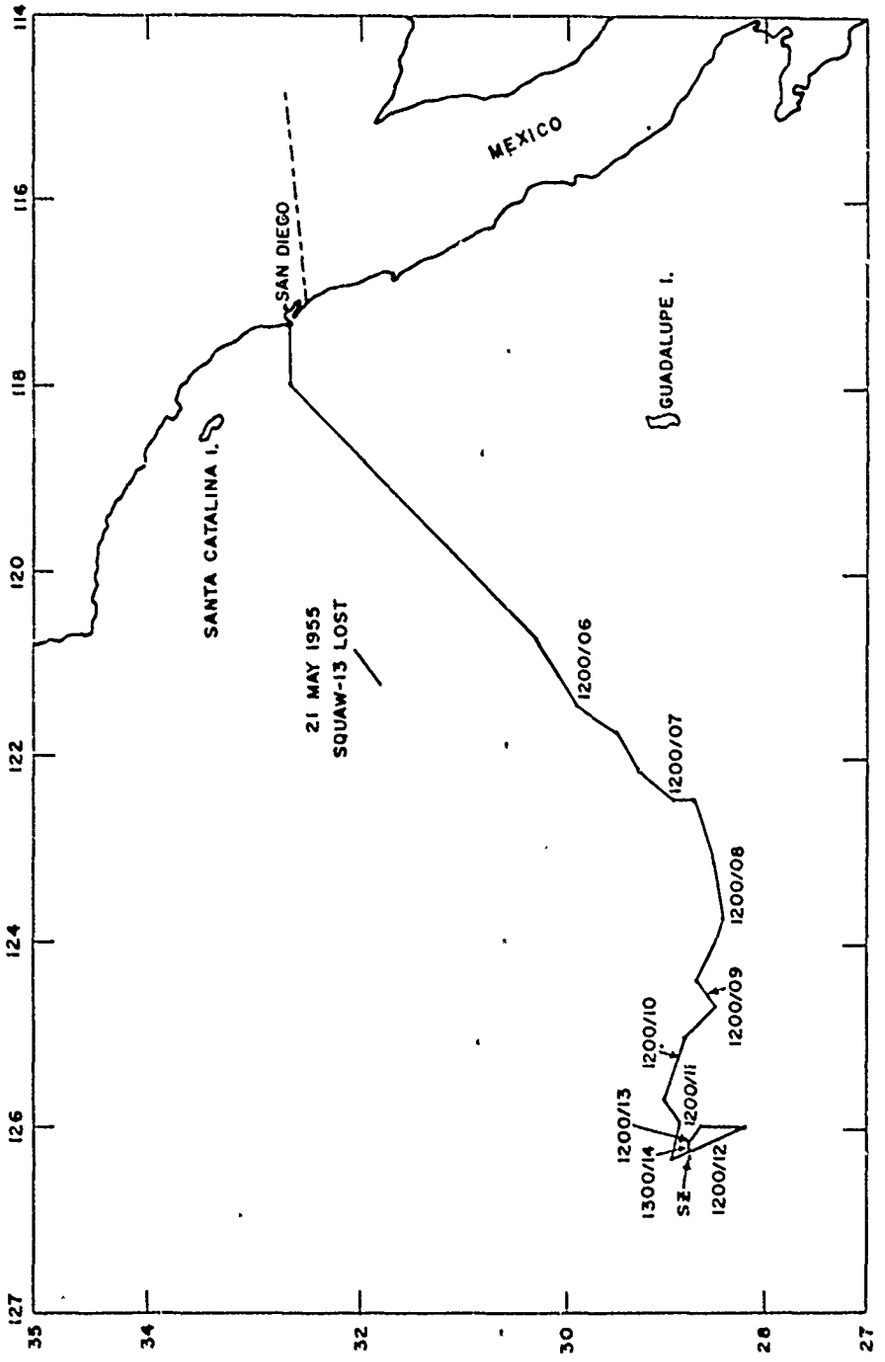


Fig. 2.4—Tracking chart.

seven enlisted men from Tactical Air Control Squadron One (TACRON), NAS, North Island, participated as members of the staff during the operation. The air control measures that pertain to close air support and fighter air direction control were practically nonexistent; however, air control personnel were necessary for traffic control as regards altitude separation, time coordination, and flight patterns of aircraft in a limited air space during the D-day air operations and were so utilized. Owing to the type of operation conducted, air control personnel were particularly necessary for the D-day control of aircraft and for rehearsals in preparation for D-day operation. Aircraft operations on days other than D day were not necessarily demanding of TACRON personnel. On these days tactical air control personnel were utilized in monitoring and maintaining long-range air patrol radio nets which were used by the land-based patrol and hydrographic aircraft. TACRON personnel were extremely helpful in assisting ship's Combat Information Center (CIC) personnel and in planning, establishing, and maintaining radar and radio facilities necessary for the operation. The TACRON detachment was embarked with the staff on the Mt. McKinley from 5 May to 20 May and conducted all necessary control from this vessel.

(b) Carrier Air Support Unit. The USS Wright (CVL-49) with embarked units of HMR-362 (Marine Helicopter Squadron), VC-35, and VS-21 comprised this task unit. The Wright, in addition to providing the operating platform for carrier aircraft, also provided billeting, office, and laboratory spaces for scientific units embarked.

Marine Helicopter Squadron Three Sixty-two (HMR-362) operated eight HRS-3 type helicopters and provided services throughout the operation. These services consisted primarily of personnel and material transportation flights within the task group formation, plane guard services, and special missions as scheduled. Small boat operations were drastically curtailed due to sea conditions, and helicopter transportation requests were unusually heavy during the sea operational period. It is considered that this element contributed greatly to the over-all effort put forth in this operation.

The VS-21 detachment had six AF-2S type aircraft available to provide sample-return flights from the carrier to NAS, North Island, on D+1 and D+2 days, and on other days if necessary. Two flights consisting of two aircraft each were returned to North Island as scheduled, one flight per day. These flights, in addition to returning samples, were also utilized to return personnel to the San Diego area. Samples were packed in specially configured wing tanks for the flight to NAS, North Island. Pilots were all-weather trained and were prepared to execute landings at alternate fields (specifically Miramar or El Centro) should the situation require. This alternate arrangement was not necessary on either of the return flights.

A VC-35 detachment consisting of three AD-5N type aircraft was available on board the USS Wright to perform special missions of radiological survey and water-sample-collector drops. Special configuration to accommodate survey instruments and technical observers was necessary on these aircraft, and this modification was accomplished at the Overhaul and Repair Facility at NAS, Alameda. These missions were flown just prior to H hour and lasted until radiological survey was no longer necessary. In order to execute scheduled missions satisfactorily, numerous practice and rehearsal flights were conducted. Actual D-day operations and those subsequent to D day were most satisfactorily accomplished, with very beneficial data being obtained by the observers and equipment contained by these aircraft. Two of these aircraft were used on station for all scheduled missions with the third aircraft being in a stand-by status should a replacement aircraft be needed (the stand-by aircraft was not utilized during the operation). These aircraft participated in frequent carrier launchings and landings during the operation without suffering any minor accidents or malfunctioning either of aircraft or of incorporated scientific equipment.

(c) Land-based Air Support Unit. This unit consisted of:

1. Air Patrol Element (VP-2 with 12 P2V-5 type aircraft).
2. Air Photographic Element (three C-54 and two RB-50 type aircraft).
3. Sample Distribution Element (three R6D aircraft of VR-3, MATS).
4. Hydrographic Survey Element (three P4Y type aircraft assigned to FASRON-110).

The Air Patrol Element conducted a continuous patrol of the test area from 6 May until secured on 19 May. Patrols were conducted with the purpose of detecting any nonparticipating air, surface, and subsurface contacts approaching the test area. Subsequent to D day, patrol aircraft were also used in locating buoys, floats, etc., which were associated with varied types of scientific instruments. No difficulties were encountered in effecting the security of the area or in maintaining a current account of associated units.

The Air Photographic Element was assigned the mission of conducting photographic coverage immediately prior to, during, and subsequent to, detonation of the weapon. Three C-54 type aircraft from the 4901st Air Base Wing and one RB-50 from the 1371st Mapping and Charting Squadron were on station from H−1 hr to H+30 min. The C-54 aircraft from Kirtland AFB, Albuquerque, arrived in the San Diego area on 4 May and remained in an "on call" status for the D-day operations. The RB-50 aircraft from Palm Beach AFB arrived in the San Diego area on 7 May and remained in an "on call" status for the D-day operations. The C-54 and RB-50 aircraft were secured immediately after participating in the H-hour events and released for return to home bases. Lookout Mountain Laboratory provided photographic crews for the C-54 type aircraft. The land-based photographic aircraft had participated in the January rehearsal, and the C-54 aircraft had also participated in the rehearsal during the week of 18 April. Plane commanders and crews were well indoctrinated in their phase of the operation, and the cooperation of these units contributed greatly to the D-day operations.

The Sample Distribution Element provided three flights, two from NAS, North Island, to NAS, Moffett Field, and one flight from NAS, North Island, to Andrews AFB via Kirtland AFB. These missions were conducted on D+1 and D+2 days and were for the purpose of delivering radiological samples to NRDL, LASL, and NRL. The aircraft were standing by at North Island, and, upon arrival of sample-return aircraft (AF-2S), transfer of samples was effected, and TE 7.3.5.3 aircraft departed North Island for designated fields in the vicinity of the above-mentioned laboratories. All deliveries were completed as scheduled.

The Hydrographic Survey Element consisted of three P4Y-2 type aircraft and their associated crews. FASRON-110 provided administrative and logistic support as needed, and the aircraft operated from NAS, North Island. The mission of the Hydrographic Survey Element was to conduct weather and hydrographic reconnaissance flights as directed by TG 7.3 Weather Central. This organization was formed particularly for this operation, and officers and enlisted personnel had not operated as a unit prior to the forming of the organization at San Diego. Officer personnel were assigned from the Bureau of Naval Personnel and were all on temporary duty en route to a permanent-duty station. Enlisted personnel were obtained by Commander Air Force, U. S. Pacific Fleet, from various activities located in the San Diego area. In view of the minimum organizational and training period available to this organization, it is considered that the efforts and results of this unit were outstanding.

2.7.3 Pre-D-day Operations

Hydrographic survey missions commenced on 15 April and were continued throughout the operation by P4Y-2 aircraft up to 23 May, when these aircraft were secured from operations and a stand-by status. Hydrographic and aerological data obtained by these missions were forwarded to CTG 7.3 Weather Central at North Island, where they were collected, analyzed, and transmitted to the task group forecasting team afloat. The Hydrographic Survey Element was under the Weather Central for technical control, and the Weather Central assigned flight tracks and conducted briefings and debriefings for this element.

Helicopter operations by HMR-362 commenced on 3 May when helicopter photographic missions were conducted on the slower surface units as they sortied from San Diego. One helicopter was assigned on board the Fort Marion to Commander Surface Support Unit for operations with that unit as necessary until rendezvous was effected with the USS Wright and embarked air units. HRS-3 type helicopters were employed on this operation and, except for the period mentioned above, were based aboard the Wright and operated from various platforms located throughout the task group.

On 6 May VP-2 (12 P2V-5's) began visual and radar patrol of the test area for the purposes of detecting air, surface, and subsurface craft not associated with the operation and initiating action to clear the area of all such contacts. The aircraft were on station in the test area for 6-hr periods and were en route an additional 5 hr. All patrols were relieved on station and, except for two brief periods when two aircraft returned to base because of engine malfunctioning, a 24-hr patrol was maintained until 19 May when patrols were secured.

Helicopters were utilized prior to D day for photographic and personnel and material transportation missions. Due to unexpectedly heavy seas, small boats could not be fully utilized as expected for transportation of personnel and material between the surface units, and this resulted in heavy utilization of the helicopter detachment. All requests for helicopter transportation were fulfilled despite the abnormal demand which was placed upon these aircraft.

On 8 May two AD-5N aircraft conducted D-day survey-mission rehearsals for the purpose of checking and calibrating airborne instruments and to further indoctrinate personnel in duties and patterns of mission.

2.7.4 D-day Operations

D-day operations were conducted as scheduled except for slight time delays in AD-5N survey, helicopter radiological survey, and helicopter sample-recovery missions which were occasioned by a delay of entry clearance because of safety reasons.

C-54 photo aircraft 1 and 3 could not be cleared out of their racetrack patterns to proceed around the array to the south because of safety reasons; however, since their missions were primarily concerned with the interval from H−2 min to H+30 sec, it is considered that their missions were successfully and adequately accomplished.

The AD-5N survey aircraft commenced the first upwind pass into the shot zone at H+11 min, 6 min after the tentatively planned run-in time. Water-sample-collector drops and the subsequent radiological survey of the area were initiated and conducted as planned. The two AD survey aircraft completed two flights each on D day, 1200 to 1500 and 1600 to 1800.

The helicopter visual and radiological survey mission was on station at H+75 min, 1 hr later than entry had been originally scheduled. This delay was occasioned primarily by the wait for area information and the determination of area Rad-Safe conditions prior to allowing entry to the survey helicopters.

2.7.5 Post-D-day Operations

On 15 May the two survey aircraft (AD-5N) were launched from the Wright and conducted missions from 0800 to 1030 and 1400 to 1600. The two sample-return aircraft (AF-2S) were launched at 0800 and arrived at NAS, North Island, at 1155. Upon arrival at North Island, the samples were transferred to two R6D type aircraft and dispatched to interested laboratories. Other missions this day were as scheduled.

On 16 May two AD-5N survey aircraft flew missions from 0900 to 1230. Two AF sample-return aircraft departed for North Island at 0900 and arrived at 1230. Samples were transferred to one R6D and flown to NAS, Moffett Field, for NRDL. Other missions were conducted as scheduled.

On 17 May the AD survey aircraft conducted operations from 0900 to 1200 and from 1300 to 1600 on 18 May, after which aircraft operations in the test area were secured. Helicopter personnel transfer missions were continued until sunset, when all transfers were completed.

A summary of flight operations is given in Tables 2.1 and 2.2.

2.8 COMMENTS AND RECOMMENDATIONS

Comment: Basic planning for Operation WIGWAM was conducted by the Plans Group, AFSWP, and this group was later transferred to TG 7.3 to form the nucleus of the test organization. In this manner continuity was maintained throughout all phases of the operation.

Recommendation: That, in any similar operation, personnel who conduct the planning also be assigned the task of directing the operation.

Comment: With but few exceptions the task unit commanders and staffs were fleet operational personnel assigned primary duties with a permanent organization and temporary duty with the task group specifically for Operation WIGWAM. This procedure resulted in considerable savings both in money and in manpower and permitted use of personnel previously experienced in assigned tasks. Additional billets, therefore, were not required.

Recommendation: That, whenever practicable, consideration be given in future operations to use of personnel in key billets on a temporary-duty basis where such employment will have no serious conflict with their primary duties.

Table 2.1—SUMMARY OF FLIGHT OPERATIONS FOR CARRIER AIR SUPPORT UNIT

	HMR-362	VC-35 detachment	VS-21 detachment
Type of aircraft	HRS-3 helicopter	AD-5N	AF-2S
Hours flown	267.5	56.3	18.4
Flights	319 (1201 landings)	17	6
Passengers carried	1944		
Cargo carried, lb	8850		
Carrier launchings		17	6
Carrier landings		14	0

Table 2.2—SUMMARY OF FLIGHT OPERATIONS FOR LAND-BASED AIR SUPPORT UNIT

	VP-2 patrol	USAF photographic unit	MATS (VR-3)	Hydrographic detachment
Type of aircraft	P2V-5	C-54, RB-50	R6D	P4Y-2
Hours flown	811*	154,† 46‡	18	390
Flights	66	3, 1§	3	40
Operating days	14			73

*Includes transit time to and from Whidbey Island.

†C-54: 20 hr on D day, 20 hr transit time to and from Kirtland AFB, and the remainder on rehearsals.

‡RB-50: 7 hr on D day and 39 hr transit time to and from Palm Beach AFB.

§D-day operations.

Comment: A firm time schedule was established at an early stage in planning. This provided for estimated procurement and construction times, periods for rehearsals and correction of defects found therein, and adequate time for instrumentation installation and check. By this method, planning, establishment of requirements, and issue of a basic concept to interested activities were greatly assisted and could be carried out with a sound appreciation of the priorities required by each of the many activities involved in the operation.

Comment: Fleet requirements were submitted to and approved by the Chief of Naval Operations approximately 18 months before the test. This was of mutual advantage to both the

planning group and the fleet and type commanders. This allowed sufficient time for the fleet commander to schedule the same ships for the preoperational and test phases, a procedure of inestimable value to the task group.

Comment: Although a recommendation is made in another part of this report that no further tests of an atomic device at deep submergence be carried out, certain lessons can be learned from this operation with regard to the design of the array and the method of assembly, which should be recorded. The task group commander considers that:

Any submerged target-suspension system should be tested for a lengthy period at sea. The rehearsals conducted prior to Operation WIGWAM showed that the suspension system used could withstand, for periods of a few days, wind and sea conditions far worse than any encountered during the operation. However, exposure for a long period to much less severe conditions caused almost crippling damage.

Assembly time must be reduced to a minimum by a reduction in the number of array elements and by the use of elements of sufficient size to be handled with some ease in rough seas. Accuracy in weather forecasting is not sufficient at present to allow more than 24 hr for array assembly.

Comment: During the postdetonation search for debris and scientific instruments, considerable delay and some confusion were experienced by the destroyers as a result of the initial lack of information as to which objects were to be destroyed and which were to be recovered. Also, because of the relatively small size and low silhouette of most of these objects, it was necessary to employ a visual search. This was later augmented by patrol aircraft and helicopters, and this procedure was of considerable assistance in the search.

Recommendation: In future operations of this nature, a list of items to be located, their description, and their disposition should be promulgated. It would be desirable, if other conditions permit, that the objects be painted in colors to indicate their disposition, i.e., a color for those to be destroyed, another color for those to be recovered, and a third color for those to be left as found.

Helicopters should be made available for use to assist in the search. The destroyers could then be used primarily for destruction and recovery of the objects.

Comment: No unauthorized surface or air contacts were made in the immediate WIGWAM area. However, numerous contacts were made with the ships operated by the Scripps Institution of Oceanography, causing considerable radio traffic and diversion of patrol ships to investigate and identify.

Recommendation: That, in future operations where vessels perform duties similar to those of the Scripps vessels, requiring movements of an itinerant nature, such vessels be provided with identification characteristics such as painting the smokestacks or other portion of the vessels a distinctive color for day identification and having them show special lights for night identification.

Comment: Requests for helicopter transportation were processed on the technical net, and the high volume of technical traffic on this net occasioned delays and errors in providing helicopter service.

Recommendation: The advantage of having a separate radio net on which helicopter requests could be handled is highly desirable, and it is recommended that this be considered on future similar operations. This arrangement was considered for this operation; however, the capabilities of landing-platform vessels to provide the additional necessary radio equipment and personnel were such that it was decided that the additional requirements would overtax them.

Comment: Helicopter scheduling agencies were unnecessarily burdened owing to nonavailability of passengers for scheduled flights and the situation of passengers embarking upon the first available but incorrect flight.

Recommendation: This situation was caused by the unfamiliarity of passenger personnel with the helicopter scheduling system and helicopter operational policies. The infeasibility of

assigning additional scheduling and liaison personnel to provide more detailed services to passenger personnel makes it necessary that the helicopter scheduling agencies be composed of small but well-indoctrinated groups. In addition, a concentrative indoctrination should be accorded all possible passenger personnel on initial operating days. (Written and posted instructions are not as productive as verbal instructions given immediately prior to desired services.)

Comment: Helicopters at times had to remain on rolling and slippery platforms while waiting for passengers. This created an undesirable situation from the viewpoints of efficiency, economy, and safety.

Recommendation: The waiting period on board any platform will necessarily vary; however, when conditions are unfavorable, helicopters should not be expected to delay on the deck. The use of nonskid paint should be considered for the decks of all landing platforms.

Comment: Helicopter landings on the YC-473 (zero barge) were not permitted except for emergency purposes because of the relatively small and unstable platform aboard that craft. During the predetonation period, small boats had difficulty in locating necessary personnel aboard because of sea conditions, and helicopter service would have been the solution were it possible to land safely aboard.

Recommendation: For future operations of this nature the zero barge should be of sufficient size and should possess an adequate helicopter platform which will permit helicopter operations under severe sea conditions.

Comment: Helicopters, while being utilized for locating buoys, floats, etc., after detonation time, occasionally lost radio or radar contact with the parent vessel. This was caused by the helicopters having to operate at lower altitudes during this type mission and was not occasioned by helicopters having to operate at excessive ranges from the parent vessel.

Recommendation: To eliminate this situation it is recommended that another aircraft or surface vessel be so located as to provide a communication link.

Comment: The conditions under which the carrier aircraft were scheduled to operate were considered ideal. The wind was usually constant at 15 to 18 knots from the northwest quadrant. This made it possible for the Wright to remain in close proximity to the rest of the formation except for very brief periods when recovering aircraft. It is considered that the wind factor was an assisting element in the maintaining of an excellent safety record for the carrier air units.

Comment: Search and rescue coordination was effected by the Wright, and preparations for the conduct of search and rescue operations were completed by that unit. One P2V-5 aircraft was returned to NAS, North Island, on a single engine during the early phase of the operation, but, other than this, no incident or emergency occurred which necessitated search and rescue action.

Recommendation: That, as in WIGWAM, the senior aviation officer in command afloat be considered as search and rescue coordinator for future operations.

Comment: On D+1 and D+2 days, a search and rescue PBM from the U. S. Coast Guard was on station midway between the operating area and North Island. Incoming AF-2S aircraft made radio and visual contact with this aircraft which, upon passage of inbound aircraft, followed the AF flight track back to North Island.

Recommendation: Although it was not necessary for the Coast Guard aircraft to effect any search and rescue action, it was highly desirable that the AF flights be covered in this manner, and it is strongly recommended that such coverage be available for similar flights where single-engine aircraft are concerned.

CHAPTER 3

COMMUNICATIONS AND ELECTRONICS

3.1 MISSIONS

1. Provide normal internal task group communications, including ship-to-shore and ship-to-plane circuits.
2. Provide special weather circuits, including facsimile broadcast.
3. Provide ship-to-shore circuits including duplex teletype and air operational circuits.
4. Install Motorola and AN/VRC-10 voice radio nets for scientific projects and for ship-to-ship use where installed equipment was inadequate.
5. Electronic, logistic, and repair support for TG 7.3 units.
6. Procure and assign frequencies to permit circuit operation without serious interference between frequencies.
7. Coordinate timing and firing requirements. The services of Edgerton, Germeshausen, and Grier, Inc. (EG&G), AEC contractors, were utilized to provide timing and firing circuits.
8. Maintain communication security and provide cryptographic systems where needed.

3.2 PLANNING AND REHEARSALS

During the period 6 July to 16 November 1954, planning was accomplished under the direction of AFSWP and thereafter by CTG 7.3.

In July 1954 the scientific programs were requested to submit requirements for radio frequencies, special voice-communication nets, radio timing signals, and other communications or electronics assistance.

Based on operational and scientific program requirements, frequencies were requested from the Chief of Naval Operations (CNO), and a tentative radio-circuit plan was prepared during September. To implement this plan, the CNO (OP-30) provided a facsimile weather broadcast originating at the Task Group Weather Central, NAS, San Diego, a teletype drop on Air Force landline weather circuit 9895, a duplex radio teletype terminal at the Communication Center, NavComSta, San Diego, and various cryptographic systems to permit classified communications with the YAG's, Scripps's ships, and the USS Butternut (AN-9). A request for a classified voice net cleared for Secret between the Mt. McKinley, Curtiss, Fort Marion, and YC-473 and utilizing National Security Agency voice-scrambling equipment was not granted since available equipment was not cleared for Secret traffic.

Program V (EG&G) was initially requested to procure approximately 60 Motorola radio sets for use on 8 voice nets. As planning progressed, additional stations were added to these nets until 81 10-w (or larger) transceivers, 21 pack sets, 9 Handie-talkies, and about 10% spares were employed on voice nets. The AEC loaned about 40% of these radios for use during

Operation WIGWAM; the remainder were procured from the Motorola Corporation at a monthly rental rate of 2.7% of new equipment cost.

In December 1954 the surface support net and three tow nets, utilizing Motorola radios, were installed in ships participating in the January sea trials. As a result of frequency interference with commercial users and changes in towing and assisting ship assignments occurring during the January trials, the three tow nets were combined to essentially parallel the surface support net, and a clear frequency was selected for this new net. The remaining Motorola radios were installed during the period 8 to 16 April.

Installation of the facsimile broadcast was completed on 15 March, and successful local tests were conducted on 16 March.

A communications and electronics rehearsal was conducted from 18 to 21 April, with the Mt. McKinley, Curtiss, Comstock, Reclaimer towing YC-473, McKean, and Small participating. Units proceeded about 130 miles southwest of San Diego to clear radio interference from shore stations on VHF and UHF frequencies. Serious interference was noted on several circuits; the most serious problem was that radio time-signal receivers were activated in several instances by Motorola voice equipment operating on adjacent frequencies at the same location. All interference experienced was local, between transmitters and receivers at the same site. Reduction of transmitter power, shifting transmitters and antennas, and use of alternate frequencies reduced this interference to an acceptable level, except that operation of Motorola voice radios within 100 ft of radio time-signal receivers was restricted for the remainder of the timing rehearsals.

The April rehearsal was scheduled to test all radio, telemetering, and radar frequencies simultaneously and to establish rehearsal and shot-time circuit usage. The rehearsal proved very valuable by permitting early detection and correction of discrepancies.

3.3 DISSEMINATION OF COMMUNICATIONS INFORMATION

A tentative Operation WIGWAM communications and electronics circuit plan was issued in October to TG 7.3, including scientific projects. This plan served to confirm requirements submitted to AFSWP and to brief personnel concerned, giving them an opportunity to suggest changes.

On 31 December a complete tentative plan was issued and made effective, as required for operations in the San Diego area.

Subsequent to the January sea trials, minor revisions were made to the plan, and it was issued as Annex C to CTG 7.3 Operation Plan 1-55 published 25 March 1955. Concurrent with this issue, additional copies of Annex C were furnished for use by communications and electronics personnel. In addition, a Confidential version of this annex was issued during April since many interested personnel were not cleared for Secret information.

During April an indexed, Confidential booklet entitled "WIGWAM Special Voice Circuits and Call Signs" was issued. This booklet contained an abbreviated voice procedure, task organization, a description of stations on Motorola and AN/VRC-10 nets with voice calls, and a complete encode and decode section of task group voice and CW call signs. This booklet proved very helpful and was tied to each voice outlet and was carried by personnel frequently using circuits.

3.4 TIMING AND FIRING

3.4.1 Description

The Operation WIGWAM timing system is described in EG&G Report 1154, dated 22 September 1954, and the WIGWAM firing system in EG&G Report 1157, dated 8 October 1954.

Seven switch-closure type radio time signals, ranging from −45 min to 0 were employed by experimenters to remotely control equipment. The −45- and −15-min signals were hand activated; the remainder were initiated by the sequence timer which was hand started at −15 min.

The voice-time broadcast commenced at −1 hr. The final 15 min were announced by a tape recording controlled by the sequence timer. The audio signals were taken off at the recorder amplifier audio stage at various impedances to key the Mt. McKinley public address system and one each Motorola, UHF, and VHF circuit.

A crystal-controlled clock was maintained accurately calibrated to WWV by frequent comparison and adjustment. A high-speed camera, actuated by the sequence timer "zero" signal, recorded clock time comparison with WWV to within ±1 msec.

Approximately 200 switch-closure radio time signals were required by the various experimenters. Since 135 of these were used on the three YFNB's and the YC-473, a central distribution system was built and installed on each of these units. Other stations employed "cans" containing a time-signal receiver, vibrasponders for times desired, an off-on 8-day clock, and three time outlets (switch closures).

3.4.2 Operations

Installation of these systems in the flag operations office, Mt. McKinley, in the transportainers on the three YFNB's, and in the weapon room on the YC-473 commenced on 16 March and was essentially completed on 1 April, at which time dry runs were started. Interference between radio channels, shortage of vibrasponders and clocks for the time "cans," equipment failures, and adjustment requirements resulted in incomplete dry runs until late April. Some experimenters were late in specifying time-signal switch locations and connecting equipment. Dry runs conducted during the final week prior to departure were essentially complete and satisfactory.

Deficiencies noted in the first two weeks of dry runs were primarily corrected by obtaining additional EG&G personnel from the Nevada Test Site, assignment of trained personnel to be responsible for key stations, and conducting routine checks and replacements of batteries employed in the system.

Operation WIGWAM planning was based on completion of Nevada tests prior to about mid-April, with EG&G at Las Vegas releasing equipment and highly trained EG&G personnel for WIGWAM use. Delay in completing Nevada tests resulted in WIGWAM delays, and the expected date of 1 April for completion of the first satisfactory dry run was not met.

Commencing 6 May, the shot-time voice-time broadcast script was run concurrently with the dry runs. For security reasons a test tape announcing actual time only was used on dry runs conducted in the vicinity of San Diego.

On D−1 day all batteries in the EG&G system were replaced with new batteries, clocks on timing "cans" were reset, and an official rehearsal was satisfactorily conducted, simulating actual shot-time radio-transmission conditions, except that some projects were not completely instrumented because of rough weather, and radio silence on array units was not complete because of urgent work in progress.

During actual shot time the firing and timing system and the voice-time broadcast operated efficiently. The initial waterborne shock wave jarred open a locked-in relay in the half-second fiducial-pulse transmitter, and these pulses ceased. The relay was manually reset after the last shock wave, and pulses were transmitted for ½ hr thereafter. One project claimed non-receipt of a −30-sec time signal; however, since all time switches were opened by radio signal at +1 sec, it is not known whether it was this signal or the project equipment which failed to function. Other stations at the same location received this signal from the signal-distribution panel.

3.5 EVALUATION OF MOTOROLA VOICE COMMUNICATIONS

This equipment was installed for the following reasons:

1. The three YFNB's and the YC-473 were delivered without installed communications equipment.

2. During overseas test operations, experience showed that UHF equipment installed in Navy ships did not provide reliable or adequate task group voice circuits for five reasons: (1) the short range; (2) blind spots; (3) transmitter, receiver, patch panel, and antenna trouble; (4) some smaller units are allowed only one transmitter and two receivers and cannot properly guard more than one busy channel; and (5) within a range of 15 miles from each other, ships generally experience outages approximating 10 to 25% of the net stations at any given time.

The scientific unit required voice-circuit terminals in trailers, office spaces, and at other locations where new circuit installations were required. In addition, the requirement for portable radios on the circuits made the use of installed UHF and VHF equipment impractical.

Motorola radios require only several man-hours each to install, are frequency modulated with attendant high circuit quality, have a range of 30 miles or more for 10-w and higher powered equipment, and are simple to operate and easy to maintain. Circuit outage is very infrequent. Equipment is a great deal less expensive than standard military equipment.

The following types of Motorola radios, operating in the frequency band 152–162 Mc, were used: 250-, 30-, 25-, and 10-w transceivers, as well as pack sets and Handie-talkies. Crystals for the various types are not interchangeable. This presented some problem in that, after the final crystal procurement was submitted in early February, set utilization on the various circuits was fixed, although in some instances substitution of radios would have been convenient.

Transceivers were installed at primary usage locations, and a total of 25 remote positions were provided. The 10- and 25-w transceivers were not provided with remote outlets; however, remote leads were soldered in where needed. Since no remote muting was installed, the transceiver station could not be operated when the handset was removed from the remote unit. Remote units were not provided with speaker volume controls, and volumes at optimum levels could not always be maintained at remote stations.

Each ship received several substantial waterborne shock waves following detonation of the weapon. Tube losses occurred in several military type UHF radios. There were no failures to Motorola radios even as close as 2000 yd from the detonation point.

3.6 SECURITY AND CRYPTOGRAPHY

3.6.1 Security

No serious breach of communications security came to the attention of CTG 7.3. In several instances persons spoke too freely on VHF voice circuits, but the subject was either of urgent operational nature with little if any value to unauthorized listeners or was evaluated as being of little consequence. In any event, the presence of TG 7.3 in the San Diego area and its mission apparently did not become public knowledge.

Initially, it was planned to use the Imperial Beach Security Unit to monitor long-range task group circuits. Since this unit was not sufficiently manned to perform this function, security responsibility was assigned to net control stations.

3.6.2 Cryptography

A decision was made that the short duration of the "at-sea" period did not warrant increasing class 1 and 2 cryptographic allowances of smaller ships to include a machine crypto system. Since the volume of classified traffic was relatively small in comparison with that of the Eniwetok area tests, normally assigned cryptographers were able to adequately process classified traffic, and no unacceptable delay occurred attributed to Navy ships not being assigned machine crypto systems.

3.7 TG 7.3 CIRCUITS

3.7.1 Plan

Refer to Annex C, CTG 7.3 Operation Order 1-55, for a description of Operation WIGWAM radio circuits. Table 3.1 lists the circuits employed.

3.7.2 Operation

Comments applicable to future planning, on the operation of certain of the circuits listed in Table 3.1, follow:

Channel 1: The task group common circuit was activated for drill purposes for 3 hr daily, commencing 15 April. One of the initial frequencies assigned, 474 kc, interfered with the Coast Guard weather broadcast on 472 kc, and a substitute frequency of 2484 kc was procured from COM 11. On 2 May, one day before the start of the final sortie, both circuit frequencies were activated on a continuous-guard basis, with each ship guarding one assigned frequency and the Mt. McKinley relaying traffic between the two nets. On 21 May the circuit was discontinued except for use between several ships engaged in towing array elements. Circuit operation was more efficient than had been anticipated. The only difficulties were that several smaller ships had to be reminded to adhere to one or two operator schedules, and, after post-shot dispersion of ships, the distance vs low power (TCS-12) employed by several ships resulted in some instances of more than one ship transmitting simultaneously.

Channel 2: Mt. McKinley- NavComSta, San Diego, duplex RATT. Existing equipment was utilized on this channel. Circuit outage was about 20%. No serious message delays occurred since reliable alternate channels were available.

Channel 3: Facsimile broadcast. BuShips provided two KY-44 keyers and adapters, which were installed at the Chollis Heights Transmitter Station, and one CV-172AU teletype converter, which was installed on a facsimile receiver monitor unit at the TG Weather Central, NAS, North Island. A receiver for this monitor circuit was borrowed from the Navy Electronics Laboratory (NEL), San Diego. Chollis Heights employed a 15-kw (or larger) transmitter on the lower frequency and a 2- or 3-kw transmitter on the higher frequency. The Times Facsimile Corporation installed two TT41 transceivers and one RD 92 receiver on 14 March. The telephone company connected one class A keying line and provided one handset telephone hot line the same date. On 15 March a satisfactory local circuit test was conducted. Two frequencies, 4259 and 8518 kc, were keyed simultaneously on each broadcast thereafter. Commencing 1 April, the Philippine Sea, upon request, copied the broadcast for test out to 600 miles while the ship was en route from San Diego to Pearl Harbor. The results were only fair, and the causes were evaluated as insufficient synchronizing time and operator inexperience. A test schedule with the Mt. McKinley in the San Diego harbor continued until sortie. During the operational phase, at least one and generally both of the transmissions were successfully received, each schedule giving excellent weather maps. Articles on Operation WIGWAM appearing in the local

Table 3.1 — RADIO CIRCUITS*

Channel	Use	Frequencies	Remarks
1	TG common (CW)	2484 and 2216 kc	Split-circuit operation
2	Mt. McKinley–NavComSta, San Diego, duplex RATT	4340, 5335, 9594, 10,255, 12,768, and 15,525 kc	A6, JANAP 195
3	FleWeaCen, San Diego, facsimile broadcast	4259 and 9518 kc	A1.1 JANAP 195
4	Air patrol net (CW)	3039, 4470, and 9035 kc	FAW-14 guarded all; AGC first two
5	TG 7.3 base radio net (V)	5080 and 3151 kc	FAW-14, AGC, & ACFT guarded
6	TATC net (V)	339.4 Mc	Aircraft "in" and "out" reports
7	TG coord. net (V)	5260 kc	DD's on patrol; long-range CI net
8	Combat information net (V)	289.8 Mc	All CIC equipped ships
9	Primary tactical (V)	295.8 Mc	All ships
10	Administrative net (V)	277.8 Mc	Back-up channel 9; voice-time broadcast
11	Tactical air dir. nets (V)	236.2, 349, and 356.2 Mc	CIC control of UHF aircraft
12	Helicopter net (V)	344.2 and 318.6 Mc	
13	Carrier land/launch (V)	237.8 Mc	
14	NPL "Dog Roger" broadcast	102, 3303, and 6397 kc	Coverage good in WIGWAM area
15	NPL ship-to-shore	2216 and 2836 kc	
16	Search and rescue	Various	
17	Boat pool net	44, 46, and 48 Mc	AN/VRC-10 equipment
18	AGC-AV radiotelephone	89.8 and 92.8 Mc	AN/TRC-1 equipment, already installed
19	SIO net (V)	4412.5 kc	
A	Technical net (V)	152.87 Mc	Motorola: 19 stations plus 7 remotes, 3 pack sets, and 3 Handie-talkies
C	Surface support net (V)	158.51 Mc	Motorola: 19 stations plus 6 remotes, 2 pack sets, and 1 Handie-talkie
D	Tow and salvage net (V)	159.03 Mc	Motorola: 15 stations plus 4 remotes, 4 pack sets, and 1 Handie-talkie
E	Rad-Safe net (V)	157.91 Mc	Motorola: 2 stations plus 2 remotes, 2 pack sets, and 1 Handie-talkie
G	Project 2.4 net (V)	153.35 Mc	Motorola: 7 stations plus 6 remotes
H	Sandia net (V)	160.20 Mc	Motorola: 6 stations, 2 pack sets, and 1 Handie-talkie
I	NRL-NOL net (V)	161.33 Mc	Motorola: 8 stations, 2 pack sets, and 1 Handie-talkie
J	EG&G net (V)	153.89 Mc	Motorola: 11 stations, 1 pack set, and 1 Handie-talkie
K	SIO net (V)	44 and 46 Mc	AN/VRC-10 equipment: 4 stations and 6 portables
L	Photo net (V)	49.5 Mc	Motorola: 6 stations and 3 portables; equipment supplied by Program VI
N	YAG remote control	30.13, 32.09, and 34.4 Mc	AN/AR3-3 telemetering
O	NRL telemetering	250–270; 140.22 Mc	Underwater pressure data
P	ARF telemetering	217; 219.5; 221.5 Mc	Waterborne shock wave
Q	NRDL buoy telemetering	162–171 Mc	Surface radiation, AN/USQ-1-XN-3
R	Sandia telemetering	225–231 Mc	Air overpressure, Bendix TXV-13-M4 equipment
S	Timing and firing	154.37–157.43 Mc	Motorola: 6 channels
T	Air survey telemetering	30.54–40.78 Mc	Motorola: 7 channels, surface temp. and radiation

*Aircraft channelization omitted from this table.

press were relayed from newsprint and were easily readable. The circuit was excellent, and it is recommended that the same type installation be provided to meet similar future requirements. Teletype terminal equipment for the drop on Air Force circuit 9895 was received by NAS in March. The telephone company effected hookup about 5 April. Initial difficulty was experienced in obtaining readable copy. Technicians were not familiar with adjustments on the 100 word-per-minute teletype and line operations. After trial and error, successful reception commenced on 10 April, and good results were obtained until the circuit was released on 23 May.

Channel 5: TG 7.3 base radio net (V). Due to local intercircuit interference in the Mt. McKinley, use of this circuit was limited. Since operation paralleled channel 4, the value of channel 5 is dubious. It did provide a voice airways channel for sample-return aircraft and was used occasionally for coordination between TACRON 1 and CTU 7.3.5; however, in the interests of reducing HF circuits in the Mt. McKinley, the circuit should not have been planned.

Channel 7: TG coordination net (V). Serious shore-station interference from a police net was noted in the San Diego area on the initial frequency of 2656 kc assigned. Since it was not known whether this interference would continue after sortie, a new frequency of 5260 kc was procured from COM 11. This circuit developed into a long-range CI net and was very valuable to DesRon 13 in coordinating the surface search and aircraft movements.

Channel 9: Tactical net (V). This circuit was used to contact ships not having Motorola circuits and was also used during radio silent periods since the frequency was above the telemetering, timing, and firing circuits. It is considered important that future operations have UHF circuits capable of assuming traffic loads of lower frequency circuits that have been silenced in order to eliminate possible interference with scientific circuits during rehearsals and tests. Higher frequencies normally do not interfere with lower frequencies.

Channel 10: Administrative net (V). The circuit was used almost exclusively to receive the voice-time broadcast during rehearsals and test, although it was occasionally valuable as a backup to channel 9. Where feasible, the voice-time broadcast should be sent on circuits separate from operation nets.

Channel 11: Tactical air direction nets (V). Initial difficulty in establishing these and other VHF circuits with aircraft was experienced since the Mt. McKinley was not checking out circuits prior to reporting of aircraft. This was alleviated by requiring check of circuits with the Wright. It is considered that all task group aircraft control circuits should have at least two ships (or land stations) on the circuit at all times that aircraft are expected on the circuit.

Channel 12: Helicopter net. Annex C assigned eight UHF channels plus the guard channel for helicopter operation. Since the HRS's assigned were equipped with the ARC-12 type radios, the Squadron Commander advised against frequent channel shifting to avoid loss of communications. In addition, the crystal allowance held by HRS was a controlling factor in assignment of task group UHF channels (e.g., CI net and primary tactical). Actual operation was restricted to 344.2 Mc except for several special sample mission flights. Future operations of this type should limit helicopter channels to two operational channels and the guard channel.

Channel 14: NPL Dog Roger broadcast. All ships were required to copy continuously or make guard arrangements. Only ships not having RATT, plus one LST experiencing equipment failure, made guard arrangements. These ships were ordered to guard channel 1B (2216 kc) for simplicity in passing guard traffic. Prior to sortie, NavComSta, San Diego, advised that the broadcast was being transmitted on 102 kc (not shown in JANAP 195) using 50 kw power. This frequency produced ground-wave transmission at night in the WIGWAM area. By simultaneously receiving on two of the three frequencies, the Mt. McKinley was able to obtain good copy at all times. Other ships stated that the broadcast was excellent.

Channel 17: Boat pool net (V). Twenty-seven AN/VRC-10 radios were installed and about ten AN/PRC-10 portable radios were issued to meet net requirements. The remaining equipment available was used on channel K. One radio set was lost with the sinking of an LCM during

heavy weather in January. Twenty-four of these AN/VRC-10 sets were furnished by BuShips for Operation CASTLE and were retained for Operation WIGWAM. Remaining sets and all spare parts were procured from the Army for WIGWAM. Retention for Operation REDWING will be requested, with WIGWAM funds being used to reimburse the Army for items expended during WIGWAM. This net was reliable and entirely satisfactory. At various times almost all units desired to use the net to coordinate activities with boats. Since installation of AN/VRC-10 equipment on all ships and array elements would have been costly, pack sets were used to meet occasional requirements.

Channel 18: AGC-AV radiotelephone. This circuit utilized already installed AN/TRC-1 equipment to provide three voice channels connected to the switchboards of the two ships. Usage was an average of 15 calls per day. Circuit fidelity was excellent. The limited usage is attributed to persons not knowing of the existence of the circuits and the ease with which contact was made on Motorola circuits. One advantage was that some measure of privacy was available on AN/TRC-1 circuits which was welcomed by persons not familiar with voice-net usage. Another advantage was the ability to place a call from, and to, any telephone on the two ships. Interference was experienced on 88.8 Mc from a Mexican broadcast station until the ships were about 50 miles out en route to the WIGWAM area.

Channel 19: SIO net (V). Just prior to sortie, the Scripps Institution of Oceanography (SIO) stated that crystals for 4260 kc were not held by SIO ships. The SIO ship-to-shore CW frequency of 4412.5 kc, used with the Fish and Wildlife Radio Station at La Jolla, Calif., was assigned to this voice net in addition to its use on the CW ship-to-shore circuit. Although early directives advised units to procure crystals, in this instance and one other, addressees of the directive failed to do so.

Channel A: Technical net. Performance of Motorola circuits is discussed in Sec. 3.5. In all instances these circuits met requirements, and service to users was excellent. This comment applies to channels A through J and L.

Channel O: NRL telemetering and control link. The control channel, 140.22 Mc, interfered with Motorola frequencies employed by other telemetering projects on the Curtiss, and in several instances it activated time-signal "cans."

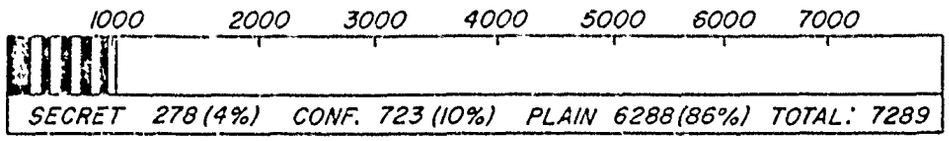
Channel S: Timing and firing. Interference was experienced on 156.83 Mc from operation of channel E (157.91 Mc) and on 157.43 Mc from channels H and I. For future operations it would be highly desirable to assign timing and firing frequencies in a band sufficiently separated from other channels to preclude adjacent channel type interference.

Channel T: NRDL telemetering. The radiac and bolometer equipment used produced a signal whose frequency varied with the readings. The AEC Division of Biology and Medicine Report WT-796 describes the use of modified Motorola equipment to telemeter this type of signal (readings) to a remote recording station. In this instance, readings were obtained by flying AD-5N aircraft over the shot area, telemetering readings to the Mt. McKinley, and recording in triplicate on Angus recorders. Although some interference was experienced on these telemetering channels, serious interference was eliminated and good results were obtained. Sixteen 25-w Motorolas were purchased by EG&G and furnished NRDL to accomplish this telemetering. It is considered that Motorola equipment is well adapted to this type use and that the cost per channel is much less than that for other types of telemetering equipment generally used.

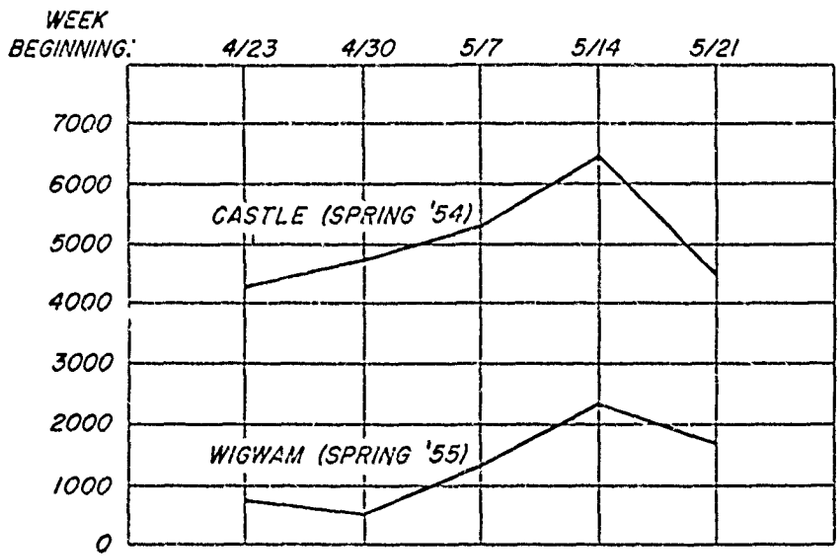
3.8 TRAFFIC ANALYSES

The traffic analyses shown in Fig. 3.1 are based on reports received from participating ships and reflect the number of messages to which a date time group was assigned and which were processed through individual communication centers.

CLASSIFICATION ANALYSIS



TRAFFIC VOLUME - TIME ANALYSIS



TRAFFIC VOLUME DURING WIGWAM AVERAGED 30% OF THAT HANDLED DURING A REPRESENTATIVE 5 WEEK PERIOD ON OPERATION CASTLE.

PRECEDENCE ANALYSIS

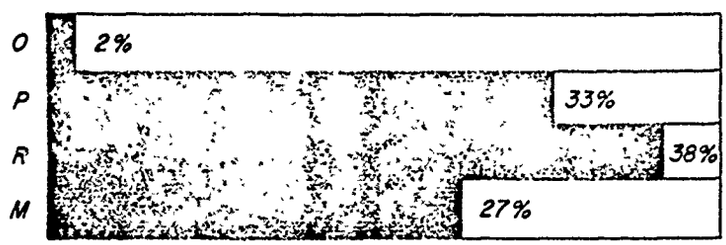


Fig. 3.1—Traffic analyses.

3.9 COMMENTS AND RECOMMENDATIONS

Comment: EG&G installed and operated the firing and timing systems and installed and maintained Motorola voice-communications equipment. From 10 March to 8 April priority was given to installation and testing of the firing and timing systems, and no Motorola voice equipment was installed during that period as had been scheduled.

Recommendation: That the agency responsible for providing the firing and timing system not be assigned other responsibilities which might conflict.

Comment: Rental of Motorola equipment to augment borrowed AEC radios was economical for this type of operation.

Recommendation: That Motorola equipment be rented to meet temporary needs, where total rental does not exceed about $\frac{1}{3}$ the cost of new radios.

Comment: The communications and electronics rehearsal conducted from 18 to 21 April was most valuable in permitting detection and correction of discrepancies.

Recommendation: That the communications and electronics plan for future test exercises be rehearsed sufficiently in advance to permit correction of major discrepancies.

Comment: Approximately half of the ships assigned held either a class 1 or a class 2 cryptographic allowance. Fortunately, operations were not impeded by message delays inherent in the use of strip crypto systems.

Recommendation: That a rapid machine crypto system be developed for issue to all commissioned Navy ships and shore stations.

Comment: Motorola remotes used were not provided with volume controls.

Recommendation: That Reynolds Electric type remotes or equivalent be used on future operations.

Comment: The radio timing and firing system used was reliable and provided all the information required.

Recommendation: That the same system, modified as necessary to meet special test requirements and with higher powered transmitters, be employed on Operation REDWING. Other improvements would be a wider separation of antennas and assignment of a frequency band with sufficient clearance on either side.

Comment: A communications handbook containing task organization, call signs, voice procedure, and description of Motorola and AN/VRC-10 nets was widely distributed and proved most helpful.

Recommendation: That a similar type communications handbook be issued by each task group participating in test operations.

Comment: CTG 7.3 held no cryptographic allowance. While embarked in the Mt. McKinley, several messages were received in class 5 systems.

Recommendation: That the flagship be authorized and directed to carry a class 5 allowance of cryptographic publications to provide adequate guard for CTG 7.3 during periods embarked.

Comment: Several VHF and UHF channels, utilizing ships' equipment, employed frequencies separated by less than 5 Mc. Multicouplers used on VHF and UHF antennas will not accept two or more signals without interchannel interference unless frequencies are separated by at least 5 Mc.

Recommendation: That, in so far as practicable, all VHF and UHF channels, utilizing ships' equipment, be assigned frequencies separated by at least 5 Mc.

Comment: The task group coordination net proved very helpful by providing voice communications between ships beyond VHF range.

Recommendation: That a long-range (HF) task group voice common net be employed on future test operations.

Comment: Radio silence was imposed on all circuits except UHF, firing, and telemetering circuits during dry runs and firing to protect critical channels. This imposed severe limitations on task group communications since timing rehearsals consumed 3 hr daily.

Recommendation: That planning provide for short-range type voice circuits with frequencies higher than critical channels. Higher frequencies seldom interfere with lower frequencies. In addition, the voice-time broadcast should not employ normal communication channels to such an extent that communications are seriously hampered during the broadcast.

Comment: Helicopters were initially assigned eight channels to guard under various conditions. The type equipment installed was unreliable in regard to shifting channels without loss of communications.

Recommendation: That helicopters be required to guard only one primary channel and under special conditions one special mission channel in addition to the guard channel.

Comment: During the initial operational phase, the Mt. McKinley failed to establish VHF and UHF communications expeditiously with task group aircraft in several instances.

Recommendation: That at least two ships or shore stations guard ship-to-aircraft channels to ensure proper functioning of the controlling ships' aircraft channels prior to the reporting time of aircraft on missions.

CHAPTER 4

LOGISTICS

4.1 PLANNING

When JTF 7 was made a continuing agency, Operation WIGWAM was not included by the JCS in the list of future tests to be conducted by the task force. Therefore planning for WIGWAM was carried out on the basis that the existing organization and facilities of JTF 7 would not be available.

Nevertheless, in the interest of uniformity, lengthy consideration was given to adopting logistics and comptroller organizations paralleling those of JTF 7 and to using their existing procedures throughout Operation WIGWAM. However, the following differences between WIGWAM and previous overseas tests made it possible to do without the special supply, transportation, and fiscal organizations which had been required on previous operations.

The base of operations would be in the continental United States. This would permit participating units to stay within reach of their normal sources of service and supply, except for very short periods at sea during which temporary emergency measures would suffice.

Although all the military services and the AEC might participate, the operational problems would be predominantly naval, and forces assigned by the other services and the AEC would not be large enough to necessitate special joint servicing and supply systems. During operations at sea, only the Navy systems would be required in any case.

As opposed to making up the technical programs from project proposals submitted in response to invitations to the services, the programs and projects necessary for obtaining the objectives of Operation WIGWAM were established in the main by the AFSWP Plans Group prior to requesting participation by the services. Since the required projects were of most interest to Navy scientific and industrial agencies, the response was mainly from naval activities. Thus the Navy would require the major portion of the special funds provided for the test, and it would be more efficient to use the normal accounting system of the Navy in the administration of these funds. The accounting function for the small portion of WIGWAM funds not transferred to the Navy or to the AEC could be absorbed by the Logistics Division, Headquarters, AFSWP, using Army accounting procedures.

The personnel of the WIGWAM Planning Group were to form the core of the TG 7.3 Staff during the operational phase and would have earliest knowledge of the detailed requirements for all phases of the operation. Hence only one logistics system was needed for both planning and carrying out the operation. Change-over from one system to another could thus be avoided.

Therefore it was stipulated that project agencies and operating units would use their normal logistics channels to the maximum extent practicable. Funding by the AFSWP and the operational commander would be through these channels, except for minor services to be made available in the staging area which could be more simply funded through a single agency for all units.

The logistics section of the Plans Group, and later the task group staff, confined itself to budgeting and allocation of funds, reporting of their use, furnishing of logistics services not obtainable from normal sources, and accountability of material purchased with WIGWAM funds.

The only special arrangements then required were the establishment and promulgation of accounting instructions for WIGWAM funds and materials. The first concern was to minimize the cost-reporting burden on project agencies. The Navy accounting system provides for "automatic" expenditure reporting to Washington by the use of expenditure account numbers in the field. Hence regular separate reports by Navy project agencies could be avoided if expenditure account numbers could be assigned to the functional purposes by which reporting was desired, provided reports of outstanding, unliquidated obligations would not be required. Elimination of such reports of obligations was acceptable for WIGWAM, and provision was made through the Navy Comptroller for the assignment of the required expenditure account numbers. It was estimated, and later borne out, that approximately 95% of WIGWAM expenditures would be reported in the Navy servicewide system and received in the form of accounting-machine tabulations in Washington.

Plans and instructions for the accountability of material were based on the policy that the purchasing activity is responsible for all accountable material procured with government funds until this responsibility is formally accepted by another properly constituted agency. Instructions made the project officers responsible for determining the need for the purchase of all material and stated that all accountable material procured with WIGWAM funds would be considered as AFSWP or task force property until the responsible agency was otherwise advised.

CTG 7.3 Operation Plan 1-55, Annex D, contained all accounting instructions issued to participating units prior to completion of the operational phase. Instructions for rollback were issued in specific cases as they were needed during the postoperational phase.

4.2 BUDGETING AND FUNDS

As for all recent atomic weapons effects tests, budgeting for the DOD costs of all phases of the operation was a function of the AFSWP. Except for the problems associated with getting both the test and a change of scope in it approved some time after planning had been started, the establishment of funds for Operation WIGWAM was accomplished in the usual manner.

After approval of the test and establishment of fund limitations, the detailed scientific programs and projects and the specifications for the targets and associated seagoing equipment were submitted to participating agencies. Firm cost estimates were not available until all plans and project proposals from these agencies were finally approved. During this process, the budget was gradually refined and adjusted as factual data and new requirements became known. It was found impracticable to make the breakdown of the Operation WIGWAM budget conform to that established for previous atomic tests.

One particularly complicated problem in the over-all budget should be pointed out. It was necessary to borrow from the Navy many expensive material items which would be hazarded by the test. Among these were the many trailer-loads of scientific instruments placed in the YFNB's, the YFNB's themselves, the target-support pontoons, etc. The sinking of one YFNB would entail the loss of nearly $1,000,000 worth of equipment. Extraordinary damage to ships also had to be budgeted for. It is obvious that such costs could not be estimated with any accuracy until after the event, but budgetary provisions had to be made beforehand. Consequently, a budget item of about $1,000,000 was established for replacement and repair of military equipment, including inactivation of the YFNB's, and a corresponding item was established for scientific equipment. Since the extra-military funds budgeted for the military equipment would not be available over the end of the fiscal year and the actual event would occur near that time, it was necessary to budget for the same purpose in both the fiscal years of 1955 and 1956, with the provision that the amount needed in FY 1956 would be reduced by the amount of the FY 1955 funds spent for this purpose. This arrangement was not readily assimilated by existing budgetary procedures.

Detailed budgeting for the individual programs and projects was broken down by the 10 functional purposes corresponding to the expenditure account numbers mentioned in Sec. 4.1. These functional purposes were especially selected to permit Navy laboratories and industrial activities to segregate expenses into the same cost items they normally use. Although the estimates for the separate purposes, as received from the project agencies, were used to determine the relative direction of proposed effort, corresponding limitations on expenditures for each purpose were not established.

The division of funding between Research and Development (R&D) funds and Maintenance and Operations (M&O) funds was determined in a different manner than had been used for previous tests. The conduct of so much of the scientific effort at sea required the expenditure of considerable M&O funds in providing suitable craft and special shipboard arrangements to make the experiments waterborne. Since the specifications for this work were so closely controlled by the scientific requirements, it proved more practicable to make the military M&O work an integral part of the related scientific program or project than to administer it separately. This caused some projects to be funded with both types of funds. On the other hand, one of the scientific programs, that which provided technical and documentary photographic coverage, was conducted by a service photographic laboratory as an extension of its normal service functions, and therefore was funded by M&O (extra-military) funds. The general rule followed was that scientific work was funded with R&D funds, whereas the work required to carry the scientific effort to sea was funded with M&O funds. For instance, the cost of the targets was considered a proper charge to R&D, and their suspension and towering systems were chargeable to M&O.

Actual funding was accomplished by the usual two methods; namely, by allotment within the Army accounting system or by transfer between appropriations, using the standard form 1080. The only direct allotments of WIGWAM funds for the entire operation involved M&O funds. These aggregated a relatively small amount of the M&O limitation. They were used to finance staff travel and office administrative expenses and to provide the funds for Program VI (photographic support). All other funding was accomplished by the use of the standard form 1080. Some $300,000 was transferred to the AEC to finance Program V (timing and firing) and certain services to the Rad-Safe Program. The remainder of all funds so transferred went to the Navy. In all cases this funding was done by transfer to a "Navy Working Fund" under the control of a particular Navy agency. The agencies involved were BuShips, BuOrd, ONR, and DTMB. With the exception of the last mentioned, these agencies made Navy allotments, from the funds thus provided, to designated project agencies in the amounts and at the times designated by the AFSWP or the operational commander, stipulating the purposes for which they would be spent. The inherent flexibility of this arrangement and the excellent cooperation of the controlling agencies made it possible for the AFSWP and the operational commander to manage the distribution of their funds effectively. The subordinate activities receiving the funds were responsible to their parent agencies for proper administration. This condition alone made it possible to perform the logistics staff function with so few personnel.

Also different from previous atomic tests was the method of financing the extra-military expenses incurred during the operational phase and the miscellaneous services required by the scientific projects in the San Diego area. By agreement between the Chief, AFSWP, and the CJTF 7, the funds required were transferred to BuShips and established for the use of the task group commander for this specific purpose. The task group commander requested placement of these funds, as required, at the disposal of the BuShips activities furnishing the desired services, regardless of whether it was to operating units or to project agencies, and use of the funds was controlled locally by task group and AFSWP representatives.

4.3 MATERIAL

There were no major material supply problems during the operational phase. The requirements originating at that time were those expected to occur in naval forces at sea for a similar period. The most gratifying aspect of the sea phase was the fact that the scientific unit was

self-supporting as regards material requirements and was able to resolve practically all material problems without staff assistance.

The only special logistic services required by the task group while at sea were those of a tanker to fuel the destroyers. The tanker, furnished by Commander Service Squadron 1 for the initial fueling approximately one week out of port, was retained on station to refuel the destroyers again after 12 days at sea.

The material problems requiring action beyond the normal supply channels of the participating agencies were those pertaining to the procurement of the large noncommissioned seagoing items of the array and their related equipment.

Of most importance was the construction of the submerged targets themselves. This was the largest single-unit cost item of the entire operation. The usual procedures for obtaining the design and construction of a new naval vessel through BuShips were followed.

The next most important procurement problem was that of obtaining the three YFNB's for use as instrumentation barges. These were obtained on the usual "activate/inactivate" loan basis from the CNO.

There was also the requirement for 24 target-support pontoons, of which there were only 30 in existence, located 10 each in Pearl Harbor, San Diego, and Charleston. These had to be borrowed from BuShips, and those not in San Diego had to be shipped there from storage locations. As it turned out, the expected cost of replacing 15 of these pontoons that were lost or had to be destroyed during the operation was the second largest encountered material cost item for which funds were required.

In addition, many lesser items, but all of considerable value, had to be borrowed or purchased for the outfitting of the YFNB-target groups and for the rigging of the array. One of these was the weapon-support barge. Since this item was definitely going to be lost, only a gift from some source would save construction costs. A Navy YC that had been officially declared unserviceable and ready for scrap was eventually obtained through CNO. It was the most essential element of the array. Much repair work had to be done to assure that it would not be lost before it reached the site.

The matter of returning all borrowed items in proper condition is still under negotiation at the present time. Approval of CNO has been obtained to leave the special YFNB outfitting equipment on board. An estimate of the overhaul and inactivation costs for the YFNB's themselves has not yet been received. Replacement cost for the 15 missing salvage pontoons has not yet been determined by BuShips.

All other WIGWAM material is being accounted for or disposed of in accordance with applicable instructions of the AFSWP or JTF 7. The remaining SQUAW has been assigned to CinCPacFlt, who is currently arranging for its transfer from the task group to COM 11 for preparation, placement, and maintenance purposes.

4.4 COST

Since accurate estimates of the cost of several large M&O items are not yet available and final adjustment of funds for continuing projects has not been made, an accurate report of overall cost cannot be made now.

However, using figures believed to be reasonably close to those eventually to be received and using estimates of normal service operating expense furnished by the fleet and other participating service activities, the indicated cost at this time is shown in Table 4.1.

4.5 COMMENTS AND RECOMMENDATIONS

Comment: The functional purpose classification used in the budgeting and accounting for Operation WIGWAM was considered more suited to the categories of expense normally used by participating agencies than was the standard object classification used for other atomic tests. It was found, however, that certain of these purposes should have been better defined to include certain expenses not specifically covered by the definitions and examples furnished.

Table 4.1—TENTATIVE COST SCHEDULE FOR OPERATION WIGWAM

Item	R&D	M&O
Preliminary planning studies and preparatory tests	$1,384,957.00	$ 50,650.00
Technical programs and projects	5,123,246.00	1,398,624.08
Military support:		
Array handling		374,692.24
Rad-Safe and aerology		140,930.00
Task group admin.		123,285.56
Repair and replacement of ships and material		998,500.00
Total	$6,508,203.00	$3,086,681.88

Normal service operating expense	$ 5,639,291.49
R&D costs from total above	6,508,203.00
M&O costs from total above	3,086,681.88
Total cost of the operation	$15,234,176.37

Recommendation: That a special functional purpose classification like that for WIGWAM be used for those future tests in which most of the expenditures will be made by industrial type activities rather than by the military elements of the services.

Comment: The adoption of an Operation WIGWAM fiscal reporting system conforming to the normal reporting system of the Navy reduced the accounting burden of the Navy participants, obviated the need for recurring complex reports from scientific project officers, and thereby reduced distraction from scientific effort. On the other hand, it was found that these "automatic" reports were received too late to be used as a satisfactory management tool, i.e., to enable timely comparison between physical progress and expenses incurred. Therefore, for management purposes, dependence had to be placed on each project officer's own analysis of his current fiscal situation. Since he was at all times responsible to his regular seniors for the administration of his funds, regardless of source, he was naturally the first to be aware of a management problem and to seek the solution. When assistance from outside his own agency was required, all the facts had to be made known. These were current and factual and were submitted only when a management decision was necessary. In retrospect, it appears that no type of regularly recurring tabular report could have served the same purpose as these special situation reports. It is therefore concluded that the regular recurring reports are of statistical value only and are not satisfactory as a management tool.

Recommendation: That, for future tests, regular recurring complex fiscal reports be required only in those cases in which the data to be reported are essential for statistical purposes or are necessary to meet the requirements of outstanding service regulations.

Comment: It is considered that the use of normal service channels for all logistics and the use of the same fiscal methods throughout the operation were of great benefit to the participating agencies and resulted in appreciable savings in manpower and funds for the operation as a whole.

Recommendation: That, in the interest of both economy and management efficiency, the establishment or use of special logistics channels be avoided to the maximum extent practicable and that procedures remain the same throughout the entire operation if possible.

CHAPTER 5

RADIOLOGICAL SAFETY

5.1 DISCUSSION

NRDL contracted to administer a radiological safety (Rad-Safe) project for the operation, which was identified for accounting and record purposes as "Project 0.17." Personnel of this project administered the film dosimetry program, instrument maintenance, repair, and calibration, monitoring, radioactive-sample handling; and assistance to ships and units on matters of radiological safety. Personnel of this project are preparing a report on the activities of the project, which will be included in the scientific reports.

Security aspects of the operation prevented the initiation by the various ships and units of a special Rad-Safe training program in preparation for the operation. A two-day course of instruction for selected individuals from the various ships and units was established prior to departure to the test area on board USS Wright with instructors from NRDL and the Naval Schools Command, Treasure Island, San Francisco. Project 0.17 personnel received special Rad Safe training before the operation and were utilized to supplement ship's Rad-Safe personnel as needed.

Each person in the operational area was issued a film-badge dosimeter for the duration of the operation. Additional film badges were daily issued to and collected from persons expected to receive significant radiation. Daily processing of these additional film badges made possible an up to date record of these exposures. Dosimetry records for all personnel are incomplete at this time, but no case is known of any person receiving as much as 3.9 r (the maximum permissible exposure) during the operation.

Owing to the magnitude and depth of the explosion, it was confidently expected that any fall-out resulting from the explosion would rise not more than a few thousand feet into the atmosphere and would not be found more than a few miles upwind or crosswind. Consequently, no washdown systems were required to be installed on ships, with the exception of YAG-39. As expected, no manned ship upwind or crosswind encountered any fall-out. No significant fall-out was encountered by any ship other than YAG-39, which was deliberately placed in the fall-out area.

It was necessary to direct a few ships into radioactive water. Salt-water systems and hulls were contaminated by this experience but not to a level high enough to become a health hazard when the proper precautions were taken.

It was also necessary to bring radioactive material, such as water samples, buoys, and cables, on board some ships. Adequate precautions prevented serious health hazards.

Preparations were made for handling the most radioactive water samples expected to be collected. These preparations included the fabrication of containers with lead shields and specially modified airplane wing tanks in which these samples were carried from the Wright to

San Diego. Officers of VP-2 and SWUPAC transferred these samples at San Diego to other aircraft, which took them to their final destinations at NRDL, LASL, and NRL.

At the conclusion of the operation all ships except two were assigned final radiological clearances. This command assigned USS Bolster (ARS-38) an operational clearance on 23 May 1955 due to intensity of 20 mr/hr at the sea suctions, but all other parts of the ship had intensities of less than 0.5 mr/hr. On 20 May 1955 the Director, NRDL, recommended to the Commander, San Francisco Naval Shipyard, that a radiological operational clearance be established aboard USS YAG-39. A preliminary survey of YAG-39 on 19 May indicated that the beta-gamma contact dose rate varied from 3 to 6 mrep/hr and the contact gamma dose rate was 1 mr/hr. No aircraft were contaminated during the operation.

The BuShips representatives were informally requested, in October 1954, to bring all ships of the task group up to full allowance of radiac equipment. Efforts were made to do this, but at the commencement of the operation some ships still did not have their full allowance. Survey meters were borrowed from Long Beach Naval Shipyard for distribution of ships and aircraft needing them. In addition, Project 0.17 equipment was available to supplement the normal allowances.

The survey instrument in most general use by naval units was the AN/PDR-27 type. It was found to be quite satisfactory. Project 0.17 personnel also used commercial survey meters because these instruments had a higher beta-gamma range (20 mrep/hr) and a larger window for beta-gamma readings than did the AN/PDR-27 type instrument.

5.2 COMMENTS AND RECOMMENDATIONS

Comment: Rad-Safe preparations and procedures in Operation WIGWAM were adequate in all respects.

Recommendation: That in future operations of this type Rad-Safe matters be conducted essentially as they had been in Operation WIGWAM and that the facilities and personnel of NRDL be utilized to the maximum extent practicable for radiological safety.

Comment: Standard naval radiac instruments are adequate. However, it is believed that a larger probe window for beta-gamma readings with the AN/PDR-27 type instrument would facilitate personnel monitoring and that a higher beta-gamma range would facilitate determination of contamination of compartments by comparing gamma with beta intensities.

Recommendation: That consideration be given to modification of the AN/PDR-27 type instrument so as to provide a larger beta-gamma window and a higher beta-gamma range.

Comment: If security considerations had permitted, naval units could have administered training to personnel on the specific radiological hazards to be expected during the operation.

CHAPTER 6

INTELLIGENCE, SECURITY, AND PUBLIC INFORMATION

6.1 DISCUSSION

6.1.1 Intelligence

Intelligence information available to CTG 7.3 during the planning and operational phases of Operation WIGWAM was considered adequate for planned operations. No additional information was received by the task group that would indicate any probable interference from enemy activity. At no time during scheduled operations were there any signs or indications that any foreign powers were making unauthorized attempts to obtain intelligence concerning this operation through the use of submarine, air, or surface craft operating in the vicinity of the designated test area. No indication of sabotage, espionage, or defection of personnel was detected within the task group.

6.1.2 Security

A classification guide applicable to Operation WIGWAM was promulgated on 8 December 1954 for the information and guidance of all commands and units participating in the operation. Distribution of the guide and number of copies issued to the respective commands were kept to a minimum, and it was noted during the planning phase of the operation that there were numerous security classification violations within some units which indicated that dissemination of the contents of the guide had not been adequately made to all their subordinate offices who "needed to know."

In view of the previous employment of TG 7.3 and its known association with nuclear weapons tests and in view of the desire of the Secretary of Defense and the concurrence of the JCS that there be no deliberate publicity in connection with Operation WIGWAM, it was determined to establish the West Coast activities of TG 7.3 under the guise of "Special Projects Unit" (SPU).

Spaces assigned to the SPU were within the confines of the NEL, San Diego, and afforded excellent security protection for the headquarters staff and all units concerned. In view of the protection desired by this command, civilian guards employed by NEL in the vicinity of SPU were selected from among those guards who held final Secret clearances. Staff, program, and visiting personnel were all required to have their clearance status filed with the Security Division, NEL, and be properly badged prior to gaining entrance to SPU spaces.

The maintenance of security within the SPU areas of operation and in the San Diego area in general was assisted by the excellent cooperation afforded by the Eleventh Naval District Intelligence Office, the Security Division, NEL, and the Security Division, Naval Station, San Diego.

All general and specific security instructions for Operation WIGWAM were disseminated to participating units through the issuance of TG 7.3 Instruction 05510.12. Detailed instructions and directives concerning the following items were included in this instruction:

1. General definitions.
2. General security principles.
3. Security clearances.
4. WIGWAM badge-identification system.
5. Emergency destruction of classified matter.
6. Security instruction for special personnel.
7. Photography and photographic material.
8. Departure security procedure.

Based on experience gained in previous operations, Queen (Q), Top Secret (TS), and Secret personnel clearance requirements for Operation WIGWAM were reduced considerably.

On 10 February 1955, as a result of the AEC's interpretation of the Atomic Energy Act of 1954, the requirements for Q clearances for military personnel requiring access to Restricted Data directly from AEC contractors and licensees was discontinued. In accordance with Section 143, Atomic Energy Act of 1954, AEC employees, contractors, and licensees are not permitted to grant access to Restricted Data to personnel of the armed forces and armed forces contractor employees who have been granted appropriate military clearances in accordance with applicable service regulations. Such access will be granted, however, only on certification by an agency of the DOD that access is required in the performance of duties and will not endanger the common defense and security. In view of the foregoing data and in accordance with amplifying instructions contained in Chief of Naval Operations Notice 5510, 21 February 1955, names of Secret or Top Secret cleared personnel for whom Q clearance had been requested but would not be issued were submitted to AEC (DMA) via Chief of Naval Operations for certification. All Q clearances held by DOD personnel prior to 10 February 1955 were to be continued in effect pending further instructions.

During the build-up and operational phases of Operation WIGWAM, exclusion and controlled areas were established as follows:

1. Exclusion area
   (a) USS Curtiss: during the period SS material and other classified weapons material were aboard
      (1) Pyrotechnic locker (02-65): capsule storage
      (2) Shops 1, 2, and 17 (as one area) final assembly, unit case storage, storage of detonator (in wall lockers, shop 17)
      (3) Shop 5: capsule checking and assembly
   (b) YC (shot barge): entire barge when test device was aboard
2. Controlled area
   Pier 5, NRF, Naval Station, San Diego: during the period that instrumentation of targets and other craft was in process

Access to exclusion areas was controlled via access list and possession of a pink SPU special pass (pink indicating Q or TS clearance).

During the period Pier 5, NRF, was established as a "controlled area," access to the pier was restricted to all personnel not badged with a SPU special pass indicating Confidential clearance or higher. Although not badged, members of ship's company or craft moored at Pier 5 were admitted to the pier upon proper identification and their names were checked against a copy of ship's muster lists on file at the security booth at the entrance of the pier.

During the period SS material was in the custody of CTG 7.3, security control of the exclusion areas was adequately handled through the AEC Security Representative to CTG 7.3, embarked in the USS Curtiss, and by the Commanding Officer, Marine Detachment, USS Curtiss, whose own personal experience and that of his detachment derived from previous operations, proved most valuable during Operation WIGWAM.

All personally owned photographic equipment and supplies were considered contraband items during Operation WIGWAM. As a result of periodic searches conducted by all commands after departure for the test area, a limited number of such items were discovered held in personal possession. In all such instances, film and photographic equipment were confiscated, and any unprocessed film was forwarded to the Photographic Element for processing and determination of classification. No confiscated film was found to contain classified information.

No reports of security violations through carelessness in personal correspondence were received by CTG 7.3. A few reports of loose talk on classified matter in scattered areas on the West Coast were received by the command, none of which resulted in breaches in security

sufficiently grave as to warrant the conduct of a formal investigation. All investigative requirements considered necessary were promptly made by the District Intelligence Office, Eleventh Naval District.

6.1.3 Training and Indoctrination

Personnel security training and indoctrination instructions for Operation WIGWAM were disseminated to all units participating through the issuance of TG 7.3 Instruction 05510.11. Directives contained therein made all task unit commanders responsible for ensuring that all personnel within their unit were given a thorough briefing and examination on "basic security responsibility," on which they had to attain a score of 100%. In addition to the foregoing, all personnel whose duties required them to handle classified material were required to pass an additional examination on "safeguarding classified information" and attain a score of 100%.

In implementation of the above, each unit commander or commanding officer was directed to designate his executive officer or such other officer as he deemed appropriate to act as security officer and assign as many additional officers as necessary to act as assistant security officers.

Included among primary duties of the security officer was the responsibility for: (1) security training; (2) enforcement of security regulations; and (3) supervision of the administration, grading, and recording of the results of security examinations.

All units were further directed to make extensive use of their daily ship's press, plan of the day, bulletin boards, posters, etc., to keep personnel security conscious throughout the entire operation.

6.1.4 Public Information

In compliance with DOD policy regarding public release of information concerning nuclear weapons, all possible action was taken to ensure that no person attached to any command or unit participating in Operation WIGWAM made any release of information concerning this operation to the press.

Through directives contained in CTG 7.3 Operation Order 1-55 and TG 7.3 Instructions 05510.11 and 05510.12, participating units were cautioned in particular on the following:

1. No deliberate publicity should be given in connection with Operation WIGWAM.
2. TG 7.3 does not release any public information.
3. Releases to the press, if any, in regard to TG 7.3 operations and activities will be made only by the AEC or DOD.

In conformance with the above, on 9 May 1955 an announcement of the scheduled test was made jointly to the press by the DOD and the AEC. This information was disseminated by CTG 7.3 to the task group on 11 May 1955.

On 17 May 1955 the DOD and the AEC announced to the public the completion of the underwater explosion of a small nuclear device.

Both releases stressed the fact that this test would not create any hazard to mainland inhabitants or to the consumers of fish.

Subsequent to the above announcements, a variety of items appearing in local papers throughout the continental United States revealed some speculation as to the size of the weapon, the area of detonation, and the type of targets utilized. One item appearing in a West Coast newspaper contained adverse comments on the conduct of this type of test. The writer considered that it would be destructive to the sardines, mackerel, and other species that were then spawning in the ocean and that this explosion might completely destroy not only the fish but also the whales.

6.2 COMMENTS AND RECOMMENDATIONS

Comment: The security training and indoctrination program for Operation WIGWAM was effective in instilling a high degree of security consciousness in each individual throughout the entire operation, and there were no known serious security violations committed by any person within the task group.

Recommendation: That a security training and indoctrination program commensurate with the type and classification of the operation being conducted be continued in future operations.

Comment: The requirement that all personnel participating in the operation obtain the minimum of a Confidential clearance or higher proved adequate and realistic.

Recommendation: That all personnel participating in any future operations be required to have a minimum military security clearance of Confidential.

Comment: That dissemination of the contents of the classification guide and other security instructions were not in all cases made to all subordinate offices to enable them to accomplish the required directives.

Recommendation: That all commands and units participating in an operation ensure that all information relative to security and classification of correspondence of material be disseminated to all subordinate offices who "need to know" in the execution of their mission.

Comment: There were no indications of any foreign power making unauthorized attempts to obtain intelligence concerning this operation, nor was there any indication of sabotage, espionage, or defection of personnel within the task group.

Comment: In view of the desire of the Secretary of Defense and the concurrence of the JCS that there be no deliberate publicity in connection with Operation WIGWAM, the initial prohibitions imposed on personal correspondence, conversations, and contraband items were not considered too restrictive.

Comment: Delaying the joint DOD-AEC press release relative to proposed intentions to conduct the test until the last major fleet unit departed for the test site was an important factor in the maintenance of security.

CHAPTER 7

SCIENTIFIC PARTICIPATION

7.1 GENERAL

The basic mission of the scientific group was to provide, place at depth, and detonate the nuclear weapon and to conduct those experimental programs and projects that were required to meet the objectives of the test.

A watertight case was designed and constructed in which to house the weapon while it was submerged to a depth of 2000 ft. The case and weapon were lowered, together with the necessary electrical conductor cable, from a modified YC.

The weapon was successfully placed at a depth of 2000 ft and was detonated on 14 May 1955 at 1959 hr 59.871 sec Zebra ± 1 msec. Arming and firing of the weapon were accomplished remotely by radio tone signals generated aboard the command ship. The time of detonation mentioned above contains all corrections except that for the time of propagation of the radio-time signal from WWV, which is estimated to be 13 msec.

In spite of the many difficulties encountered by all experimenters because of the poor weather conditions prevailing during the days leading up to, and including, the day of the test, a high degree of success was attained by the majority of the projects participating. Formal presentation of the data obtained and their meaning with respect to the test objectives will be made in the interim and final technical reports by the projects concerned.

7.2 PRELIMINARY RESULTS

The total energy release of the weapon used was apparently that to be expected, namely, that equivalent to 30 kt of TNT. However, the "effective" yield, from the standpoint of the underwater pressure field generated by the detonation, was equivalent to that of 40,000,000 lb of TNT. This difference between "rated" and "effective" yield when considering the use of a nuclear weapon underwater is important to the scaling of underwater pressure fields to different yields.

Although the numbers at hand are extremely preliminary in nature, some results can be indicated at this time. It should be noted that the conclusions presented are subject to revision as the data are analyzed, and any validity is only appropriate to Operation WIGWAM conditions. The maximum range at which lethal hull-splitting damage to a typical submerged submarine can be assured (i.e., a kill probability of 1.0) is approximately 7000 ft from surface zero.

For surface vessels, lethal hull splitting should be expected at ranges up to 3500 ft from surface zero. Sufficient shock damage to cause complete loss of power and effectiveness can be expected at ranges out to 7000 ft. At surface ranges greater than 10,000 ft no significant

shock damage was noted at the test, although minor shock damage was experienced by some vessels in the operation which were at ranges of 5 miles. For the Operation WIGWAM geometry and depth of water, the peak velocities and accelerations of the direct primary shock were greater than those induced by bottom reflection at ranges of less than 10,000 ft. At greater ranges, the reverse condition seemed to be true.

The maximum air overpressure measured was 1.36 psi at the surface above the detonation. The minimum measured was 0.16 psi at 5500 ft. These measurements confirm the validity of the aircraft-escape distances given in NAVAER 00-25-536, "Guide to the Effects of Atomic Weapons on Naval Aircraft," 1 July 1954. It should be noted, however, that the duration of the shock-wave loading in air was about 10 times that predicted.

It would seem that, with the exception of radioactive fall-out downwind of the detonation, the safe ranges indicated from the standpoint of hull splitting and shock damage are also valid from the standpoint of surface effects including waterborne radioactivity. The hazardous area downwind is obviously a function of wind speed. With the exception of YAG-39 and YAG-40, no attempt was made to document the downwind fall-out owing to operational difficulties. Incomplete data presently available indicate that, in this operation, less than 1 % of the total fission activity appeared as airborne activity. Surface activity remained hazardous for several hours in an area approximately 1 mile in diameter at the detonation point but decreased rapidly in intensity as a result of dispersion after the local water circulation diminished and normal horizontal spreading became effective. By D + 4 day the area of surface activity covered approximately 80 square miles and read 1 mr/hr. On D + 40 day the only contaminated surface water located was still within 120 miles of the detonation point and had a maximum level of about 10^{-2} mr/hr. Insufficient data are available at this time to warrant conclusions as to the vertical dispersion of the activity, although it would seem that, when the vertical circulation set up by the detonation ceased, the waterborne activity stratified in numerous density layers below the thermocline and then underwent horizontal dispersion along the various strata in a manner similar to, but slower than, the surface layer.

It is considered necessary and desirable to point out at this time that the radiological aspects of this operation should be considered as being applicable only to the particular geometry of the test. At shallower depths a progressively greater radiological hazard to ships and personnel must be expected.

7.3 COMMENTS AND RECOMMENDATIONS

Comment: On the basis of present information, it may be concluded that, despite the inclement weather encountered during the test, sufficient scientific information has been obtained to meet all the objectives of the test. The validity of scaling the effects of conventional explosions to those of underwater nuclear detonations was confirmed. Further information needed on the response of targets of different design can be gained from tests using scaled models and tapered HE charges.

Recommendation: That no additional tests of atomic devices at deep submergence be conducted.

CHAPTER 8

AEROLOGICAL OPERATIONS

8.1 DISCUSSION

Accurate weather forecasting was required during the operational phase of WIGWAM in order to protect array units, particularly submerged SQUAWS, from loss or damage that might be caused by unexpected, rough seas, to permit the best selection of course and detonation site, and to schedule events. Since the WIGWAM site was clear of shipping lanes, established weather services provided very meager coverage of the area. In addition, the state of the sea was a most important factor in this type operation. To provide the best weather forecasts reasonably obtainable, a task group weather unit was established, and the necessary facilities were arranged to furnish climatological data.

8.2 BASIC TASK GROUP WEATHER ORGANIZATION

8.2.1 Task Group Weather Central

This facility was established on the third floor of the Operations Building, NAS, San Diego, directly above the Fleet Weather Central. The Task Group Weather Central was manned by 4 officers and 12 aerographer's mates ordered to the SPU by the Bureau of Naval Personnel for temporary duty.

The mission of the Task Group Weather Central was to:

1. Collect, plot, analyze, and transmit weather information required by the Task Group Forecasting Team in the USS Mt. McKinley.
2. Coordinate weather and oceanic reconnaissance.
3. Establish full-scale operations by 1 April 1955 to train personnel and test facilities prior to sortie of the task group on 2 May 1955.

8.2.2 Task Group Forecasting Team

This team was embarked in the USS Mt. McKinley with the task group commander and consisted of the TG 7.3 Aerological Officer and one Chief Aerographer's Mate, attached to the CTG 7.3 Staff, assisted by the Mt. McKinley aerological personnel and one civilian observer furnished by the Hydrographic Office, Washington, D. C., to take sea and swell observations. The forecasting team provided the information required by the TG 7.3 Aerological Officer to brief the task group commander and issue forecasts, advisories, and warnings to the task group at 1000 and 2000 hr daily and as significant changes occurred.

8.3 SOURCES AND TYPES OF WEATHER DATA

In preparing special weather maps of the WIGWAM operating area, the facilities of TG 7.3 and reports from weather agencies possessing data affecting the area were utilized. A description of these services follows.

8.3.1 TG 7.3

(a) Hydrographic Survey Element (TE 7.3.5.4). Three P4Y aircraft were employed to provide sea and swell observations. During the WIGWAM planning stage a British-manufactured sea and swell recorder was installed in a P4Y, and tests of it were conducted. These tests indicated that modifications would be needed to meet Operation WIGWAM requirements; however, NRL could not complete these modifications in time. The Hydrographic Office furnished three civilians to make visual observations of the sea and swell. Two of these observers were assigned to make P4Y observation flights. The maximum error of these observations, as determined by comparison with surface observations, was 2 ft.

The tracks to be flown by these aircraft were assigned by the Task Group Weather Central. The scheduled tracks were changed in only one instance in order to investigate an area to the south of the task group for a possible tropical disturbance.

(b) Carrier Air Support Unit (TU 7.3.2). The aerological unit in the USS Wright furnished helicopter aerograph (AMQ-11) low-level air soundings on D day and aerological support to embarked aviation units. The aerograph used was obtained on loan from the Bureau of Aeronautics and was the first developmental model to be completed by NRL. The instrument is considered to be well designed and operationally sound. A report on this equipment was forwarded to the Bureau of Aeronautics.

(c) USS Curtiss and USS Walke. The Curtiss was assigned the mission of taking all upper air observations in accordance with the schedules furnished by the Task Group Aerological Officer. Because of a casualty to the Curtiss Mark 25 radar system, the Walke was assigned to track RAWIN sounding balloons launched by the Curtiss. The Walke personnel did an outstanding tracking job resulting in satisfactory RAWINS. A total of 28 RAWINS was taken with an average altitude of 45,000 ft and a maximum altitude of 60,000 ft. No difficulty was experienced by the Curtiss in taking radiosondes. A total of 37 radiosondes was taken with an average altitude of 42,380 ft and a maximum altitude of 75,325 ft.

(d) Air Patrol Element (TE 7.3.5.1). P2V aircraft on security patrols filed hourly weather reports addressed to the Task Group Weather Central and to the Mt. McKinley for use by the Task Group Forecasting Team.

(e) Other Weather Units Afloat. TG 7.3 ships were required to make normal weather reports when operating at a distance greater than 50 miles from the Mt. McKinley.

8.3.2 Fleet Weather Central, San Diego

The Fleet Weather Central made available to the Task Group Weather Central all routine weather reports and assisted in the plotting and preparation of the various charts required.

8.3.3 Air Force RATT Circuit 9098

A receive-only drop on this circuit was installed at the Fleet Weather Central during Operation WIGWAM in order to receive weather data from the Western Pacific. No difficulties were encountered in the operation of this facility.

8.3.4 Fleet Weather Central, Pearl Harbor

A central southern hemisphere analysis was received daily from the Fleet Weather Central, Pearl Harbor. It was obtained by intercept of the Nandi and Auckland broadcasts. This analysis was required in order to locate any generating area which might cause swell in the WIGWAM operating area.

8.3.5 NSS Washington Primary General Broadcast (RATT)

Arrangements were made to receive this broadcast by teletype relay from Washington. Of particular interest were the hemispheric 500-mb space-mean analysis, the 36-hr space-mean prognostic analysis, and the hemispheric zonal wind profile.

8.4 OPERATIONS

8.4.1 Facsimile Charts

(a) WABAN. The Task Group Weather Central prepared WABAN 2 and WABAN 2A facsimile base charts. These charts provide modified weather hemispheric coverage and were ideal for the purpose intended. The entire Pacific, most of North America, and portions of Asia were covered in two facsimile transmissions. The WABAN analyses and prognoses proved very reliable over the United States and provided a basis for the prognoses over the Pacific. Emphasis was placed on the surface and low-level charts, since high-level radiological fallout was considered a very remote possibility.

(b) Synoptic Sea and Swell Chart. This is a Hydrographic Office chart devised to give the synoptic state of the sea. Based primarily on surface wind reports and secondarily on such sea and swell observations as may be available, isolines of sea heights are drawn. The areas of high and low seas are shown, and the different wave trains are clearly delineated. Based on prognostic surface charts, prognostic sea and swell charts were prepared.

The sea and swell charts were prepared by two oceanographers from the Hydrographic Office, using the facilities of the Task Group Weather Central. These charts proved very useful and were excellent briefing charts.

8.4.2 Facsimile Transmission

A special weather facsimile broadcast was established to transmit maps from the Task Group Weather Central to the Mt. McKinley. The broadcast schedule is contained in Table 8.1. The Mt. McKinley received excellent maps on all schedules.

8.4.3 Effect of Weather on Task Group Operations

The commander was primarily interested in the state of the sea. Damage to SQUAW pontoons and cable bundles occurred en route to the operating area as a result of wave action. Upon arrival in the area, emergency repairs to this equipment were effected under very adverse boating conditions. The task group course was altered to place the array in a more favorable sea area. Since damage to array units by sea action was continuing and progressive, the shot date was determined by this factor rather than waiting for more favorable weather conditions. The scientific effort was reduced as a result of the unfavorable boating conditions on 12 and 13 May, the action of the wind on balloons, and the inability to lower certain instrumentation strings because of heavy seas. Table 8.2 contains the sea and swell summary for the critical operating period.

8.5 COMMUNICATIONS

In general, weather communications were excellent, particularly the facsimile broadcast circuit. Refer to Chap. 3 for detailed operation of weather circuits.

8.6 COMMENTS AND RECOMMENDATIONS

Comment: Prior to Operation WIGWAM a careful search of all climatological records was conducted, and an extensive weather survey of the area to be used was carried out for more than a year prior to the test. Nevertheless, wind and sea conditions were not as good as those

Table 8.1—BROADCAST SCHEDULE

Transmission time (Tare)	Type chart	Time of chart	Section
0050	5-day fcst. (Mon. and Thur. only)		1
0115	5-day fcst. (Mon. and Thur. only)		2
0151	700 mb	0300Z	1
0215	700 mb	0300Z	2
0240	500 mb	0300Z	1
0305	500 mb	0300Z	2
0330	SFC chart	0630Z	1
0355	SFC chart	0630Z	2
0420	850 mb	0300Z	1
0445	850 mb	0300Z	2
0510	300 mb	0300Z	1
0535	300 mb	0300Z	2
0600	850-mb prog.	0300Z	1
0625	Ocean wave	0630Z	1
0740	500-mb prog.	0300Z	1
0805	Prog. SFC	0630Z	1
0855	Prog. ocean wave	0630Z	1
0930	SFC chart	1230Z	1
0955	SFC chart	1230Z	2
1350	700 mb	1500Z	1
1415	700 mb	1500Z	2
1440	500 mb	1500Z	1
1505	500 mb	1500Z	2
1530	SFC chart	1830Z	1
1555	SFC chart	1830Z	2
1620	850 mb	1500Z	1
1645	850 mb	1500Z	2
1710	300 mb	1500Z	1
1735	300 mb	1500Z	2
1800	850-mb prog.	1500Z	1
1825	Ocean wave chart	1830Z	1
1850	500-mb space mean		1
1915	500-mb space mean prog.		1
1940	500-mb prog.	1500Z	1
2005	SFC prog.	1830Z	1
2030	24-hr thickness chart		1
2055	Ocean wave prog.	1830Z	1
2130	SFC chart	0030Z	1
2155	SFC chart	0030Z	2
2220	Alternate for 1850 chart		1
2245	Alternate for 1915 chart		1

anticipated because of year to year variation in average weather conditions. The very nature of an atomic test at sea requires selection of an area remote from land and free from shipping. Hence climatological data will be sparse. Planning agencies for such a test must consider the probability of lengthy spells of unsatisfactory weather and the need for flexibility in selection of time and place.

Table 8.2—SEA AND SWELL SUMMARY

Date	Wind direction	Velocity, knots	Sea, ft*	Swell, ft*	Combined, ft*
6	S	16	3	4	5
7	W	11	2	5	5.2
8	NW	14	3	4–5	6
9	N	17	3–4	5–6	7
10	N	12	1	4–5	5.1
11	NE	6	1	4–5	5.1
12	NNW	8	1–2	4	4.2
13	NNE	15	5–6	4–5	7
14	NNE	18	5	7	8.3
15	NE	17	4	6	7
16	N	14	2–3	5	6
17	NNE	18	5	3	6
18	N	19	4–5	5	7
19	NNW	17	5–6	5–6	8.3
20	WNW	8	1	3–4	4

*Significant heights (average of highest one-third waves).

Comment: The facsimile broadcast installed to transmit weather maps provided excellent service. To provide the same analyses afloat without this service would have required an estimated 4 officers and 16 men in the Mt. McKinley plus four RATT circuits and some means of receiving WABAN data.

Recommendation: That a similar circuit be established to meet future requirements of this type.

Comment: The prognostic sea and swell charts proved very useful and are excellent briefing charts.

Recommendation: That the Hydrographic Office continue development of these charts with the end in view of eventual fleet utilization.

CHAPTER 9

ADMINISTRATION

9.1 NARRATIVE

The preliminary phase of Operation WIGWAM, covering the period from 16 December 1952 to 15 November 1954, was conducted by the Special Field Projects Division, Headquarters, AFSWP. The headquarters furnished the administrative support for this phase, including personnel administration. The Special Field Projects Division, however, carried out the preparations to provide for administration and personnel necessary for its becoming the operational command for the test. This transition occurred on 15 November 1954, upon the reporting of the task group commander and the personnel of the Special Field Projects Division assigned to him as members of his staff. This marked the beginning of the preoperational phase which extended until 31 March 1955.

During the preliminary phase the Special Field Projects Division developed to completion the establishment of SPU at NEL, San Diego. This unit was, in actuality, the advance headquarters of the task group, and the Chief of Staff was assigned as Special Projects Officer resident at San Diego. The title "Special Projects Unit" concealed the relation of TG 7.3 to the large accumulation of scientific material and the arrival of scientific personnel at San Diego.

During the preliminary phase it was determined that the WIGWAM correspondence and file systems in effect at Headquarters, AFSWP, would be continued throughout the preoperational and operational phases since the responsibility for WIGWAM was to return to the Chief, AFSWP, at the beginning of the postoperational phase. This necessitated using both the AFSWP and Navy correspondence and file systems to provide permanent records for Headquarters, AFSWP, and TG 7.3.

Accounting for personnel of SPU to avoid disclosing a relation with TG 7.3 was accomplished by reporting the officers in the Officer Diary of the task group headquarters and the enlisted personnel to the Personnel Accounting Machine Installation (PAMI), Air Force, U. S. Pacific Fleet, in a special diary using eight zeros in place of the Bureau of Naval Personnel eight-digit personnel-allowance identification code assigned SPU since this code number was the same as that assigned TG 7.3.

During the preoperational phase the arrangements for the reproduction and distribution of WIGWAM interim and final weapons test reports by the AEC Technical Information Service, Oak Ridge, Tenn., were made. Arrangements for classification and technical and scientific review of these reports were also completed.

A minimum of special regulations and military requirements was placed on scientific personnel who were to board Navy ships for the test. Under this policy, immunization requirements for embarkation were waived.

Invitational travel orders were prepared and furnished all participating personnel of non-DOD agencies. DOD agencies originated travel orders for their civilian and military personnel.

At the request of CTG 7.3, the Bureau of Naval Personnel issued orders stabilizing personnel of all Navy ships and units assigned to Operation WIGWAM, commencing 1 March 1955. This stabilization was terminated on 25 May 1955, when the completion of the operation could be accurately foreseen.

Preparations for the movement of the task group headquarters to San Diego were essentially completed on 1 April, concurrent with the commencement of the operational phase. Staff personnel were divided into two groups. One group, with the task group files, proceeded via Fleet Logistic Air Wing aircraft from NAS, Patuxent River, Md., on 5 April. The other group departed the same day via MATS. Both of these flights terminated at NAS, Moffett Field, Calif. Staff members with priority business continued to San Diego the same day, and the remaining members, with the task group files, completed the trip the following day. On 6 April, CTG 7.3 established his headquarters at SPU.

PAMI, Air Force, U. S. Pacific Fleet, made listings of all civilian and military personnel participating in Operation WIGWAM. This included scientific personnel, staff personnel, and official observers, totaling 752 individuals. These listings were prepared to provide each ship with personnel lists for embarkation, for musters of personnel on board at 1800 on D−1 day, and for the preshot musters of personnel on board at H−4 hr.

Emergency leave cases involving 1 officer and 10 enlisted men occurred while at sea during the operation. The officer and eight of the enlisted men were transferred to the USS Hubbard on 14 May; one of the remaining enlisted men was transferred to the USS Cimarron on 15 May, and the other was transferred to the USS Small on 16 May for return to port.

During Operation WIGWAM two personnel casualties were reported, both of a minor nature. One man from the YFNB-12 suffered a lacerated hand on 11 May and was delivered to the USS Mt. McKinley by helicopter for treatment. The other casualty, consisting of a lacerated ear, occurred on 12 May to a man on the LST-975. He was transferred by helicopter to the USS Curtiss for treatment.

9.2 COMMENTS AND RECOMMENDATIONS

None.