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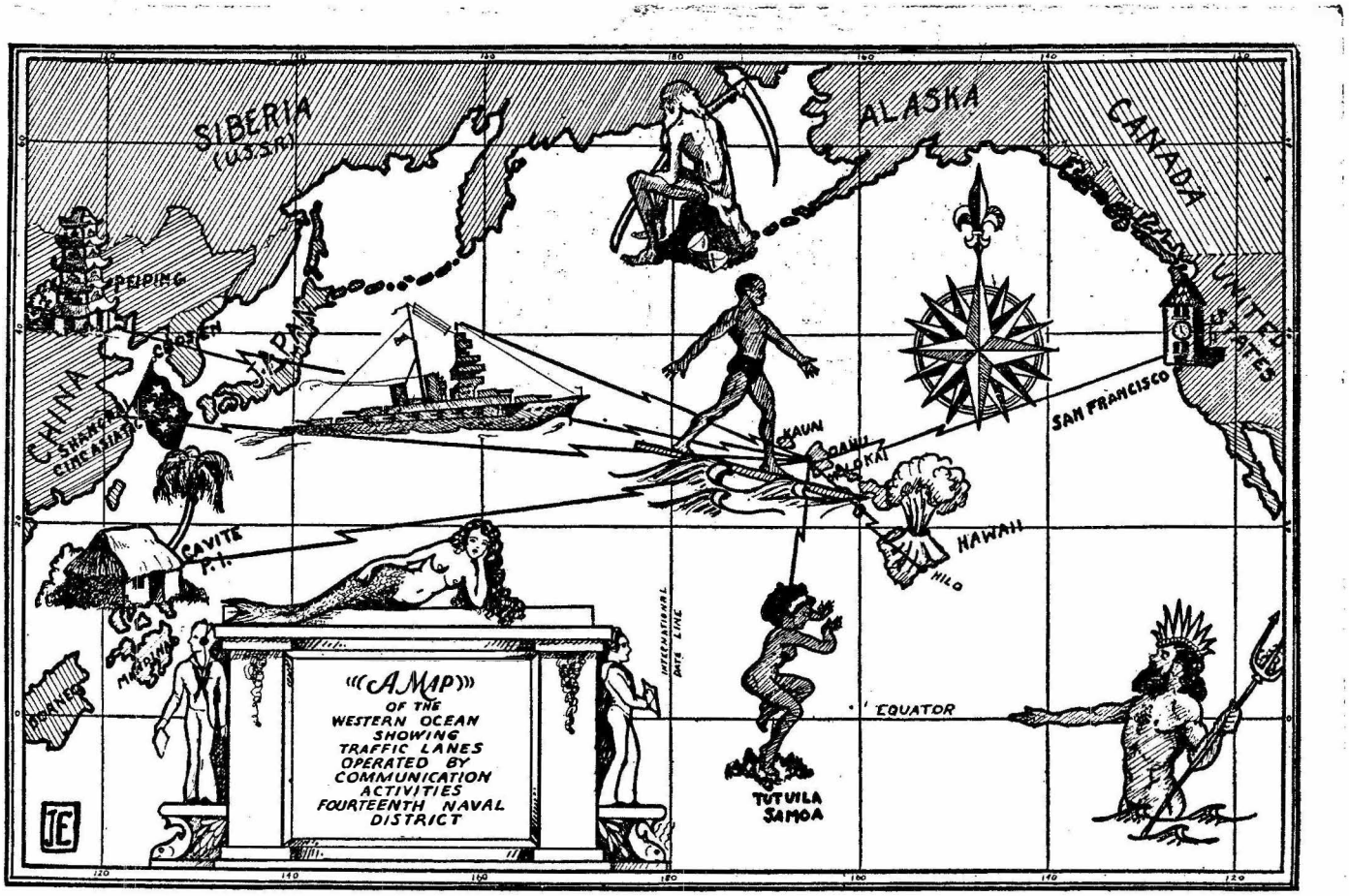
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Early Radio Communications in the Fourteenth Naval District Pearl Harbor, Territory of Hawaii (Revised 1985)

Collected, assembled and prepared for the OLD TIMER COMMUNICATORS

by George B. Todd, LT USN RET

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Navy Library, Washington Navy Yard, Washington, D. C.

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CONTENTS

BACKGROUND HISTORY

The first foothold on territory in the Hawaiian Islands by the United States resulted from the lease of land for a coaling station at Honolulu in 1860.

In 1866, the USS LACKAWANNA surveyed the islands and reefs northwest of the Hawaiian Islands toward Japan. It was as a result of these surveys that the United States established its claim to Midway.

In 1887 the U. S. Senate modified an original reciprocity treaty with Hawaii providing for an extension of the treaty, after adding an amendment providing that "His Majesty the King of the Hawaiian Islands grants to the Government of the United States the exclusive right to enter the harbor of Pearl River, in the island of Oahu, and to establish and maintain there a coaling and repair station."

Annexation of the Hawaiian Islands by the United States was approved on 6 July 1898 and on 12 August 1898 the U. S. flag was run up over the palace. The Hawaiian Islands became the Territory of Hawaii in 1899. Commander J. F. Merry, USN, became the Naval representative in Hawaii.

From 1901 to 1908 the Navy devoted its time to improving the facilities of the 85 acres that constituted the naval reservation in Honolulu. Under the Appropriation Act of 3 March 1901 this tract of land was improved with the erection of additional sheds and housing.

Under the above Appropriation Act, Congress approved the acquisition of lands for the development of a naval station at Pearl Harbor.

Until the transfer of the Naval Station to Pearl Harbor in 1913, the naval reservation in Honolulu remained nothing more than a rather elaborate coaling station.

On 14 August 1916 the Hawaiian Islands were established as the Fourteenth Naval District. The first Commandant was Captain G. R. Clark.

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EARLY RADIO COMMUNICATIONS

The Marconi Wireless Company of America was incorporated on 22 November 1899 with sole rights to exploit Marconi patents in the United States, its possessions, and Cuba, except a newly established Hawaiian Interisland system which was retained by the British Marconi Company. Commercial wireless service was established between the main Hawaiian Islands in March 1901. (This system was later acquired by the Mutual Telephone and Telegraph Company of Hawaii).

On 22 November 1904 there were 15 U. S. Navy radio stations, fully manned and ready to receive messages at all hours, with nine more expected to be in operation within a few weeks. The latter included stations in the Canal Zone and at Cavite, in the Philippine Islands. Neither list included a station in Hawaii. The Bureau of equipment had plans to erect stations in insular possessions at a later date.

The Navy Radio Station in Honolulu was functioning by the end of 1905 and had established a record for sending messages to a distance of 140 miles and receiving at 225 miles. By 1907 this record had been increased to 250 miles and 260 miles respectively.

The Navy had purchased 47 Slaby-Arco equipments from the Telefunken Company of Germany and 10 of other manufacture. The installation at Honolulu was probably of

the Slaby-Arco type. The original German equipments were very crude with little provision for changing the transmitter frequency. In most cases the emitted frequency was governed by the natural period of the antenna.

By the end of 1906, the Navy had purchased and installed equipments from many companies. About half were of German manufacture. The original transmitters had been modified to give a 500 cycle note instead of the original 50 cycle note, by increasing the number of segments in the mercury turbine interrupter. This improvement was a result of experiments conducted by a Navy operator named Woberton.

Navy installations operated in a band close to 750 kHz (400 meters). There was much unintentional interference between naval, commercial and amateur stations. No attempt was made to use several different frequencies. The wideband transmissions of the old spark apparatus emitted at least one additional wideband frequency almost equal in intensity to the primary and their combined emissions covered most of the spectrum in use. Control of the air was usually pre-empted by stations with high power and large antenna systems. Their transmissions carried through to their limited range by drowning out all others in the vicinity. No efforts were made to limit the power used to that required for the distance involved.

The Navy tried to exercise some discipline in radio communications by issue of a special Notice to Mariners No. 472 issued 22 November 1904. Quoting from a part of that notice: "A vessel wishing to communicate with a station and having ascertained by "listening in" that she is not interfering with messages being exchanged within her range, should make the call letters of the station at a distance not greater than 75 miles from it. The call should not be continuous, but should be at intervals of about three minutes in order to give the station a chance to answer..... Then the vessel begins to send messages, stopping at the end of each 50 words and waiting until the station signals O. K. and go ahead....."

Gradual improvement in receivers was being made. Crystal detectors came into general use replacing electrolytic detectors and coherers. Pickard of Wireless Specialty Apparatus Company, developed the IP76 crystal-detector receivers. Large quantities of these receivers were purchased to replace the obsolescent original equipments. The crystal detector was improved within a few months by B. F. Meissner, a Naval radio electrician's mate, by the addition of the popularly named "cat whisker," a fine metal point making contact with the crystal.

Max Wein of the Telefunken Company developed a quenched-gap transmitter. The discharges from these gaps enabled the sparks to follow each other so regularly that a musical tone was emitted instead of the sharp staccato sound of the open spark. Transmission ranges were increased by a reduction in the damping effect. The transmitter tone could be adjusted so that one signal could be distinguished from another. In 1911 the Navy purchased several of these transmitters. They came into use rapidly as a modification to existing transmitters. Except for the Poulsen arc, this company would have become the Navy's sole source for the procurement of transmitters following 1912.

In 1912 the Navy was directed to use the term "radio" in lieu of "wireless." Naval radio stations were opened to commercial traffic in all areas where commercial radio facilities were non-existent or inadequate.

On 13 September 1912 the Office of Superintendent, Naval Radio Service, was organized. Shore stations were divided by geographical considerations into three areas, Atlantic, Pacific and Philippines, each with a Superintendent. Initially the title in the Pacific was Pacific Coast Communications Superintendent, later changed to Pacific Communications Superintendent (P.C.S) and finally to Pacific Communications Officer (P.C.O.) Captain E. H. Dodd was the first Pacific Superintendent.

In 1908 Poulsen of Denmark developed an arc transmitter. The Navy purchased two of these equipments, conducted experiments with the arc transmitter and the "tikker" receiver and recommended against their use because of the inadequacy of the receiver. This delayed the Navy's adoption of continuous wave transmissions for approximately four years.

Discovery of the heterodyne method of receiving continuous wave signals provided a vastly improved system for receiving the undamped arc signals. This was made possible by the development of the three element vacuum tube by De Forest.

The Washington Navy Yard designed the Navy types A, B and C receivers using the De Forest vacuum tube. These were completed in early 1915 and placed in production the same year. The Cohen method was used. This consisted of a modified type of feedback circuit to produce oscillations. To avoid use of the term "feedback," it was termed a "tickler" because it tickles the audion and "makes it quiver."

These receivers were placed in service at the shore stations and on the more important combatant ships as fast as they could be manufactured. However, economy dictated the continued use of the crystal detector, and the heterodyne feature was used only for reception of continuous wave signals.

In July of 1911 the Federal Telegraph Company of California was incorporated. It owned the U. S. rights to the Poulsen arc transmitter patents. In 1912 this company established a circuit between San Francisco and Honolulu using 30 kw arc transmitters and the "tikker" receivers. The circuit was satisfactory during darkness and contracts were obtained with the Honolulu papers for daily transmission of news. Later use of the improved heterodyne receivers provided twentyfour hour communications.

By 1915 the transmitters at all of our shore stations had been equipped with either Telefunken, Chaffee or Lowenstein quenched-gap or Fessenden rotary-gap spark transmitters. These improvements made it possible to transmit simultaneously on several frequencies in the same area provided transmitter power was kept sufficiently low. Many of the transmitters had "jury-rig" frequency changers.

The Navy had purchased a 30 kw arc transmitter that had been installed at Arlington, Virginia. Tests demonstrated effective transmissions of over 1000 miles. Plans had previously been evolved for a system of high-powered stations which would cover all necessary ocean areas and which would be inter-communicable and supported by the existent low-powered shore stations as a secondary system. The successful tests at Arlington convinced the Navy that high-powered arc transmitters should be used for the ocean chain.

An Act of Congress dated 22 August 1912 contained this provision: "Toward the purchase and preparation of necessary sites, purchase and erection of towers and buildings, and the purchase and installation of machinery and apparatus of high-power radio stations (cost not to exceed one million dollars), to be located as follows: One in the Isthmian Canal Zone, one on the California coast, one in the Hawaiian Islands, one in American Samoa, one in the Island of Guam, and one in the Philippine Islands, four hundred thousand dollars to be available until expended." In later legislation and prior to completion of all high-powered stations listed, the authorization of one million dollars was increased to $1,500,000.

Construction of the station at Darien, Canal Zone, was begun in 1913 and placed in commission on 1 July 1915. The 100 kw arc immediately provided a signal easily received at Arlington. The "tikker" receivers were supplemented by the Navy designed heterodyne receivers. The successful operation of the Darien transmitter with its increased range made possible a change of plans.

It was decided to equip Pearl Harbor and Cavite with 350 kw transmitters capable of communication with each other, thereby eliminating the requirement of relaying through Guam or Samoa. At those locations 30 kw equipments would be installed in the existent buildings and the antennas would be improved to provide sufficient radiation. The Federal Telegraph Company had refused to guarantee the 100 kw arc for Darien. When asked to construct the 200 kw for San Diego and the two 350 kw for Pearl Harbor and Cavite, they were horrified and again the Bureau had to gamble that they would be successful. The contract for these was signed on 21 February 1916.

The San Diego station was the first to be completed. Although it did not go into commission until May 1917, the official trials commenced on 26 January when Lt. S. C. Hooper, USN, sent the first message to Arlington using a silver key especially prepared for the occasion.

Meanwhile, construction of the stations at Pearl Harbor and Cavite was proceeding. The war caused delays in the fabrication of the towers and those for Cavite were further delayed by the British seizure of the ship carrying them. The towers were finally released after prolonged diplomatic negotiations. The acceptance tests for the Pearl Harbor transmitter were completed on 4 October 1917, but owing to defects developing in the arc chamber, the final acceptance was not approved until 6 March 1918 and turned over to the Communication Service on that date. The Cavite transmitter was placed in commission on 19 December 1917.

Construction of the transpacific chain had necessitated overcoming many obstacles and the taking of numerous calculated risks. NRL radio engineers had claimed that the antenna voltages would be more than the existing insulators could withstand and that the corona would prevent efficient radiation. When the Federal Telegraph Company submitted a plan requiring chains of interlocking porcelain insulators, each approximately 15 feet long and at a total cost almost equal to that of the transmitter, Lt. Hooper asked the Locke Insulator Company to design a practical strain insulator for the purpose. To the great credit of the company, they developed a practical insulator with metal corona shields which could be installed on the wings of the towers.

The day after the President signed a resolution declaring the existence of a state of war with Germany (7 April 1917), all amateur and commercial radio stations were either closed or taken over by the Navy.

The following is an account of all of the radio stations in the 14th Naval District which were controlled by the Navy during World War I, taken from the 1917, 1918 and 1919 annual reports of the Pacific Coast Communication Superintendent:

U. S. Naval Radio Station, Pearl Harbor (NPM):

Located at Navy Yard, Pearl Harbor, Oahu, Territory of Hawaii. Equipped with one 350 kw arc set adjusted to the following waves: 6100, 8100, 11200 and 14100. These waves are used for both calling and working; and one 5 kw 500 cycle quenched spark set adjusted for the following waves: 300, 600 (commercial), 752, 952 (calling and working), 1900 and 2400 (working) meters.

At present (1918) this station is operated by distant control from Koko Head. Inasmuch as Koko Head will soon revert to the Marconi Company, a new control station must be obtained. Effort is being made to obtain a site as free from interference from the several transmitting stations as possible. Exploration work is now in progress. It is probable that a site on Waialae Bay, between Honolulu and Koko Head (where NPM control was later located at Wailupe), or in Honolulu, will be chosen - at least for temporary control.

Radio Communications. Arc set: Communication is effective with San Diego, San Francisco, Cavite, Funibashi, Japan and Tutuila, American Samoa. Regular daily schedules are maintained with all these stations. Communication with Darien, Canal Zone is practicable but no schedule has been established. This can be done if necessary. Can also communicate with ships equipped with arc sets when required, dependent on their range.

Spark set: Communication is effective with Kawaihae (KHN), Lahaina (KHL), Kaunakakai (KHO) and Lihue (KHM) in the Hawaiian Islands. Cannot be satisfactorily effected with Wahiawa (KHK) spark set. Also effective with ships equipped with spark sets dependent on their range.

A master clock, chronometer, time ball and other equipment necessary for transmitting time signals by radio are now being installed at Pearl Harbor and, when completed, time will be broadcast at least twice daily on both spark and arc sets. Time of broadcasting and wave lengths used will be determined later.

Telegraph connections: One arc control, one spark control, one communication wire and one telephone circuit that can be used as a control or communication wire. These circuits all come in to a plug board at the Naval Communication Office, Honolulu, and can there be cut over to any other station of the system, which is very flexible.

Comment. This station is a superprimary, primary and coastal station and is the headquarters for the District Communication Superintendent of the Pearl Harbor District. Pearl Harbor now handles practically all the long distance commercial radio work of the district, as it has taken over the Marconi and Federal business with the Pacific Coast, the Marconi business with Japan, and handles the new commercial business with Guam and Cavite. Some of this load will soon be taken over by the new arc at Heeia. The greater part of it will revert to the commercial companies when their stations are returned to them.

The military value of this station is of the greatest importance, offering direct radio communication with the United States, Guam and the Philippines, supplementing the cable, and affording the only direct communication with Tutuila. It would also be of primary importance in broadcasting messages to the Fleet in the Pacific.

U. S. Naval Radio Station, Heeia Point (KHX):

Located at Heeia Point, Oahu, Territory of Hawaii. The original Federal arc was dismantled and shipped to Vladivostok 7 December 1918. In its place was installed a makeshift 25 kw arc set, principally useful for ship work. Very recently a modern 100 kw arc set has arrived and has just been installed temporarily to relieve the trans-Pacific congestion. The new helix and keys have not arrived, so full power cannot be obtained. Permanent installation, calibration and acceptance tests await their arrival and opportunity.

Radio Communications: Only transpacific traffic is handled between this station and the South San Francisco station. Also communicates with ships equipped with arc apparatus enroute from Honolulu to the United States, or to Samoa, New Zealand and Australia. Can communicate with San Diego and San Francisco. Will be able to communicate with the new arc stations at Tutuila and Guam. This station is operated by distant control from Koko Head.

Telegraph connections: Two circuits to Koko Head via Honolulu.

Comment: This station was taken over by the Navy on 6 April 1917 and has since been operated by the Naval Communication Service. It was opened to commercial traffic on 10 April 1917. This station was acquired by the Government by purchase and all properties were transferred to the Government as of 15 May 1918.

U. S. Naval Radio Station, Kahuku (KIE): (Formerly operated as a Marconi Station):

Located at Kahuku, Oahu, Territory of Hawaii. Equipped with a high power spark transmitter. (Power not known. One source states it had a 100 kw rotary-gap spark transmitter. The transmitter at Bolinas was 300 kw spark transmitter. Kahuku probably had a similar transmitter as that station communicated with both Bolinas and Funibashi).

Radio Communications: Only transpacific traffic is handled between this station and Bolinas, California, and Funibashi, Japan; also communicates with San Diego.

Telegraph connections: One circuit to Honolulu. Two more available if required.

Comment: This station was taken over by the Navy on 6 April 1917 and has since been operated by the Naval Communication Service. It was opened to commercial traffic on 10 April 1917.

This station creates considerable interference between 4000 and 8000 meters for considerable distances, reaching its maximum in the vicinity of Hawaii.

This station should be closed as soon as efficient and satisfactory means are available for handling its traffic. The establishment of Pearl Harbor - San Diego and Pearl Harbor - Funibashi circuits may offer this solution.

This station has no military value, except if it were required to create interference in time of war with enemy ships or stations. For this purpose, its purchase and retention by the Navy is recommended, as well as for the purpose of lessening interference, by closing the station. If retained by the government, preparations should be made for its operation by distant control as noted in this report under Pearl Harbor.

This station was closed 25 February 1918 and returned to the owners 20 March 1918.

U. S. Naval Radio Station, Koko Head (KHJ):
(Owned by the Marconi Wireless Telegraph Company, but never operated by that company).

Located at Koko Head, Oahu, Territory of Hawaii. Equipped for receiving and distant control only.

Radio Communications: The station is used for distant control of the Pearl Harbor (both arc and spark sets) and the Heeia transmitting stations. Receives from San Diego, San Francisco, Tutuila, Guam, Cavite, Funibashi, Japan, and ships equipped with arc or spark sets, dependent on their range.

Telegraph connections: Two circuits to Heeia Point via Honolulu; two circuits to Honolulu; two circuits to Pearl Harbor; three extra circuits available.

Comment: This station was taken over by the Navy on 3 January 1918, and has since been operated by the Naval Communication Service. It handles Government and commercial traffic to points mentioned above. Handles commercial traffic for ships equipped with radio apparatus. It is believed that a better distant control site can be found on the Island of Oahu than the one at Koko Head. The latter has the following disadvantages: interference from Heeia; relative inaccessibility; must be self-supporting as regards light, power and water. It is not recommended for purchase for distant control purposes. It is expected to return to the Marconi Company at an early date. Exploration work for more suitable distant control site is in progress.

(Ed Note: During the period from 6 April 1917 until this station was taken over by the Navy on 3 January 1918, the Kahuku and Heeia transmitters were probably controlled from the Marconi and Federal Telegraph offices in Honolulu).

U. S. Naval Radio Station, Wahiawa (KHK):
(formerly operated by the Mutual Telephone Company)

Located at Wahiawa, Oahu, Territory of Hawaii. Equipped with one 10 kw 60 cycle spark set and one 2 kw 600 cycle spark set, working on 600 meters. Communicates with the other four Hawaiian Islands stations and, at night only, with Tutuila and Apia, Samoa, and via Apia with Suva and Papeete, and with ships equipped with spark apparatus, dependent on their range. Cannot be satisfactorily effected with Pearl Harbor spark set. Broadcasts press news about 500 words at 11:30 pm daily on 600 meters.

This station was taken over and closed by the Navy on 6 April, 1917. It was opened on 10 April 1917 and has since been operated by the Naval Communication Service for handling commercial stations and ships as noted above. This station is of military value as a standby in case of failure of the 5 kw set at Pearl Harbor. Its purchase and retention by the Navy is recommended for this purpose and also in line with the policy of Government control of all shore radio stations. If retained by the Government and a more efficient spark set is installed at Pearl Harbor, it is recommended that the Pearl Harbor spark be operated by distant control from Wahiawa and the present equipment at Wahiawa be maintained for emergency purposes in case of an accident to the Pearl Harbor set.

(Ed Note: This station was originally located at Kahuku where Mr. Arthur A. Isbell, who retired as a Lt. Comdr. USNR, installed the 10 kw spark transmitter in 1908. He used it to establish the first radio communication between Hawaii and the mainland. The station was moved to Wahiawa in 1913 to get away from the intolerable interference created by the new point to point Marconi high powered spark transmitter that was installed at Kahuku that year).

As authority for the purchase of the Mutual Telephone Company's inter-island radio stations was not obtained from Congress, the Wahiawa station will revert to its owners upon signing of the peace treaty.

U. S. Naval Radio Station, Kawaihae, Island of Hawaii (KHN), 2 kw 60 cycle spark set.
U. S. Naval Radio Station, Lahaina, Island of Maui (KHL), 2 kw 60 cycle spark set.
U. S. Naval Radio Station, Kaunakakai, Island of Molokai (KHO), ½ kw 60 cycle spark set.
U. S. Naval Radio Station, Lihue, Island of Kauai (KHM), 2 kw 60 cycle spark set.
(all formerly operated by the Mutual Telephone Company)

Communication on 600 meters is effective with each other, with the Wahiawa station and with ships equipped with spark sets, dependent on their range. Can be effected with the Pearl Harbor spark set.

These stations were taken over by the Navy on 8 April 1917. They were opened on 19 April, 17 May, 14 June and 18 April, respectively, and have since been operated by the Naval Communication Service for handling commercial traffic as noted above. They are of military importance for inter-island communication with patrol and observation stations and small craft operating in their vicinity. Their purchase and retention by the Navy is recommended for this purpose and in line with the general policy of Government control of all shore radio stations.

As authority for the purchase of the Mutual Telephone Company's inter-island radio stations was not obtained from Congress, these stations will revert to their owners upon signing of the peace treaty.

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U. S. Army Radio Stations, Pearl Harbor District:

The Fort De Russy station has been closed by Army authorities and traffic formerly handled by this station is now handled by Wahiawa. The Schofield Barracks and Fort Shafter, Honolulu, were formerly equipped with 1 kw Army Signal Corps wagon sets, but these have been removed and only the antennas remain. The above stations are or were employed exclusively in Army work, but can communicate by radio with the Naval Radio Stations on the Island of Oahu, but as the same communications can be effected by telephone, it is not believed advisable to use the radio. These stations would be of advantage to the Navy in connection with patrol and observation stations. In case of necessity they could communicate with submarines or other small craft in the vicinity, but it is believed such traffic should be handled by the Pearl Harbor spark set, or Wahiawa.

These stations were closed upon request of the Navy after the war had begun and Executive Proclamation had placed control of radio under the Secretary of the Navy. The Army may wish to reopen them after the present emergency is over, but it is hoped for the good of communication on the islands, that this can be prevented, as it would cause additional interference.

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Commercial Radio Stations, Pearl Harbor District:

The commercial stations in the Pearl Harbor Communication District are now all under the control of the Navy, with the exception of Kahuku. The latter has been returned to the Marconi Company and is being made ready for operation when the restrictions are removed. Koko Head and the Mutual stations will revert to their owners shortly after the signing of the peace treaty. The Mutual stations will continue operation under commercial management without interruption. Whether the Marconi Company will utilize Koko Head is unknown.

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Naval Station, Pearl Harbor:

The Commandant's communication office is located in the Administration Building at the Navy Yard, Pearl Harbor, close to the office of the District Commandant. It is a telegraph and coding office, and confidential publication issuing office.

Because the high-power arc transmitter is located so near the Administration Building, it has been impracticable to locate the distant control station there. To connect "Operations" with "Communications" a separate communication office was necessary in the Administration Building, which is under the charge of the Commandant's Aide who is an assistant to the District Communication Superintendent for communications.

In the near future, upon reorganization of the District and the giving up of the commercial radio stations and traffic, the office of the District Communication Superintendent will be moved to the Administration Building, and the District Communication Superintendent will take direct charge of the communication office there.

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Naval Communication Office, Honolulu:

The Naval Communication Office, Honolulu, is located in the center of the business district. It is only a telegraph office and primarily the center of local commercial traffic. Adjacent to it are the offices of the District Communication Superintendent, and Communications Accounting Officer and, until recently, the Naval Censor.

At times, upper stories of the building have been used as a listening station and for control of the Pearl Harbor spark set. This office has been very necessary while commercial stations have been controlled by the Navy and commercial traffic handled. It has really combined the town offices of the Inter-island, Marconi and Federal Telegraph companies.

Owing to the touch which must be maintained with the commercial interests, and its central geographical position respecting the other important communication centers on the island, it has logically been the office of the District Communication Superintendent. Later, the latter can and should be moved to the Administration Building, Naval Station, Pearl Harbor, but as long as commercial traffic is maintained, at least a small down-town office will be required for receipt and delivery of local business.

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U. S. Naval Radio Station, Tutuila, American Samoa, (NPU):
(Pearl Harbor Communication District)

Located on the island of Tutuila, American Samoa. Equipped with a 5 kw composite spark set adjusted to the following wave lengths: 600, 756 (working) and 952 (calling) meters. Also with a 30 kw arc set adjusted to the following wave lengths: 4000 (calling) 3000, 5000, 6000 and 8500 (working) meters.

Radio Communications: Arc set: Is effective with Pearl Harbor, Heeia Point, Guam (new arc set), Papeete and probably effective with San Diego and Darien, Canal Zone and with ships equipped with arc apparatus, depending on their range. It is probable this set will work with arc stations in New Zealand and Australia. Spark set: Now effective with Wahiawa (night only), Suva (night only), and Apia, British Samoa. Also communicates with ships equipped with spark sets, dependent on their range.

Comment: This station handles commercial traffic. It is of military value in furnishing the only outside communication of the Naval Station and for communicating with ships of the Fleet in the Pacific. The present spark set is old and in great part makeshift. There is a semi-highpowered radio station in Apia that works regularly with Suva and Awanui, New Zealand. The Apia station contains two 500 cycle quenched spark sets, one 50 kw and one 10 kw. The apparatus is Telefunken and is practically the same as that in use in the U. S. Navy. The antennas are of the umbrella type and are supported by one guyed steel mast 400 feet high. Apia communication is now successful with Wahiawa.

There is a ½ kw field set in the Manua group, American Samoa, used to communicate between Ofu and Tau and with Tutuila. This set is for administrative purposes only and is not open to commercial business. It is operated by hand.

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U. S. Naval Radio Station, Guam, Marianas Islands (NPN):

NOTE: This station belongs to the Philippine Division, but as its communications are an important factor in the service of the Pearl Harbor Communication District, its report is contained in that district. It is believed this station should be placed in the Pearl Harbor District, as the Guam Naval Station is under the Commandant of the 14th Naval District and the detailing of personnel for the Guam Radio Station is under the Pacific Coast Communication Superintendent.

Located at Guam, Marianas Islands. Equipped with a 30 kw arc set adjusted to the following wave lengths: 5100, 6240, 7000 and 3000 meters. It is also equipped with a 3 kw 60 cycle composite spark set, working on 600 and 1800 meters.

Radio Communication: Arc set: Is effective with Pearl Harbor, Russian Island, Cavite and ships equipped arc apparatus, dependent on their range. Also with Japanese stations. Spark set: With ships equipped with spark sets, within range of 300 miles, depending on the ship's range.

Comment: This station is authorized to handle commercial traffic. It is of military value in furnishing communication for the Naval Station, supplementing the cable, and for communicating with vessels of the Fleet in the Pacific.

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U. S. Naval Radio Station, Russian Island (NPH):

Located on Russian Island, Siberia (Vladivostok). Equipped with a 60 kw arc set and a 12 kw arc set. At the present time no permanent wave lengths have been assigned.

Radio Communication: Tests are being made to establish schedules for this station. At the present time communication is effective with Peking, Cavite, Guam and with ships within range of the station. Can communicate with St. Paul and Cordova, Alaska. Signals are very weak from those stations, but it is expected to establish effective communications in the near future.

Recommendations have been made to lay a cable from the station to Vladivostok, a distance of about fifteen miles, for both telephone and telegraph service. It is expected that this cable will be laid by winter (1919). The Vladivostok end will be at the headquarters of the American Expeditionary Forces, with a loop to a U. S. ship in port. Telephone communications may be had at the Russian Island Red Cross Hospital, about one mile from the station, which connects to Vladivostok by cable.

Comment: This station will probably handle commercial traffic as well as Government traffic. It is of military value in furnishing communication to and from the American Expeditionary Forces in Siberia, and for communicating with vessels of the Fleet in Chinese and Japanese waters.

This station was taken over from the Russian Government, and was equipped with apparatus furnished by the Navy Yard Mare Island, and equipment taken from the Heeia Point Station, Honolulu, and was commissioned about 30 May 1919.

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End of excerpts from the 1917, 1918 and 1919 annual reports of the Pacific Coast Communication Superintendent.

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In 1919 a location for a remote receiving and control station was chosen at Wailupe, Oahu, about seven miles east of Honolulu, close to the Marconi station at Koko Head. Harold B. Phelps, LT USN RET, was stationed at Wailupe from 1919 until 1922. His story of the establishment of the Wailupe station was published in the Naval Communication Station, Honolulu, "Trade Winds" issue of 25 June 1970. A portion of that story is quoted:

"When we entered World War I, the Navy simply moved a recruiting crew to the commercial stations and signed up the entire crew in various ratings in the Naval Reserve, put uniforms on them, and continued to utilize their communication skills under Navy supervision.

The temporary station at Wailupe was probably built around the first part of 1919 and NPM moved there to allow the Kahuku and Koko Head stations to be remodeled. Almost the entire crew of operators at Koko Head was sent to Wailupe as USNR, supplemented by such regular Navy radiomen available. In those days not too many Navy operators had experience in handling commercial traffic.

The Navy purchased a piece of land at Wailupe for the temporary station and it was very temporary as plans were in the making for a permanent station at Wailupe. There were three booths, more like chicken coops, scattered on the beach. Each booth, of crude construction, had room for two circuits. The roofs leaked and some of the operators had to sit under an umbrella suspended from the ceiling to keep water off the equipment. Or we would search around the yard for a scrap of tarpaper or some boards to lead the water off the operating position. There were no signals piped in. Receiving antennas were strung between trees and poles. All control wires were very haywire, no soldered connections and very few even taped, which brought on intermittent wire trouble, rain or shine.

There was an old house on the land. It was one big room, no doors, windows or screens. This housed the office, file rooms, ship to shore circuit and the landwire to the Honolulu city office (HU) and the office in Pearl Harbor (PH). Anyone working in this house after dusk had to put rubber bands around the bottom of their trousers and have several sticks of mosquito punk under their chair to be able to stay there. If they forgot to bring their punk or couldn't find someone else's cache they would stuff an old rag in a can and light it off. Anything was better than those mosquitoes.

We stood a three section watch, seven days a week, no rotation of watches, no days off. Straight 8 on and 16 off, and that's the way it was at the start of NPM at Wailupe as a Government and commercial traffic station.

When I went there in August of 1919, NPM had schedules with NPL (San Diego), NPU (Tutuila, Samoa), NPN (Guam), and NPO (Cavite). There was no direct daylight communication with NPO or JJC (Japan). NPO broadcast to NPM at midnight. NPU broadcast to NPM at 2 a.m. and NPM broadcast to NPU at 9 a.m. None of those circuits were reliable at all times due to static and fading periods. We just kept the traffic moving as best we could, all by hand, on low frequencies. Practically all traffic for Cavite and the Asiatic Fleet was relayed through NPN.

The Navy had been searching around for a piece of land for the permanent station and finally had found some school land that was suitable, for which they traded the temporary site, and started construction of the permanent buildings. The new site also gave room for expansion up the hill in back of the reservation.

The station was completed early in 1921. It was built over the water to provide more land space for the proposed D.C.O.'s quarters, two duplex CPO quarters, and the single men's barracks. These were completed late in '21 or early in '22.

About that time, the D.C.O, Lt. Comdr. C. N. Ingraham, and the Chief in Charge of the Wailupe station, made a tour of the outer islands to locate a suitable site for a compass station. They finally decided on Hilo, on the island of Hawaii, where NPH was built."

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The U. S. Government's appropriation of the commercial shore stations at the start of WWI necessitated paying rightful compensation to their owners. Early in 1918, the U. S. Shipping Board requested the Navy to purchase all radio equipment on vessels owned or operated by them. The Marconi Company was unwilling to sell those installations unless the coastal stations were included. The Navy purchased, on 1 November 1918, at a cost of $798,000, the low-powered stations which had been taken over from the Marconi Company, plus the high-powered stations at Ketchikan and Juneau, Alaska, and Astoria, Washington. This did not include the high-powered stations used by Marconi on the transpacific and transatlantic circuits. The parent company, British Marconi, intended to resume operations as soon as possible after the war ended, and was making plans to utilize continuous wave equipment. They had already negotiated for the exclusive use of the Alexanderson alternator, but this was held in abeyance.

It became known that they were also interested in purchase of the Federal Telegraph Company. Acquisition of Federal patents would give them control over the right to the Poulsen arc patents. To avoid complications and to obtain control of the Federal patents, the Navy, on 15 May 1918, acquired these together with three high-powered and five coastal stations for $1,600,000. This included the transmitter station at Heeia, Oahu.

As previously stated, the Marconi Company, was negotiating with General Electric for exclusive use of Alexanderson high frequency alternators. The Navy desired to keep the alternator patents under U. S. control so they delayed the return of commercial stations to their owners until a new U. S. company could be formed to acquire those patents. (The war was not technically over until the peace treaty was signed by the President on 2 July 1921).

On 17 October 1919, the Radio Corporation of America was formed and came into possession of the American Marconi patents, high-powered stations, and other contracts and assets of the company. Soon after that RCA installed Alexanderson alternators at Bolinas, California and at Kahuku, in Hawaii.

The President on 11 July 1919, approved the return of the radio stations to their owners to be effective on 1 March 1920. Since the government owned most of the coastal stations, legislation was required to permit use of those stations for commercial purposes at locations where proper facilities were not provided by private interests. Congress on 5 June 1920 authorized the use of Naval Radio Stations for a period of 2 years for handling commercial traffic. This was extended until 30 June 1925 by another resolution approved 14 April 1922. Still further extension until 30 June 1927 was granted by Public Resolution approved 28 February 1925. Prior to the last extension, the authority was made permanent by the enactment of Public Law 632, approved 23 February 1927. In 1924 the commercial companies commenced the use of higher frequencies which allowed coverage of larger ocean areas by their coastal stations, and from that time there was a gradual diminution of the assistance needed from Naval radio stations.

From the time of the armistice on 11 November 1918, until the commercial stations were returned to their owners, the Navy continued to conduct all commercial radio business of the United States in addition to providing radio service for itself and other government departments. Due to rapid demobilization, most of the shore stations were operating with about 40 percent of their complements. This condition would have been aggravated had commercial positions been available for Navy radio operators.

My first duty assignment, after graduation from the Navy Radio School, Great Lakes, Illinois in 1923, was as an "arc engineer" at the Navy High Power Radio Transmitter Station at Pearl Harbor.

That station was situated on a plot of land on the east shore of the harbor entrance channel, about half way between the Naval Hospital and the Navy Yard drydock. The transmitter building was directly under the lead-in from the massive antenna suspended from three 600 foot steel towers.

The transmitter building contained the 500 kw arc transmitter (which had been upgraded from the original 1917 350 kw installation); two huge motor-generators to supply power for the arc (one a standby); the arc helix and frequency changer; numerous keying relays around the base of the helix; oil transformers; control panels; a water cooling tower; a 5 kw quenched gap spark transmitter and a Model TD vacuum tube transmitter.

The AC motor - DC generator provided 500 DC volts to the arc converter. The arc converter consisted of a water cooled bronze chamber in which the arc burned in hydrogen gas (produced by dripping "pink lady" alcohol into the arc chamber) between a carbon electrode and a water cooled copper electrode. (We called the carbon electrode, the "cathode" and the copper electrode, the "anode"). Above and below this chamber were two series field coils surrounding and energizing the two poles of the magnetic circuit. These poles projected into the chamber, one on each side of the arc to provide a magnetic blow-out which blew the arc flame to one side. The frequency of the emitted signal was controlled by varying the antenna loading inductance by a frequency changing component.

The early high-powered arcs were crude devices compared with later standards. The means of keying them was by short circuiting some of the turns of the antenna helix or by changing the capacity of the antenna. Thus, at a time a signal was being transmitted, the antenna emitted one frequency and, at other times, another frequency called the spacing or compensating frequency.

The key first provided to operate the changes in antenna inductances or capacities was a crude device known as the "barrel key." It consisted of a wooden lever about 8 feet long pivoted to the top of a large barrel filled with water. From the end of the lever a heavy wire led down into the barrel where it could be made to contact a heavy metal plate at the bottom. This barrel key was connected across the ground and the insulated lower half of one of the antenna support towers. Messages could be transmitted by it at a rate of about eight words a minute provided a sufficient relay of operators was available for pumping the lever. In 1916 Lt. W. A. Eaton USN, devised a multi-contact key which provided one contact for each turn of the helix. This solved the keying problem insofar as manpower and speed of transmission was concerned but did not eliminate the compensating frequency.

In addition to this compensating frequency the arc also emitted numerous harmonics of both the transmitting and compensating frequencies. Additionally, its tone was quite mushy. With the reactivation of amateur activities in 1919 and the advent of broadcasting in 1921, considerable criticism was justly leveled at the Navy because of the interference they caused.

Lt. Eaton devised a satisfactory uniwave keying system to eliminate the compensating frequency by utilizing a bank of noninductive resistance units between the transmitter and the antenna, and an absorbing circuit. Radio Aid Hallborg devised a system to eliminate harmonics and reduce arc mush by coupling the arc to a rejector circuit in series with the antenna.

Neither the uniwave system nor the harmonic eliminating system had been installed in the Pearl Harbor arc transmitter while I was stationed there in 1923. There were no amateur stations in the vicinity of the Navy Yard and no radio broadcast stations in the islands until one of the Navy Yard Radio Aids constructed a crude transmitter about 1924 and commenced to broadcast phonograph records over the air. That transmitter was the forerunner of radio station KGU in Honolulu.

The arc was activated by ungrounding the antenna and connecting it to the arc chamber through the helix. The motor-generator was started and the motor brought up to optimum speed. The DC generator was then connected to the arc and the arc was "struck." This was accomplished by moving the carbon cathode towards the copper anode until they touched momentarily. The carbon rod was then backed away from the anode creating an electric arc between the two electrodes. Voltage was controlled by a variable resistor, similar to the control on an electric street car. Antenna current was kept at an optimum level by controlling the width of the gap between the two electrodes. The carbon rod was in a holder connected to a worm drive gear controlled by a hand wheel. The carbon rod was also continuously rotated by a motor so that the end of the rod would burn evenly and thus maintain the proper distance from the anode. Care had to be exercised to insure that the antenna current did not fall off when the rod had burned excessively and the gap separation increased. At times the arc operator was busy attending to one of the other transmitters and the arc antenna current would fall off enough to extinguish the arc. When that happened the magnetic circuit was broken and it was necessary to shut the entire equipment down and start over. Operators soon learned that they could put a metal bucket against the arc chamber while the arc was operating. The bucket would be held there by the magnetism. If the arc failed the bucket would fall to the floor creating a noise that would immediately alert the operator of the emergency so that he could take steps to get the transmitter back on the air. During normal operation the operator kept his eye on the antenna current meter so that type of interruption did not occur.

The fixed, water cooled, copper anode was constructed from thick walled copper tubing formed into a "U" shape and bolted to other tubing connected to the other generator terminal. The water in the tubing was led to the outside watertower for cooling, then returned to the anode and the chamber. The heat of the arc would eventually burn through the wall of the tubing of the anode so spare anodes were always kept on hand to replace the one in use. Normally replacement was done on a scheduled maintenance basis but occasionally an anode would rupture during operation, flood the chamber and extinguish the arc. This necessitated shutting down the entire operation until the chamber could be opened, cleaned out, and the anode replaced. At that time a new carbon rod was also inserted in the chamber.

As stated earlier, the arc keying system had been improved so that it could be keyed at high speed, by remote control from Wailupe. I was not aware of the frequency plan in effect at that time but I seem to recall that I had to change "wave lengths" one or two times each watch. The numbers 8000 and 12000 meters seem to ring a bell. (The Pacific Coast Communication Superintendent's annual reports confirms the wave lengths assigned to the Pearl Harbor arc transmitter as 8100 and 11200 meters).

The 5 kw quenched gap spark transmitter was keyed by Wailupe on several different frequencies for communication with ships at sea - mostly commercial ships. Frequency of the transmitter was changed by rotating a wheel on the front of the helix, cutting in or out turns of the helix. Numerous spark gaps were located on the front of the helix, cooled by an air blower. Each gap consisted of two silver discs about two or three inches in diameter, mounted opposite each other at an optimum separation, in a bolted assembly with 12 or 14 inch square metal cooling fins. Each gap assembly was inserted into one of a series of slots on the front of the transmitter. Continuity was

maintained by contact between each assembly in the series. As long as proper gap distance was maintained in each assembly, the current could jump each gap and cause the transmitter to radiate. When the silver discs became eroded enough to create excessive widening of the gap, the transmitter became inoperative. In an emergency, a gap assembly could be shorted out by inserting a large screwdriver or other flat metal object between the cooling fins until a re-built gap assembly could be exchanged for the faulty one.

An early Navy Vacuum tube transmitter, Model TD, with a frequency range of 100 to 600 kHz and a power output of 1500 watts, was used for communication with the Navy station at Hilo and with Navy and commercial ships equipped to receive CW signals.

Communication between the station at Pearl Harbor and Wailupe was by Morse code sounder over an Army landline. Transmitters were also keyed by Wailupe over Army landlines.

The Navy followed tradition, even on shore radio stations. We were required to make daily 8 o'clock reports to the District Communication Officer, Lt. Comdr. Frank Loftin at Wailupe. At 2000 each evening, the Chief Radioman in Charge, Nathan Adler, would bring to the transmitter building a message to be transmitted to Wailupe: "PM v HP - PQM SAT 2000." (Personnel, Operation, Material, Satisfactory).

The station had a single men's barracks and two duplex quarters for Chief Petty Officers. There was a boat dock on the harbor shore opposite Ford Island where we kept the station sail boat for recreation trips in the harbor. That boat dock was located on what has been referred to in many publications as "Hospital Point."

There was a small building about a hundred yards from the transmitter building which contained a chronometer connected to an electric keying circuit. This was used to transmit time signals over the arc transmitter at specified times each day. That was another of the duties of the "arc engineer" during his watch. However he had to be relieved in the transmitter building while he performed this task. The chronometer was corrected each day by the Chief Radioman in Charge from time signals received from the San Diego transmitter.

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In the fall of 1923, I was transferred to the Naval Radio Receiving and Control Station at Wailupe. There was a shortage of high speed operators at that time.

The permanent buildings at Wailupe had been completed only two years earlier. As described by Mr. Phelps, the operating building was located over water on the shore of the bay. (Waialae Bay extends from Diamond Head to Koko Head). It was a rectangular, one story building on pilings in the water. The building was divided into compartments or booths, seven on each side separated by a hallway extending the full length of the building. The front of the building contained the wireroom and the Traffic Chief's booth on the left; the office of the District Communication Officer, Lt. Comdr. Frank Loftin, and the office of the Chief Radioman in Charge, D. A. Chauncey, on the right.

The wireroom had Morse code landline circuits to the Old Naval Station in Honolulu (HU) for transmission of commercial, other government department traffic and press news despatches for the Honolulu newspapers; and a circuit to the Communication Office in the Pearl Harbor Navy Yard (AD). All message traffic was processed through the Traffic Chief's booth for circuit routing and filing.

Despite improvement in equipment, reception was still difficult at times due to static, weak and fading signals. Separate booths were provided for operators on each

circuit to minimize the additional distractions from outside noises.

Prior to and during WWI, receiving equipment had been vastly improved. The Navy had designed the Models A, B and C receivers and later the SE 143, SE 1420, SE 1530, SE 1899 and others, and separate units such as the acceptor-rejector and the ultra-audion. I found all of these types in use at Wailupe. The Baldwin type headphones were standard, with their hard bakelite earpieces which could be adjusted to the ear by sliding the earpiece up and down on metal rods attached to the canvas covered headpiece.

I was first assigned to the wireroom because of my landline experience at Pearl Harbor. Later I had opportunities to sample each of the other circuits: the ship-shore circuit where we worked the Navy and commercial ships using the spark and tube transmitters at HP. I especially remember the Matson line ships WMN, WMO and WMP.

Then I was given an opportunity to pound out traffic to NPN (Guam). (The Navy had originally planned that Pearl Harbor and Cavite (NPO) would communicate directly with each other and each had been equipped with high-powered 350 kw arc transmitters for this purpose. They found that direct 24 hour communication between those stations was not possible due to weak signals and static. Night time schedules were maintained for a while but they soon decided that the direct circuit should be abandoned and all traffic from that time was relayed through the Guam station).

Messages for transmission were divided according to classification, affixed to spring clips and hung from hooks in front of the operator. The classes I remember were: RED (official Navy messages); GOVT (other government department messages); BLUE (commercial messages); SVC (inter-station messages straightening out goofs in other messages); PRESS (news despatches for newspapers); JAP CODE (messages for Japanese Government addressees, usually held for transmission on direct schedule between NPM and JAA, but relayed through Guam when direct communication was delayed); CHINESE CODE (ten letter CABLE CODE messages addressed to Chinese Government addressees - always relayed through NPN to NPO for further relay to China); MSG (messages filed by Navy personnel overseas or on board Navy ships for free transmission over Navy circuits to San Francisco for filing with Western Union or Postal Telegraph for further paid delivery within the United States).

I was also given a stint on the NPM-NPL intercept circuit. This circuit transmitted messages for Navy ships at sea too distant from coastal stations for effective communication. Schedules were on every other hour, except 1900. San Diego (NPL) would transmit HYPO messages for the first 15 minutes. Wailupe would copy. Wailupe would then repeat-back (G) the San Diego transmissions. Wailupe would then transmit PREP messages for the next 15 minutes and S an Diego would repeat them back. This gave ships two opportunities to copy each message. Consecutive serial numbers would insure that ships had copied all messages. They would not have to use their transmitters to receipt for the messages and thus would not have to break any radio silence that could be imposed. Schedules seldom consumed the full allotted hour.

Wailupe had once nightly schedules with JAA (Tokyo) for transmission of JAP CODE messages and with PKX (Java) for embassy traffic to Indonesia.

The 30 kw arc transmitter at Tutuila, Samoa (NPU) was in the same building with their receivers so they were not able to operate in duplex. Wailupe would transmit blind, on schedule, then wait for NPU to come on the air with their arc, receipt for traffic and then transmit their messages. NPU would then shut down and listen for the receipt from Wailupe.

My final circuit assignment was on the San Francisco (NPG) circuit where I remained for the balance of my tour. Traffic flowed freely on this circuit at high speeds using Vibroplex speed keys or "Sidewinder" or "Cootie Keys." Speed was usually in the range

of 35 to 45 WPM. One of the San Francisco operators whom I found most difficult to copy, when he used his "Cootie Key," was J. W. "Pop" Warner. (In 1927, Warner was the radio operator on the airplane "Southern Cross" which made the first flight from San Francisco to Australia with pilot, Sir Kingsford-Smith, Co-pilot Ulm, and navigator, Comdr. Lyons, USN RET).

It was the usual practice of receiving operators to space their copy in groups of five words so that they could easily keep track of and verify the group count of each message. This was not difficult except for the JAP CODE messages. Most of the words in those messages were 15 to 20 letters long so it was impossible to put "ten on a line." The "slop-over" of the five word grouping onto subsequent lines would soon throw the receiving operator completely off the count and he would have to stop and count all of the words in the message before receipting for the transmission.

The Underwood #5 typewriters provided were all capital letters but only in the lower case. The upper case on each letter key was only a wavy line. Operators soon learned that it was adviseable for them to learn the touch system so that they could keep their eyes on the message blank as they copied to insure that they didn't wind up with a lot of wavy lines!

There were only a total of five transmitters available to Wailupe: the arc, the spark and the tube transmitters at Pearl Harbor; and the two arc transmitters at Heeia transmitter station on the other side of the island.

The station at Heeia had been taken over by the Navy at the start of WWI, then purchased from the Federal Telegraph Company in 1918. It was used by the Navy until deactivated later when arc transmitters became obsolete and were replaced by high powered vacuum tube transmitters.

There were two transmitters at Heeia - a 30 kw and a 100 kw - both Federal Telegraph Company Poulsen arcs. They were keyed by remote control from Wailupe. Communication between Heeia (HX) and Wailupe (PM) was by Morse sounder over Army landline.

Mr. Phelps described some of his impressions of the Heeia station:

"We used Heeia's 30 kw arc for communication with ships having an arc installation. We used the big arc for communication with NPG. Once in a while we could use the 30 kw to NPG. If we could work a ship over a thousand miles on the 30 it was considered good."

"Federal had a wooden tower at Heeia which was about 400 feet high and not over 4 or 5 feet square straight up. It took a good number of insulated guy wires to hold that tower erect. Every bolt in the tower had to be thoroughly grounded. If any of the ground wires broke or became detached, it would generally start a fire on the tower. This happened one night but fortunately a young Chinese fellow was on watch and spotted the fire. He called the Chief and told Wailupe to shut down for a while. He then strapped a fire extinguisher on his back, crawled almost to the top and put the fire out. They called him the crazy Chink."

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Public Law Number 264, approved 13 August 1912, required all amateur stations to utilize frequencies higher than 1500 kHz. As a result, the amateurs were the first to experiment with "short wave" equipments. In the early 1920's, much success had been achieved in long distance communication using those higher frequencies. The Naval Research Laboratory was constructing experimental high frequency transmitters and receivers. Shore stations were encouraged to construct similar equipments using newly designed power vacuum tubes and using power sources from existing spark transmitters.

In 1924, Wailupe personnel constructed a "short wave" receiver and installed it in the pump house near the D.C.O's quarters.

The first crystal controlled transmitter was completed by NRL in late 1924. A one way circuit was established between Washington and Balboa. Within one month, additional one way night time circuits were established with London, San Diego, San Francisco and Wailupe.

During this period radio amateurs already numbered in the thousands and they were increasingly interested in using the higher frequencies.

During early 1925, the Fleet was preparing for a cruise to Australia. An experimental installation was made in the Fleet flagship, the USS SEATTLE, consisting of a laboratory transmitter operating on 5700 kHz and one of the newly designed high frequency receivers, the RG. Additionally, RG receivers were installed at San Francisco, Wailupe and Balboa. The American Radio Relay League (an amateur organization) made arrangements for cooperation of amateurs all over the world. Numerous tests were conducted during the cruise. During best transmission hours, 2330-0800 zone plus five time, little difficulty was experienced in handling direct communication with Washington, even during the period when the Fleet was in Melbourne, nearly 10,000 miles away. (I was privileged to have made that cruise to Australia in the USS SLOAT, DD 316).

Following those tests, the Commander in Chief recommended the addition of high frequencies to the fleet frequency plan and that shore stations be equipped to transmit to the fleet on frequencies not higher than 9000 kHz. The Bureau disregarded the latter and immediately made plans to equip 28 shore stations with transmitters and receivers with an upper frequency limit of 18,000 kHz.

The Naval Communication Frequency Plan was approved early in 1926. Very low frequencies plus frequencies between 4000 and 4525 kHz and the harmonics thereof were assigned Naval shore stations. Once the decision to utilize the higher frequencies was made, there were no further major changes made in the modernization plan.

Harmonic operation of the earlier equipment was far from satisfactory and most of the transmissions were confined to the fundamental frequencies. Later, Lt. Comdr. J. B. Dow USN, designed an electron-coupled circuit that made utilization of the harmonics practicable.

Development of 20 kw low frequency vacuum tube transmitters with a performance equal to the 100 kw arc transmitter gave indication that the latter type, in which the Navy had invested millions of dollars, would soon be obsolescent, however economy dictated their continued usage until such time as they would become uneconomical in operation. In the meantime high power low frequency vacuum tube transmitters were being developed to eventually replace all of the arc transmitters.

Spark transmitters were to be eliminated from future consideration. The Bureau had to determine: Whether low powered high frequency transmitters would render service ashore and afloat, equal or superior to that rendered by the high powered low frequency arc transmitters then installed; whether high powered low frequency vacuum tube transmitters should be used to replace the reliable, rugged arcs which were still capable of rendering service to the fleet; and, whether, presuming that the vacuum tube transmitter was to become standard, the arcs be still further refined to render them capable of meeting requirements of standby transmitters.

Design and development of improved vacuum tube transmitters and receivers proceeded at an accelerated pace. A program for modernizing shore radio station transmitters was carried out. Models TAB-3, TAD-2, TAF-2, TAJ-1, TAQ, TAS and TAT were installed as required in those stations. In fiscal year 1930, 9 TAB-4, 2 TAW, 10 TAY and 13 XJ-2 were

purchased specifically for shore stations.

In 1931, RCA was given a contract for 227 Model RAA (10-1000 kHz) and 163 Model RAB (1-30 mHz) receivers. These were the first alternating current receivers. They were installed during the fiscal year 1932. NRL had previously, in 1930, designed the Model RAC low frequency (12-80 kHz) barrage receiving equipment for shore stations.

Following delivery of the Models RAA and RAB receivers and concurrent issue of the Models TAU, TAZ, TBB and TBC transmitters, which had been purchased in 1931, the U. S. Navy possessed the most modern and efficient radio system of any navy.

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In 1924 the design and development of high speed (100 WPM) keying and recording mechanisms was commenced. The first equipments were then manufactured and installed at shore stations. The Kleinschmidt tape perforators and the Boehme keying heads became increasingly popular with Navy operators, The perforators were often used to pre-punch message traffic for transmission on the FOX broadcast circuits to the Fleet. (FOX broadcasts were instituted to replace the intercept schedules). They were also used to pre-punch message traffic during circuit outages on point to point circuits, which could then be transmitted at high speeds after communication was restored. The speed of transmission was dictated by individual receiver operator capabilities. The automatic recording devices were seldom used in the early days of high frequency communications due to the natural fading of those signals.

To provide a constant signal to the automatic recording devices from the fading high frequency signals, the Navy designed a diversity receiving system utilizing three separate rhombic antennas individually spaced and oriented, each feeding into separate receivers. The output of each receiver actuated a common audio tone keyer. Received signals seldom faded in all three receivers at the same time. A constant tone output from the keyer was usually obtained unless receiving conditions were exceptionally poor due to signal skip. At those times the sending station was directed to shift to another harmonic frequency to improve the signal. The control station could monitor the audio tone signal from the diversity station for manual reception or feed the tone signal into a demodulator, convert it into an electric impulse to actuate the arm of an inked pen and produce the dots and dashes on continuous feed paper tape through the recording device.

Operators, with practice, soon became efficient in transcribing messages from the paper tape which could be fed through slots on the front of the typewriter, at speeds controlled by a foot pedal rheostat.

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I reported to Wailupe for my second tour of duty in 1934, serving as one of the Traffic Chiefs until I went back to the Fleet in 1937.

The general appearance of the station had not changed much since I left there in 1925. The road past the station had been paved. The control station was still in its original location, however the shore line had been filled in, a brakwater built, the bridge over the water to the control building had been replaced by a paved walkway up to the front steps of the building.

One additional set of duplex quarters had been built between the two original duplexes. A tennis court, swimming pool and recreation building had been constructed between the single men's barracks and the CPO quarters at the back of the station. A diversity receiving station had been built on top of the hill behind the quarters.

The inside of the control building was completely changed. All of the former isolated operating booths had been dismantled, creating one big operating room. RAA, RAB and RAC receivers were mounted at the sides of the room on individual metal frames, bolted to the floor. Operating tables were portable, on casters, which could be moved to any receiver position. Plug in controls were built in to each table and receiver position.

The Traffic Chief and File Clark occupied back-to-back desks in the center of the room. A transmitter control panel was mounted alongside the Traffic Chief's desk.

High speed operating positions were located on a long table toward the back of the room. Typewriter wells and automatic recording devices were situated on both sides of the table. Kleinschmidt perforators and Boehme keying heads were mounted on tables against the back wall. A relay rack containing control panels and demodulators was mounted between the two sets of perforators. Signals from the diversity station were fed into the control panel. Keying heads and operator positions were also connected to the control panel. Operators could connect the various equipments in any combination desired.

The main circuits were with San Francisco and Cavite. Wailupe no longer needed to relay Cavite traffic through Guam since reliable communications had been established with Cavite using high frequencies. Guam traffic was routed via Cavite.

The San Francisco and Cavite circuits were usually maintained on a 24 hour high speed basis using the automatic sending and receiving equipments. Some outages were experienced daily on the Cavite circuit. At those times messages were pre-punched for later transmission at high speeds when communications were restored.

Improved signal keyers were provided during my tour of duty at Wailupe. Those keyers enabled us to feed a signal from the diversity station into a demodulator then to a control line to the transmitter station to key a transmitter. San Francisco was able to key the Pearl Harbor transmitter for direct transmission to Cavite. Cavite was able to duplicate that procedure in the opposite direction. Until those procedures were perfected by long experience, Wailupe continued to record and transcribe all transmissions from each station to insure that the distant station did in fact receive the transmissions.

There was a high frequency circuit, on schedule, with Tutuila, American Samoa (NPU); another circuit also on schedule with Hilo (NPH); and a ship-shore circuit with Navy ships on 355 kHz split-foned with 500 kHz, the International Distress frequency.

A FOX method broadcast for Navy ships used the TAW very low frequency transmitter at Pearl Harbor on 26.1 kHz. The FOX method of broadcasting to ships replaced the former intercept circuit between San Diego and Wailupe.

The front part of the control building was unchanged from its original format. The DCO still occupied the front office and the Officer in Charge the next one. The original wireroom and the Traffic Chief's booth had been converted into equipment maintenance and battery rooms.

The wireroom had been moved to a room adjoining the operating room. There, communication was maintained with the Honolulu, Pearl Harbor and Fleet Air communication offices by teletype - not page printers, but the old Western Union type that fed gummed tape through the machine which had to be glued to message blanks before delivery to the Traffic Chief for routing.

The Heeia transmitter station had been deactivated. It was still owned by the Navy.

Due to the growth of Naval activities in Pearl Harbor, continued operation of the High Power Transmitter Station there became impractical. Therefor, in 1936, the radio transmitters at Pearl Harbor were reconditioned and transferred to a new site at Lualualei on the island of Oahu. The Lualualei tract had been obtained by the Navy under condemnation proceedings in 1931 by payment of $227,127.00. Communications were maintained during this move by shifting the FOX fleet broadcast to San Diego and by moving only one or two of the other transmitters at one time.

Major Fleet units of the U. S. Navy arrived in the Pacific in 1939. A program to mobilize 14th Naval District communications was necessary as the Pacific system of Naval Communications was inadequate to serve the large fleet. When the American armada entered the Pacific, there were nine transmitters at Lualualei. The powerful 300 kw VLF transmitter was being converted into a 500 kw transmitter (TAW-a). By 1941 there were twelve transmitters at Lualualei which were operated via Army landlines from Wailupe.

Facilities at Wailupe in 1939 were meager, and an entirely new receiving and control station was under construction. At Wailupe in December 1941 there were seventy-six men operating twelve positions to receive and send naval despatches. High speed Boehme was employed on a continuous circuit with Cavite, and a similar circuit joined San Francisco with Wailupe. San Francisco was worked on the same circuit with Washington (NSS). Each of the two mainland stations handled traffic for alternate periods of fifteen minutes. Washington was received through San Francisco on an automatic relay basis.

Wailupe worked Samoa (NPU), Wellington (ZLP), Auckland (ZLD) and Canberra (VHC) on a point to point manual circuit. Dutch Harbor, Peiping and Shanghai were worked one hour daily on direct circuits. A manually operated circuit via NAS Pearl Harbor, the Line Island Net, connected Naval Radio Stations on Midway (NQM), Johnston (NIQ), Palmyra (NIX) and Wake (NCL) with Wailupe.

Units afloat sent and received on 355 kHz and the 4235 series through its fourth harmonic, which were manned by Wailupe continuously. The 4235 series of four frequencies was covered by only one operator controlling only one transmitter which had to be shifted from one frequency to another in the event a ship called. A continuous watch was maintained on the International Distress Frequency, 500 kHz. Joint Army and Navy, Inshore Patrol, Local Defense, and Harbor communications were coordinated by several teletypewriter and radio circuits.

The most important broadcast was the Primary Fleet (FOX) broadcast which was transmitted on the frequency of 26.1 kHz using the 500 kw VLF transmitter at Lualualei. Navy ships at sea and a majority of naval activities ashore copied the entire FOX broadcast. The Wailupe FOX was the most rapid way to get messages to ships.

(When the 14th ND history was being compiled in 1945, Lt. C. A. Porter, Communications Officer at Wahiawa, contributed his "Recollections," and "Notes from NRM." His comments are interspersed in this narrative from time to time.)

Lt. Porter: "In 1940, the Navy began construction of a control and receiving station at Wahiawa which was scheduled for completion in the year 1942. Wahiawa Radio Control Station was the most important of a number of Naval Radio and Naval Air Radio Stations constructed as part of a general plan of expansion."

The large expansion and rapid development of naval air communications required especially close control coordination by the District Communication Officer. In January 1941, NAS Pearl Harbor was the only well-equipped naval air radio station in the district. At NAS Pearl there were sixteen operating positions. This station assisted Wailupe to coordinate communications with the four line islands, with Navy patrol, combat,

and transport airplanes, and with surface craft in the Hawaiian area. During 1941 radio equipment was placed in operation at Naval Air Stations Kaneohe, Johnston, Midway, Wake, Palmyra, Puunene and Ewa (U. S. Marine Corps).

All naval air stations provided air to ground communications and radio aids to navigation. The busiest circuits were for training purposes, and some of these were on frequencies held jointly by the Army. Interisland flights were handled by air stations involved, assisted by the Civil Aeronautical Administration and NAS Pearl. Naval air stations furnished a constant flow of information on airplane flights, on surface craft, and on the weather conditions which was passed on to all Navy and Army activities concerned.

The district was poorly equipped for the dissemination of information among various naval and government activities on Oahu. Teletypewriter loops connected Wailupe, Major Navy commands, Army Headquarters, the District Communication Center, NAS Pearl Harbor, the Yard Signal Towers, and the Branch Communication Office in Honolulu. Equipment used by the Navy was "antiquated!" and Army cables for the teletype circuits were unreliable. The 14th Naval District had no terminal equipment over which unencrypted despatches above restricted could be passed. To relay despatches, manual perforation was necessary, as there was not a single automatic reperforator in the entire district until 1944. Therefor, dissemination of information among local activities was slow, unreliable and inadequate.

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A few minutes before 0800, 7 December 1941, several squadrons of Japanese aircraft passed over the Lualualei radio station on their way to bomb Pearl Harbor and the airfields of Oahu. An hour prior to the attack, the very low frequency transmitter at Lualualei had been closed down for repairs, but sufficient high frequency transmitters were in service to continue essential communications. As was customary when Lualualei ceased normal operations, its auxiliary station, Naval Radio Station, San Diego (NPL), was notified to stand by in the event of an emergency. When the air raid began, Wailupe attempted rather unsuccessfully to operate the VLF transmitter at San Diego by radio control. At 0949, before good communications with San Diego were established, Lualualei was again in full operation. At 0800 Radio San Francisco followed instructions to "plug in the automatic relay connection to Washington with Wailupe and, under no condition, to disconnect the two stations until further notice."

The Army failed to come up according to the plan on the drill circuits, but the Fort Shafter Army communications center maintained a watch on another joint Army-Navy frequency with Wailupe and "everything worked fairly smoothly." Each of the four frequencies of the 4235 kHz series was manned continuously and a watch was set up on the Force Commander's circuit. Stations in the district "manned every Naval frequency they could think of."

Communication between Cavite and Guam was interrupted. It was necessary for Wailupe to maintain a continuous watch on a circuit with Guam. The busiest of all was the Line Island Net, controlled by NAS Pearl Harbor, but by nightfall, stations on this circuit were under supervised radio silence.

Each major radio station was strafed by one or two planes and the naval air stations on Oahu were bombed. Casualties among communication personnel were light. District naval communications functioned satisfactorily throughout the air raids, though several activities were compelled to rely on battery units. Later in the month, Midway and Johnston suffered loss of communication facilities, but in neither place was the damage of serious proportions. The most serious loss of personnel and facilities occurred at Wake on 22 December 1941. Wake Island "disappeared on the 9th but came back fortyeight hours later to stay until its fall."

Lt. Porter: "The circuit with Guam was terminated on 13 December 1941. Navy radiomen of the Philippines, their 'dots and dashes dripping with contempt for the Japanese' beamed Wahiawa, on 6 May 1942, to advise that they were 'going off the air now. CUL OM.' Within a few hours the antenna of the 50 kw transmitter, used by Wahiawa on the circuit to Corregidor, was 'swung south-westward to Australia for the new war phase'"

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Radio stations of the district were vulnerable to attacks by land, air and sea. Lualualei was only 4000 yards from the shore line and its power was received over exposed lines from the Hawaiian Electric Company twentytwo miles away. Steps were taken to increase auxiliary and emergency power, to develop an efficient system of passive defense, to disperse transmitters and to construct bombproof shelters for equipment and men. Three bombproof shelters for radio stations were erected subsequent to 1941, but expansion programs after 1941 seldom provided for the construction of permanent buildings even on projects long planned on a permanent basis. There was a gradual increase of auxiliary power units procured through loans from the Army and through deliveries from the Bureau of Ships.

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Lt. Porter: "Wailupe, too, was located on the seacoast and had neither splinter-proof nor bombproof buildings. So, on the morning of 10 December 1941, the District Communication Officer decided to have all radio equipment at Wailupe moved to Wahiawa. The new site was an excellent receiving area and the best protected radio station of the entire district. Men worked night and day to transfer operations to Wahiawa. The move became a veritable scramble causing facilities to be installed more or less at random. Relocation was completed on 17 December without the slightest interruption of communications. Equipment for receiving purposes, for control keying, and for the coding board, was located in Operations Building No. 2, a 100% bombproof building. A Boehme point to point circuit was established with Washington immediately and, though it was one of the longest circuits of this type on record, it gave excellent service. Equipment was operated at speeds of 200 to 300 words per minute to clear traffic. According to prearranged plans, the distress frequency was assigned to the Coast Guard station at Diamond Head (NMO). Diamond Head thus became the first Coast Guard station in the Pacific to relieve a Navy station of guarding the distress frequency."

Wahiawa ceased to assist directly with trans-oceanic flights of Navy aircraft and this service was rendered by naval air stations.

In some areas of the Pacific the Fleet broadcast faded and very low frequency was difficult for ships and shore stations to copy. To correct this situation, beginning 1 February 1942, all traffic on the Primary Fleet Broadcast was transmitted simultaneously on high frequencies, as well as on very low frequency. The paralleling resulted in better coverage throughout the Pacific. The improvement was made possible by delivery and installation of equipment ordered many months before a state of hostilities existed. Increased facilities also provided a first-class link between Wailupe and Alaska, the Canal Zone and the Navy Department in Washington.

In 1942 the district was confronted with the problem of trying to manage combat communications for too large an area on one Fleet broadcast. As a consequence, the San Francisco Fleet Broadcast was initiated and relieved Wahiawa of the Aleutian area, and later serviced all ships between Honolulu and the mainland. A point to point circuit with Kodiak (NHB) was also assigned to the Naval Radio Station at San Francisco. Wahiawa was then able to concentrate on providing efficient communications for the defense of the Southern and Central Pacific ocean areas.

One of the critical moments of Pacific communications occurred when the Japanese made an assault on the island of Midway, May-June 1942. The Line Island circuit was insufficient to accomodate all operational traffic, so "the battle was fought over the Midway cable" which permitted the passage of unencrypted operational despatches. To eliminate the possibility of passing communications to the enemy by induction, the commercial cable between Midway and Guam had been cut in April 1942. The Honolulu branch communication office assumed control of the Midway cable circuit and set up a local Navy teletype circuit terminating in the office of the local cable company. Actual transmission on the cable, however, was done by civilian operators.

When operating under normal conditions, the branch office received press despatches through regular Navy channels and passed them to the mainland via commercial lines and also released the press news to the Honolulu papers. This activity also received and delivered official government communications and Naval despatches that were to be sent via commercial lines. It provided an inter-connecting link into district communications by the operation of a continuous teletype watch in the Federal Building to serve various Naval activities in Honolulu.

In 1942, American forces made a counter thrust in the South Pacific area. "A duplex manual point to point circuit was activated between Wahiawa and ComSoPac in the communication ship USS ARGONNE. Communications were not satisfactory but improved when ComSoPac moved ashore at Noumea in October 1942, and established a point to point circuit with Wahiawa, though the set-up with Noumea never attained the smooth efficiency toward which all hands worked." (Lt. Porter)

Lt. Porter: "A point to point simplex manual circuit was established with Melbourne (VIY) in the fall of 1942. Operation of this circuit was unique in that for several weeks Melbourne used civilian operators who knew only commercial procedure. Nevertheless, communication was successful and Melbourne rapidly became one of the heaviest circuits of the Pacific. After the expansion of communications to Melbourne, circuits at Wahiawa remained fairly constant for a number of months."

On 23 September 1943 the JUMP FOX broadcast was instituted. Originally it was copied only by Naval Radio Stations at Johnston, Midway and Palmyra. Before the end of the year, approximately a score of naval units received this broadcast which was still on a trial basis. The significance of the JUMP broadcast grew rapidly, but reception was short of the standards of a first class Fleet broadcast. To inaugurate it, Kaena Point transmitters had been obtained from the Army, which were turned back after several months of unsatisfactory service.

In a large scale expansion program of 1943, sufficient transmitters became available and the Navy reactivated the transmitter station at Heeia, Oahu. Transmitters installed at Heeia and Lualualei, in the latter part of 1943 and in early 1944, were suitable for an efficient Secondary FOX (JUMP) broadcast. Eventually Heeia transmitters were more effectively used on circuits to the mainland and Lualualei transmitters then carried the Secondary Fox.

By the end of 1942 the Navy had succeeded in obtaining and delivering to the district a sufficient number of transmitters to permit the largest expansion of 14th ND communication facilities during the war. In early 1943 six buildings were erected to accomodate an increase of transmitters from twentytwo to fifty which made Lualualei into "a completely new station." After the installation of a cooling system for the high frequency transmitters, the officer in charge was of the opinion that Lualualei was "one of, if not the finest, radio transmitting stations in existence." A corresponding increase of radio material took place at Wahiawa, and an entirely new radio station was erected at Haiku, Oahu.

The Navy was cognizant of the need for another large transmitting station on Oahu in a well protected location as a standby for Lualualei and as part of a general prog m of dispersion. Early in the spring of 1942 plans were drawn to build a radio station in Haiku Valley. The mountain valley afforded excellent natural protection and came within the defense line of the island. Antennas were stretched between mountain tops and the project was admittedly slow, expensive and fraught with difficulties. The highest antenna spanned 7500 feet at a height of 2800 feet. Tests made in November showed the performance was to be satisfactory for a good Fleet broadcast though "considerably below what was expected." The Haiku radio project was completed in December of 1943 and over the 200 kw Alexanderson alternator at Haiku, messages to merchant ships, weather reports to naval ships and despatches to submarines were broadcast.

Property was obtained and plans drawn to construct a radio station at Waimano Gulch. Transmitters were ordered for the project in 1942, but immediate danger of an enemy had passed by the time requisitions for equipment were filled and the equipment was installed at Haiku, Heeia and Lualualei.

Accompanying the growth and improvement of major radio stations was a program to expand communications for naval aircraft. In 1942 communication material was allocated to naval air stations at Barbers Point, Kahului, Hilo and French Frigate Shoals. Communications at Barbers Point was primarily for the purpose of air to ground and for naval air t raining. NAS Hilo was completed in 1942 and with the assistance of the Hilo Section Base provided communications for the island of Hawaii. The Naval Radio Station at Hilo was dismantled early in the year of 1942. In 1942 NAS French Frigate Shoals was rushed to completion and placed into operation. It assisted in providing communications for combat aircraft during the Midway campaign. French Frigate Shoals also set up an intercept watch on the Line Islands circuit. NAS Kahului on the island of Maui was activated in September of 1943 and a considerable amount of its communication was joined with NAS Puunene, Puunene providing the coding guard, point to point interisland circuits and medium power air ground training transmitters for both stations. These two stations served as a Naval Communication Center for the island of Maui.

"At Line Island Naval Air Stations, well trained units were formed to give communication service for air to ground communications, sea rescue and inshore patrol. Functioning alongside and jointly with naval air radio stations were naval radio stations at each of these islands. NOB Midway served the Midway naval submarine operating base. Large airfields and modern bombproof structures were built at Midway and Johnston during 1943." (Lt. E. A. Tucker, Communication Liaison Officer).

Though the island of Canton was but a tiny link in the large district communication system, in 1943 it became the first, and further developments showed it to be the only, joint communication center of the 14th Naval District. NAS Canton handled air communications for the Navy and Army planes from the time of its activation until the end of the Marshalls-Marianas campaigns. Reorganization and consolidation of communication facilities at Canton created what was to be known as a Joint Air Communication System of the Pacific (JACSPAC). Cooperating in the venture were the Army Air Communication System (AACS), Civil Aeronautical Administration (CAA) and Naval Air Transport System Command (NATS). Facilities, equipment and personnel were pooled and JACSPAC influenced the development of later air communications between the Army and Navy air stations of the district.

NAS Pearl Harbor controlled a naval air station net using the frequency of 532 kHz. Over this circuit naval air stations were joined but the Navy did not have terminal equipment to pass arrival and departure despatches with the necessary speed. Throughout the duration of hostilities, naval aircraft in the district occasionally arrived ahead of operational despatches concerning the flights. Gradually, however, the Navy improved its facilities and systems for air communications. An additional interisland air station

manual circuit was established. Later both interisland circuits for the naval air stations of the Hawaiian Islands were supplanted by teletype circuits operated over interisland Army VHF radio links; and a common air ground point to point voice frequency for transport flights.

The DCO maintained close liaison with the District Coast Guard Officer to effect required coordination of effort and activity. Under the cognizance of the District Coast Guard Officer were navigational and air sea rescue radio direction finder stations (several D/F stations were shifted to the Coast Guard in 1944); section bases at Nawiliwili, Hilo and Kahului to serve small craft and patrol craft of the respective areas; a number of lookout and signal towers, most important of which were Aloha, Diamond Head and Makapuu Point; and sixteen Loran stations to enable surface vessels and aircraft to obtain a fix without breaking radio silence. Coast Guard section bases assisted the Navy by handling many despatches for merchant, Allied and Army vessels of the Hawaiian area which called on 500 kHz; received and transmitted on 425 kHz. At the height of operations, there were approximately sixteen officers and two hundred enlisted men at Coast Guard communication activities. The Communication Center was at Coast Guard Headquarters, Honolulu, and coding boards were maintained at the Headquarters office and at the three section bases. The Coast Guard transmitting station was shifted from Diamond Head to Wailupe in 1944.

The U. S. Marine Corps depended upon the regular Navy system for its communication with distant points, but maintained separate receiving, control and transmitting stations for local and interisland communications. The Marine Communications Center was at FMFPAC, Pearl Harbor, and its transmitting station was at Aiea. A circuit connected Marine radio stations at Pearl Harbor with Marine radio stations at Maui, Hilo and Kaui which were staging areas for Marine divisions and battalions. FMFPAC was radio guard for the other stations and copied the Primary and Secondary FOX broadcasts. This activity was joined with Navy and Army activities via teletype channels connecting into the NTX and TWX systems. Headquarters Communication Center handled approximately 5000 messages each month. Eight officers and fifteen radiomen were on each watch at this activity.

As a general rule, communications were passed among naval activities in the district by manual operation on teletypewriter nets which were connected by Army landlines. In early 1942 there were sixty machines on fifteen loops. By the conclusion of the second year of the war, facilities for local landline communications had more than doubled. No central station controlled communications on these landlines, but Wahiawa, the District Communication Center, Army Headquarters and CINCPOA were connected on a majority of the nets. Indirectly or directly, all major commands of the Navy, Army, Coast Guard and Marine Corps were connected by teletype circuits which were manned continuously and were operated exclusively by service personnel.

"Teletype equipment ordered on 12 December 1942 to bring the district activities up to an efficient operating basis was many months in arriving, and came in driblets..... ...(the equipment) was dissipated in meeting demands beyond the scope of anticipation.... .....the dispersion of naval commands, each requiring urgent receipt of tactical information, increased the complexity of the teletype problem. (Memo by Lt. Tucker).

Teletype circuits and control lines on the island were unsatisfactory due to frequent interruptions and the installation of radio control apparatus (CCS) was adjudged to be the solution to the problem. Plans for CCS equipment were drawn up before the war in order that "the Navy would not be required to rely totally on the present extremely unsatisfactory land wire connections between the various communication centers ....." Construction was begun in 1942 and in 1943 CCS was installed between Wahiawa and Lualualei, Heeia, Haiku and CINCPOA. CCS apparatus soon proved to be reliable and

satisfactory and became an important addition employed in the remote control of radio transmitters in the district.

Lack of proper equipment for intra-island and inter-island communications was a serious handicap to rapid naval communications on Oahu. By a joint communication policy, the Army was given the responsibility to provide landline facilities for intercommunication between naval establishments. The following excerpts from a letter written by Rear Admiral R. A. Theobald, USN, gives a description of conditions and a statement of needs which existed to some extent throughout the war:

"During the conduct of the subject exercise I was Commander Air Group in the White Force. Preliminary investigation made it appear that the best location from which to command the Air Group was at the Naval Air Station, Kaneohe. Accordingly, throughout Exercise No. 191 command of the land based White Air Group was exercised from that station.....

"The telephone, and page printer communication systems connecting Kaneohe, Marine Air Field at Ewa, and NAS Pearl are extremely unreliable; in fact they are virtually nonexistent. On the first day, the page printer system, which is designed to furnish direct communication between Kaneohe and Ewa, ceased operating. There were no qualified naval repairmen available nor does the navy maintain linemen for the repair of this system, as far as could be ascertained. Even if such personnel had been available they could not have attempted repairs to this system because of lack of familiarity with the Army landline network. In consequence, repairs have to be executed by the Army Signal Corps, according to statements made to members of my staff. Several requests to the Army resulted in a non-productive visit by a sergeant. Monday, the 14th ND repairman was at Kaneohe but stated he could do nothing as this system was an Army network.....

"From my brief experience in Exercise No. 191 it appears to me that the tactical command of land based Naval and Marine Air Forces on Oahu will be difficult if not impossible with present communication arrangements. Coordination of the detached air forces at Kaneohe, Pearl Harbor, Ewa and Barbers Point requires Navy controlled communication arrangements between these fields by installing an adequate number of trunk telephone lines. Direct telegraph and telephone lines entirely under Navy cognizance are, in my opinion, prime requisites to the coordination of Naval and Marine land based air forces on the island of Oahu.....

"Radio communication between the detached air stations is possible, of course, but this entails the same security requirements as between detached Naval units at sea. The necessity of coding and decoding radio transmitted messages between Kaneohe and other air fields on Oahu under Naval communications emphasizes the urgent need for Navy controlled land communication system for efficient control of these units in combat."

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Beginning in 1942 all radio equipment from the Bureau of Ships was assigned to a Pacific pool. Radio material was then issued to the district if its need was considered to be urgent. Installation was made by the Radio Material Office which cooperated very closely with the District Communications Office in the installztion and maintenance of equipment. (Electronics Office beginning in 1945). Considerable radio material operating in the district was on loan from one of the elements of CINCPOA, from the Army, from commercial companies, and from CAA. Diverting, shifting, and reconditioning were

significant parts of a program to provide radio material. Urgently needed facilities sometimes were constructed locally. Frequently equipment was obtained from commercial communication companies, especially the Mutual Telephone Company, on a rental basis. A graphic idea of the equipment problem may be obtained from the following letter, informally written to the Radio Material Officer by a radio engineer at NAS Hilo:

"The Army authorities are a little more than somewhat put out by the TCS in the control tower. In fact one fellow swears he will throw the thing out the window if its left here. I agree with him - I would too. As you know, the TCS has motor-generators for both the receiver and transmitter, and to make things worse, this one has a motor-generator to drive the motor-generators. Anyway, when the thing is on it practically drowns out everything in the room - four or five super pros and the high frequency unit used to communicate with the planes landing and taking off. The motor gens cause a buzzing thru which it is impossible to copy anyone. Even with the receiver alone on it is pretty bad.

"That's the situation. Now what to do about it. The proper thing of course would be to replace it with a unit intended for that sort of thing - TCA for instance or even a TCS with a 110V power supply using tube rectifiers. If that is out of the question then the only thing I can suggest is that we move it down to the foot of the control room. That would not be certain either because the MG noise might feed thru the 110 volt lines.

"No one around here seems to be in a hurry, so if you can't scare up a TCA or a rectifier for the TCS send me a despatch thru the section base and I'll try moving it down out of the tower. The station has no material man yet and the portable power gas generator outfit isn't very reliable. Public works man shrugs his shoulders and looks bewildered when I ask him about city power."

In 1941 "the efficiency and usefulness of communications to the Fleet suffered due to poor delivery of essential communication apparatus," and "by 1943 the disparity between that (equipment) required and that delivered was widening." In reply to an inquiry made by CNO in 1943, it was suggested that highest priority be given to the following equipment: radar, reperforators, scramblers, frequency meters, TCA transceivers, FM and AM mobile receivers and transmitters and speech amplifiers, remote controls, rhombic antennas, automatic tuning, band limiters and channel filters.

Communication facilities operated at less than their capacity in 1941. Except for communications among activities on the island, the system was capable in 1942 of absorbing the increased flow of administrative and operational despatches. Traffic at Wahiawa in January 1942 amounted to a total of 2,208,869 words. Over the Fleet broadcast 144,235 words were transmitted. Local landlines accounted for about one third of the despatches handled. The heaviest lines of communication were with Washington, Cavite and San Francisco. Communications handled for government agencies and commercial traffic formed a larger percentage of the total in the first few months of the war than at later dates. All district communication facilities handled 400,000 despatches and 28,000,000 words during the first year of the war. This was only a small portion of the number handled in the next twelve months when groups received and transmitted tripled and Wahiawa's total approached 11,000,000 per month by the end of 1943. Within a period of less than two years, the Primary FOX became the largest radio broadcast to ships at sea. Its daily average of 150 messages increased to above 200 as the rate of transmission was gradually increased from 18 to 25 WPM. After the first year the Fleet broadcast "was saturated" and reserved primarily for operational despatches. Boehme replaced manual operations on heavily loaded point to point circuits so backlogs with shore radio stations seldom accumulated.

The District Communication Officer wrote: "The subject matter of a considerable proportion of this traffic is administrative.....(and) not urgent; much is unnecessarily verbose, and some is of doubtful importance to the war effort."

Services due to errors in encipherment and transmissions also contributed to increased traffic loads. To divert despatches from the Primary Fox and to facilitate the delivery of operational despatches on all circuits, and to prevent errors in coding and transmission, large numbers of despatches were deciphered (screened) at relay stations. Incidental to the major reasons for screening traffic, important information on naval units was gleaned for routing purposes.

There were 18 sources of routing information on units of the Fleet which were routinely sent to the relay station at Wahiawa. Several of these were daily reports but the question "How Route?" was an abiding one, further complicated by the gradual growth of the British Pacific Fleet and the rapid growth of the American sea and land forces. "To say that the situation regarding Fox dope is confused is to make a great understatement," wrote the Wahiawa Communications Officer. From a single Fleet broadcast, which every naval unit either copied or received from others, major Pacific channels increased to three Wahiawa Fleet broadcasts. (Later Guam instituted Fox broadcasts). With each major expansion of the Fleet, with each major invasion, and with each step toward decentralization and specialization in Pacific communications, the problem of routing and making deliveries to innumerable action and information addressees became more complex. The most important sources of information were guard lists submitted regularly by Fleet commands, guard lists of various radio stations of the Pacific and the mainland, and despatches deciphered for the purpose of diverting messages and improvement of communications.

To improve communications, a Communication Security Unit under the management and control of the Chief of Naval Operations was instituted at Wahiawa in April 1943. This activity eventually had a complement of approximately 25 officers and specially trained enlisted men to assist CINCPOA in a program of cryptographic security, traffic control and traffic analysis.

There were a total of approximately 55 officers and 250 enlisted men in district communications in July 1942 as compared with 5 officers and 165 enlisted men prior to 1 December 1941. Most enlisted men were radiomen occupying positions at Wailupe, the District Communications Center and NAS Pearl Harbor, or were technicians at Lualualei and Wahiawa. A majority of officers were members of coding boards of the District Communication Center, Aliamanu Crater and Wailupe. In July 1942 fifteen officers were on the DCC's coding board and at Wahiawa there were four. (There were eleven on the JOC coding board). After two years of war, district personnel had increased to a total of approximately 700, of whom 100 were officers. More than one third of the total number of communicators of the district were stationed at Wahiawa and served on the coding board at that station.

In September 1943 fifteen coding boards of the district deciphered a total of 100,000 words daily. Line islands naval radio stations and their associated naval air stations, eight naval air stations, Navy Yard communication center, DCC, and Wahiawa were served by coding boards most of which passed plain language messages by messenger service or teletypes to various activities for which they maintained a coding watch. (Plain language was often relayed via teletype if landlines used were on Navy property exclusively). The DCC maintained a continuous coding watch of five or six officers and Wahiawa approximately ten on each watch. There were one or two officers on each coding watch at each of the other district activities. A small number of enlisted men assisted in Navy coding work, but these were employed in joint or liaison communications.

One major item of unfinished business in 1941 was the procurement of trained personnel. Several naval schools in the U. S. trained radiomen, technicians, or

communicators prior to being assigned to the district. Many enlisted men and officers received valuable experience by having a tour of duty at some naval communication activity in the States. Only a minority of men, however, assigned to the 14th ND communications during the first two years of the war were experienced or trained. Each communication activity was confronted with the problem of converting inexperienced men into efficient operators or communicators. Larger units instituted formal training and a regular course of study. Each activity trained its personnel informally. A short course of study preceded each new project or major change of policy. In the district there were usually two radio schools from which approximately forty radiomen were graduated each quarter. Many in attendance, however, were trained for service in other commands. Frequent demands by Fleet commands for experienced operators and communicators caused a constant drain on the limited number of men in the district communications. Fortyfive officers and many enlisted men were assigned to units afloat between April and October 1943, but a large number of men of the district were retained for many months and formed an experienced nucleus of communicators, operators and technicians.

Significant in the gradual process of decentralization and specialization which marked District Communications throughout the preparation for offensive combat communications was the formation of a separate communication unit for the Navy Yard, and the separation of Hawaiian Sea Frontier Communications from the district. Beginning in April 1942, the Commandant of the Yard was served by a separate radio station and coding board, the Yard Communication Office. This activity (June 1945) was situated in a recently constructed bombproof building near the Administration Building in the Yard. It served the Captain of the Yard and a score of other important Yard activities. The YCC was assigned control of 2716 kHz ship-shore frequency for ships in the Hawaiian area and monitored the 355 kHz Navy ship frequency. It also copied major Fleet broadcasts which were passed to all ships in the harbor requesting the service, and provided coding board service for ships present.

All Navy ships in the harbor were directed to maintain an efficient radio and signal watch. Despatches for ships present were normally sent by way of Yard signal towers. Arrangements were made by each ship whereby it would receive any messages passed to it via the Fleet broadcasts, any messages for the ship passed by visual methods from the Yard towers, and any communication for them on the 355 or 2716 kHz ship frequencies. DCC supplied these vessels with clear copies of all general messages and basegrams. The DCC, YCC and communication centers of Type Commanders rendered various communication services to Navy ships present in the harbor.

Merchant, Army and Allied vessels in the harbor were permitted to cease all communication watches and receive messages "over the counter" from the Communication Office or the Port Director. Upon leaving Pearl Harbor all ships manned harbor frequencies and resumed their normal radio guards when twentyfour hours at sea. Merchant, Army and Allied ships in the Honolulu Harbor were served by an Assistant Port Director at the Aloha Signal Tower.

In February 1942, the Hawaiian Sea Frontier, an organization to perform all operational functions of the 14th ND under the administrative and technical control of CINCPAC, was established and the Commandant of the 14th ND was placed in command. Commander Hawaiian Sea Frontier was a higher military title than Com14 and the responsibilities of the DCO officially became "additional duties" of his new position. The Communication Officer of the Hawaiian Sea Frontier supervised personnel and operation of facilities to provide communications for inshore patrol, air sea rescue, defense air and naval forces, liaison with Fleet commands and liaison with the Army. He had cognizance of communication facilities which enabled him to plot the movement of all aircraft, ships and submarines in the Hawaiian Area. Aliamanu Crater was selected as the Hawaiian Sea Frontier Communications Center. In December 1942, transfers of personnel and radio material by the Navy to the Crater "were completed," and the Crater soon maintained watch on more than a score of important radio frequencies. As soon as

the Crater was in full operation, it had a coding board of nineteen officers. Prior to the establishment of communication centers for various type commanders, for ComHawSeaFron and Joint Operations Command, and for the Commandant of the Navy Yard, practically all naval communications required for the Navy Yard and the District were provided by DCC, NAS Pearl and Wahiawa. "JOC (Aliamanu Crater) communications" as Com14 observed, "cannot be entirely separated without unnecessary duplication of personnel and equipment." So the District Communication Office continued to serve as a District Communication Center and Aliamanu Crater operated "to coordinate communications of the Frontier and CINCPAC, the Army and the outside world." The nature of the relation between ComHaw-SeaFron communications and District communications is illustrated by the fact that the two centers oftentimes divided operational despatches to be handled on a fifty-fifty basis. The largest of the section bases was Bishops Point, a ComHawSeaFron activity, which maintained a communication center to provide basic communications with small craft and patrol craft in the Hawaiian area.

After an investigation early in 1942, the District Communication Officer found that communications with the Army had failed, as vital information needed by both was "incomplete, misleading, erroneous, unfamiliar.....and its delivery marked by long delays." Communication facilities for the Hawaiian Sea Frontier and Joint Operations Command were installed by the Navy at Aliamanu Crater, which was Army property. The Army and the Navy had communication personnel in separate rooms at the Crater early in 1942, but the communications long remained inadequate and inefficient, and efforts to convert it into a joint communications center were "haphazard." Cooperation achieved at the Crater proved to be of definite value to Pacific communications, but it was late in 1944 before the Crater functioned effectively. Eventually communications between the Army and the Navy became closely allied but remained separate.

In peace times, communications for merchant ships were provided by commercial companies. After the beginning of the Pacific war this job was taken over by the Navy. The Port Director at Pearl Harbor and an Assistant Port Director at Honolulu (Convoy and Routing Officer of Honolulu) directed this phase of naval communications for 14ND. Wahiawa, signal towers and Coast Guard stations supplied the means of communications, and the DCC handled the coding work, much of which was eventually done at the Crater. For normal communications merchant ships called up Wahiawa or a Coast Guard station on the distress frequency then transmitted on 468 or 425 kHz while at sea. At scheduled hours these vessels copied the International BAMS broadcast, transmitted from Wahiawa. BAMS messages for the area were drafted for the Port Director by the DCC or the Crater, broadcast by Wahiawa, and repeated by other BAMS stations of the district. But many merchant ships had only one operator to perform many duties, and the BAMS schedule was frequently interrupted to transmit submarine messages. Better service was rendered by the institution of the Haiku FOX broadcast for ships copying BAMS, by the establishment of a separate submarine broadcast, and by the broadcast of BAMS schedules from each of the Line Island naval radio stations and from the Coast Guard radio station in Honolulu. BAMS stations maintained a continuous watch of the distress frequency and passed despatches and distress calls to the Crater via Radio Honolulu. Merchant, Army and Allied ships copied BAMS and held class two Navy publications.

In accordance with Communication Instructions, major considerations in the construction of the 14th Naval District system of communications were reliability, speed, accuracy and security. Apparently the principal consideration was security. Otherwise existing commercial facilities and personnel could have been utilized to a much greater extent in passing Navy despatches. In 1941, none of the commercial radio stations was incorporated into the Navy system, and none was earmarked for use other than in an emergency. Facilities of the Mutual Telephone Company were paralleled by Navy controlled landlines in order that Navy communication would be entirely separate and be operated and maintained by service personnel. ("The very nature of the Pearl Harbor attack involving espionage and treachery," threw a pall of suspicion on all civilian activities. Contributing also "to the non-usage of commercial activities" were that the Navy lacked personnel to guard scattered commercial facilities, which were accessible for sabotage; and confusion resulting from Army martial law).

Lt. Porter: "Radio stations of the district were inextricably involved in the offensive warfare waged by American forces of the Pacific. Tarawa was the first major invasion for which Radio Wahiawa provided communication service. According to communication operation plans, radio silence was maintained by all ships until landing was in progress. From his flagship, the Senior Officer Present Afloat contacted a joint communication center as soon as it could be set up on the island. Communications between the Tarawa shore unit and Wahiawa were then established on previously prescribed frequencies. All traffic sent to the Tarawa shore station by Wahiawa was sent to the SOPA and Wahiawa placed the same despatches on the Primary FOX broadcast."

"As a result of advances made by the armed forces, circuits were established with Tarawa (December 1943), Eniwetok (February 1944), Majuro (February 1944), Kwajalein (February 1944), Hockwan (June 1944), Saipan (June 1944), Guam (August 1944), Palau (September 1944), Leyte (November 1944), Ulithi (December 1944), Luzon (January 1945), Manila (February 1945), Iwo Jima (March 1945), and Okinawa (April 1945). Some of these circuits were established on a temporary basis as communication was with an AGC (communication headquarters ship) in the harbor or with an Army shore radio station. A number of direct circuits were discontinued after a few months of operation. A manual duplex circuit was set up between Wahiawa and Manus (NTF) when the naval base was completed in July 1944. It was soon necessary to shift to another Boehme as NRS Manus became a major naval radio station. When the small islands of the Pacific fell into American hands, communicators immediately set up a continuous watch on the Secondary Fleet broadcast, and large radio stations copied the Primary, the Secondary and the Haiku Basegram schedules."

Sufficient high frequency transmitters were in operation by 10 October 1944 to establish the Submarine or Peter FOX. (A VLF transmitter at Haiku was paralleled with several high frequencies). This broadcast was planned and carefully directed by the Commander of Submarines in the Pacific. Despatches were broadcast to submarines at hours when reception conditions were best and all despatches were later repeated. At other hours, news items, weather reports and administrative traffic was transmitted. By close cooperation with Wahiawa, by repeating traffic, by special care in preparing messages and by requiring frequent and complete data on every unit, SubPac maintained a high standard of naval communications. (Beginning in January 1945 all Wahiawa FOX broadcasts repeated some traffic).

Beginning in November 1944, many Basegrams were transmitted by a special broadcast. Naval radio stations throughout the Pacific thereafter intercepted basegrams from the Haiku Basegram schedule and made delivery to addressees in their respective areas. From March 1945 until July 1945, a special Haiku William FOX carried despatches for the Third Fleet.

Lt. Porter: "When CINCPAC shifted his headquarters to Guam in early 1945, a high speed, point to point circuit connected Wahiawa and Guam. Wahiawa Primary, Secondary and Submarine broadcasts were automatically re-broadcast by Guam. (At the end of the war, Guam was re-broadcasting only the Primary FOX). In 1945 Guam relieved Wahiawa of several point to point circuits, but it was not until the last few weeks of the war that many activities afloat were served exclusively by Radio Guam or in many instances by Radio Manila (NPO). Advanced Headquarters JCA Guam worked invasions, beginning with Iwo Jima and Wahiawa established a circuit with the SOPA's communication headquarters ship immediately after invasion began in order to take over in case of casualty to Guam."

On 14 August 1945 Wahiawa operated multiplex point to point circuits with Washington, San Francisco and Guam; manual duplex with Manus; manual simplex with Tutuila, Canberra, the Line Islands; and ship to shore circuits; radio teletype duplex with Kwajalein; automatic keying at a rate of 18 to 27 WPM on four major broadcasts;

and relay circuits with Saipan, Noumea, Eniwetok and Okinawa via Fort Shafter, the Army Communications Center. Line Island circuits were shifted to Wahiawa in June 1944 and the Tutuila circuit was re-established in July 1945. (NPM daily operating schedule, 1 August 1945).

At Wahiawa there were 101 receiving positions, eight of which were operated in connection with diversity equipment. To propagate despatches there were 87 transmitters two at Haiku; ten at Heeia and 75 at Lualualei. These transmitters covered the spectrum from the very low frequencies through the intermediate and high frequency levels, which provided good coverage of the area from Washington to the most distant points of the Pacific. By use of a wide range of frequencies, transmitted broadcasts were received despite the location of the ship or the hour of the day. (NPM daily operating schedule, 1 September 1945).

In an effort to handle the problem of traffic, on 1 November 1944, FOX broadcasts were rearranged. Thereafter, the Primary FOX was copied by ships of the CVE, DD and DE classes and later the DM class was given the privilege. Ships of the AGC, BB, OBB, CA, OCL, CV, CVB and CVL classes and all Flag Officers Afloat copied both Primary and Secondary FOX. Submarine FOX was guarded by all vessels and units under the operational control of the Commander of Submarines in the Pacific. Other units afloat intercepted the Jump FOX. Island bases from the Marianas eastward discontinued guard of the Jump and received official despatches via point to point circuits. New island objectives copied Jump until directed to do otherwise. Four one hour periods were scheduled on the BAMS Haiku FOX for merchant ships Allied ships and Army ships. Basegram centers were established at Pearl Harbor, Eniwetok, Kwajalein, Majuro, Tarawa, Guam, Saipan and Ulithi to pass basegrams to all units in their respective areas. Eight naval activities on the island of Oahu continued to copy the Primary and seven the Secondary.

Serious delays in passing and delivery of despatches to CINCPAC and other commands resulted in a thorough investigation and "drastic changes," during the final month of the war. On 1 August 1945, once more an effort was made to organize the Wahiawa Fleet broadcasts so that important operational despatches could be passed to Fleet units without delay. Despite reforms, backlogs on FOX broadcasts caused delays which were serious and admittedly high.

ALPAC 479 provided that on 1 August 1945 the Primary should be known as the "Task Commanders FOX" and be guarded by Commanders of Fleets, Task Forces, Task Groups, Battleship Squadrons, Battleship Divisions, Aircraft Carrier Divisions, Cruiser Divisions Service Squadrons, Service Divisions, Amphibious Groups and Minecraft in the Pacific. All other surface craft in the Pacific and commanders were to copy the Secondary (Jump) FOX now to be known as the "Ship FOX." Except when definitely notified that they were receiving on the "Ship FOX" - "it was considered safe" to deliver British messages via the Task Commanders FOX.

The traffic load of the District varied considerably over the year 1944, but the general level was much higher than in 1943. In the early part, over half of it was to or from the Commanders of South and Central Pacific. The greatest amount of operational traffic was routed via Task throughout the duration but by the end of 1944 the Ship FOX had a backlog of important despatches requiring more than twentyfour hours to transmit. As a general rule the most experienced operators of the Fleet received Task on which more than 225 operational despatches were delivered each day. In 1944 and 1945, despatches, if not operational, were removed from FOX broadcasts and sent via the basegram schedule, point to point, or mailed. Practically all messages except operational despatches and those which could go over point to point circuits were converted into mailgrams.

The British Fleet in the Pacific increased in size and by early 1945 was a source of considerable traffic for the 14th ND and the FOX broadcasts. Most of the Fleet was

serviced by point to point circuits to British stations which relayed the despatches to British ships, but many British units ashore and afloat were served by Wahiawa. During the last few months of hostilities, the routing of combined communications through the regular channels of the 14th ND continues to increase.

During each month of 1945, between 15 and 20 million groups were routed via 14th ND communication activities. To cope with the increased traffic, changes were made in the type of equipment used. High speed automatic keying (Boehme) which is capable of speeds as high as 250 to 350 WPM, was gradually superseded by radio teletype at Wahiawa. Four 60 WPM teletypes could be used on a single radio channel using multiplex equipment. The added reliability of radio teletype was due largely to the development of space diversity receiving equipment. (Modern equipment now being installed (Single Side Band) will permit usage of twelve teletypes on one circuit over one transmitter to pass six messages simultaneously in each direction.)

In District communications at the close of the war there were a total of 197 officers and 1132 enlisted men. These figures do not include air stations, weather central, HawSeaFron, Port Director, Merco Pearl, RPIO, Censoring, Post Office, Yard Communication offices, Coast or Marine activities. Due to the growth of Guam there was a slight decrease in total number of circuits maintained and in total number of operators and communicators in the district. In June 1945, DCC handled 14,760 unclassified messages and 478,050 groups of classified traffic. From 7 December 1941 to 14 August 1945, radiomen at Wahiawa handled approximately 5,600,000 messages and 400,000,000 words.

By the end of April 1945, many Wave operators and communicators were in 14th ND communications. In August approximately 25 percent of the entire complement was Waves. They were assigned to activities on Oahu, Hilo and Maui. Waves were usually experienced Navy operators, communicators or yeomen, and the period of time required for them to become of material assistance was much less than required in previous groups of personnel.

In October 1944 there were 163 machines employed on sixtytwo Navy landline circuits on the Island of Oahu. The number of teletypewriters increased appreciably each month. Most of these were Type 14 and 15 devices but the Type 19 displaced other types on a few local circuits. An automatic switchboard for teletypewriters was set in operation early in the war to give flexibility to the landline system, but it was too small to be of great value. In May 1945, ten BD-100 switchboards, manually operated, were installed and provided an efficient teletypewriter exchange. For reasons of security, several landline circuits were not connected to the exchange. This innovation facilitated traffic, provided greater flexibility, released a number of teletypewriters seriously needed by smaller communication centers, effected material improvement in liaison communications with the Army, and eliminated considerable duplication of effort.

Clear copies of confidential and secret despatches frequently passed between Wahiawa and CINCPOA on a CSP1515 scrambled circuit, the only one of its kind in district communications. The latter controlled lines over which messages were often sent to eight other addressees without additional handling by coding boards. Relay service was rendered by CINCPOA if that activity was addressed; otherwise many despatches were transmitted by various landline nets from Wahiawa to be deciphered by several different coding boards. Aliamanu Crater and JACSPAC radio stations were loaned scrambler equipment by the Army.

Lt. E. A. Tucker: "As late as April 1945 there was a 'total lack of reperforators,' and only a small supply of improved types of terminal equipment. Manual handling and retyping were required to send despatches from one loop to another. All page copy from an off-island circuit was perforated by hand when sent on local loops, and page copy from island loops was repunched by hand for the radioteletype circuits of the district. Plain language traffic, as a general rule, was passed by messengers unless activities were joined by Navy owned landlines on Navy property."

The most important development in air communications was the commissioning of NAS Honolulu (1 January 1944) at a newly constructed air field adjacent to Keehe Lagoon and Army and civilian air transport fields. By 1944 there was a large number of naval transport planes. NAS Honolulu soon passed 15,000 words per day in official despatches, 85 percent of which were operational, to become the largest communication center for naval aircraft of the district. The Naval system of air communications was joined with the Army's to establish NAS Honolulu as a Joint Air Communications System for the Pacific.

Lt. Tucker: "JACSPAC was established in 1944 and 1945 at NAS Honolulu, Palmyra, Midway and Johnston. The Official Communication Bulletin states that 'JACSPAC is a function of the Army Airways Communication System, but it is augmented by naval personnel and equipment so that it can operate with either service.' Army Airways Communication System was developed by the Army in the European theater and transplanted to each of the Pacific islands. In developing the system, the Army made ample provision for terminal and central office equipment necessary for its operation. As a result of its experience and facilities, the Army moved operational traffic with sufficient speed to keep ahead of airplane arrivals. Naval operational despatches concerning the movement of aircraft on trans-oceanic flights was sent in a joint code, via Army equipment and channels. With the exception of Johnston, these facilities were operated primarily by Navy personnel, under the direction of the communication officer of each naval air station. Administrative traffic was propagated via regular Navy communication systems. The Navy also provided air to ground communications at the naval air stations."

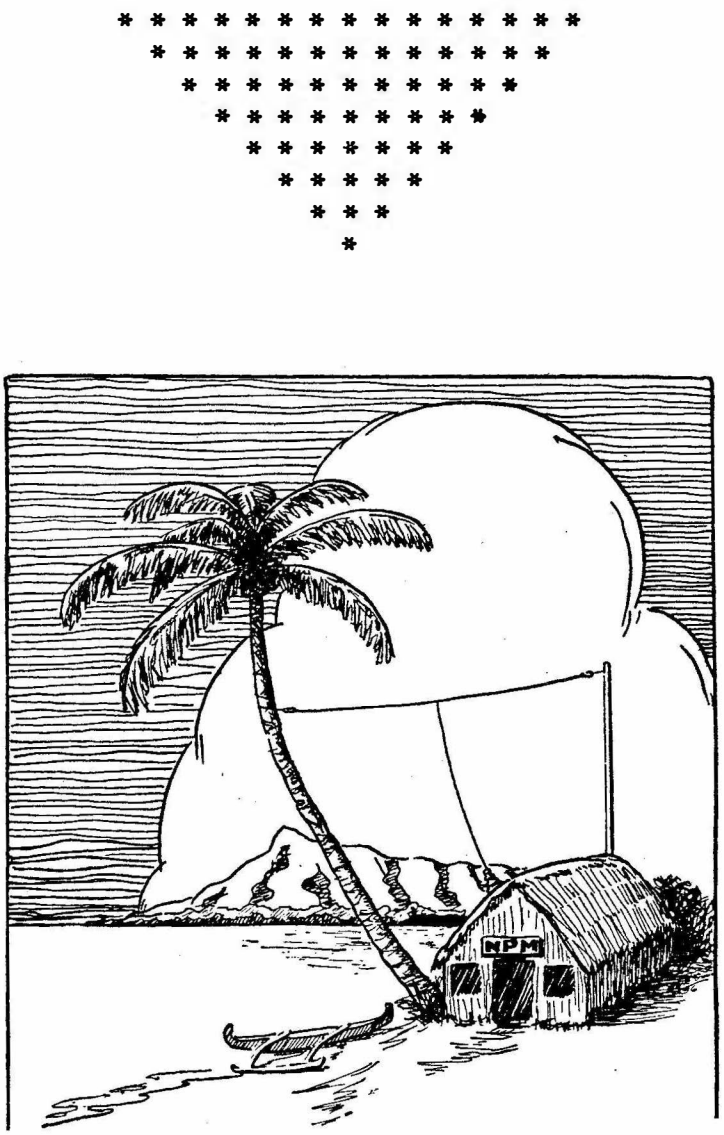
On 1 September 1944 a MERCO office was established at Pearl Harbor, the last of major developments in the decentralization and specialization of communications in the district. This activity was responsible for receiving and re-transmitting traffic associated with the control and movement of merchant vessels, landing craft and naval auxiliaries (traveling independently or in convoy), and for making summaries and reports of its information and operations to cognizant Army and Navy commands and other MERCO offices. Heretofore, the central MERCO office of the Pacific at San Francisco, served the Hawaiian area and DCC supplied the necessary communication facilities and personnel for handling MERCO messages for the district. MERCO Pearl was first located at the District Communication Office, but after a few weeks, the new activity was relocated in a separate office in the Administration Annex. Work for MERCO Pearl increased rapidly and by the end of the war it was served by a coding board of 36 officers handling 573,570 groups and 7,600 despatches.

* * * * * * * * * * * * * * * * *

In April of 1945, a board of experienced Naval communicators and radio engineers representing the Chief of Naval Operations arrived in Honolulu to make a survey of communication facilities of this area and to formulate plans for the consolidation of the shore, Fleet, aeronautical, intelligence and security communication activities..... ....."covering equipment, building, housing, and logistics concerning naval communications and personnel." As the committee observed, the muchroom growth, lack of proper equipment, and the need for quick operations had led to overlapping and duplication. Definite plans for consolidation of naval communications on the island of Oahu were drawn by the committee and a beginning was effected immediately. By July 1945, the teletypewriter exchange was in operation; personnel was available; better landline service was in use; and a supply of reperforators, scramblers and commercial terminal equipment was on hand or scheduled for delivery to the district. (Single Side Band equipment was placed in operation in September 1945).

On 1 July 1945 a major change in systems and procedures was initiated to accelerate the delivery of despatches among district centers and between the 14th ND and the

mainland. On all messages involved in the system (NTX) a geographical or direct routing indicator was employed which expedited delivery of a message to addressees. Originator and addressee appeared in plain language. By the inauguration of the NTX system (torn tape) messages were routed and passed quickly over modern and improved equipment. It was a simplified system and served to fix responsibility on the originator and addressee for all servicing. The NTX center was established first at Wahiawa and then at Pearl Harbor. A number of Waves experienced in the system were assigned to watches on the NTX circuits. Approximately one hundred operators and technicians were given instructions before operations commenced in July 1945.



The lists of personnel included in this appendix were obtained by the historian of the Old Timer Communicators (OTC), John W. Trott, from Christmas cards and other documents provided by members, and others. Some lists were compiled strictly from names recalled by shipmates. Others were provided with group photographs included in the appendix.

The historian has researched the names to include first names or initials, Bellevue, San Diego, WORES and Electronic Maintenance schools class numbers, the ranks or rates at which the men retired from service and dates, their current status (living or deceased, when known) and any other pertinent data that would be of interest to OTC members and other readers.

Members and others who happen to read this history can help to augment these lists by searching their scrapbooks and their memories for any records, including Christmas cards, of officers and men who served in communications at any Naval shore communication station or any Naval ship.

Readers are also invited to contribute (or loan) additional material for these histories including, but not limited to, personal recollections (sea stories), with dates, of their experiences in Naval communications. Of special interest are lists and photographs of personnel, photographs of early equipments, buildings, towers, antenna systems, etc. If possible, identification and dates of photo subjects should accompany each photo.

Please send such material either to the Old Timer Communicators historian, John W. Trott, 4512 Pescadero Avenue, San Diego, California, 92107, or to George B. Todd, 822 La Salina Place, Oceanside, California, 92054. Indicate which items are to be returned to you.

NRM RADIO WAILUPE (CONTROL) — 1919-1921

RMS Cl#	Name	R/R	Retired
	ADAMS, "Hook"	RM2	
	ESTES, N B "Red"	CRM	
	†FALK, V H	CRM	
	†FICKAS, Wilbert R	RM2	Ltjg'50
	GOTTLIEB, William	RM	CWO2'43
	HARRIS, E L	CRM	
	MERRILL	RM2	
	OAKES, Willie	CRM	
	†PHELPS, Harold B	CRM	Lt '46
	RABORN, D O	CRM	
	†RAGUET,,Edward C	Lt	Capt'47
?SD3	SCOTT, Oren H	CRM	
SD9	SPENCER, William C	RM2	Lt '50
	SPICER, C R	RM2	
	TICHENOR, W G	CRM	
	TILFORD, Ray	CRM	
	†WALKER, Lewis W "Waco"	CRM	RMC '47
	WESTLAKE, Victor H	CRM	
	WILLIAMS, H P	CRM	
	or		
SD5	WILLIAMS, H F	CRM	
	WINDSER, L R	CRM	
	†WORLEY, Homer	CRM	CWO?'4?

†Deceased
MEMBER OTC SoCal and/or NorCal 1985 or earlier.

From a list and picture notations provided by Phelps, to be expanded (hopefully) by others. San Diego class numbers, if known, added for cross reference. Any errors in first names are those made during continuing research.

14th NAVDIST COMMUNICATIONS — May 1923 to May 1925
Wailupe, High-Power, Heeia, AD, NPH
(Partial list only)

RMS Cl#	Name	R/R	Retired
	‡ADLER, Nathan	CRM	RMC '??
	ANDREWS, R M	RM3	
	BECK, Robert C	RM	
	BERGERON,	RM	
	BLIZZARD?	CRM	
	‡CHAUNCEY, Dorman A	CRM	CWO2 '42
	‡CONNOR, Cecil B	RM3	CWO2 '51
	DAVIDSON,	RM1	
	DRAUCKER, Dave	RM3	
	‡DUNSON, Barnarr A	RM3	‡10-8-44 Ltjg
	DOBYNS, C Bruce	RM	
	‡DYE, Harold Marcus	CRM	Lt '50
	EIDOM,	RM3	
19	ENGLEMAN, G R ??	RM3	
	FAIRWEATHER, J W	RM3	
	GELL, Charles F	RM3	
SD10	‡GLEVANIK, John J	RM3	Lt '??
	‡GLYNN, Michael Joseph	RM	
	‡GREEN, Douglas S	CRM	‡8-30-34 CRE
SD4	‡GREEN, Wallace V	RM3	RMC '5?
	GRIGSBY	RM3	
13	‡GUEST, James L	CRM	Lt '45
	HARRIS, Erwin Leroy	CRM	RMC '46
	HELQUIST,	RM	
18	HIGHSMITH, Clifford	RM3	CWO2 '52
	JARSON,	CRM	
	JOHNSON,	RM3	
	KENT, Harrison E	RE	Resig '26
	LANDIS, John T	RM	
	‡LAVELLE, William R	CRM	‡CRE 11-16-39
	‡LOFTIN, Frank	Lcdr	Capt '44
	LONG, (unsure)	CRM	
	McNALLY,	RM	
	MOLLER,	RM3	
	MOUNTAIN, C E	CRM	
	OAKES, "Willie"	CRM	
SD4	‡PALMER, Glenn E	RM2	
	‡PARSONS, Charles J	CRM	CWO2 '47
	‡PROFFER, John W	RM	Lt '49
	QUIRK,	RM	
	RICHARDSON,	RM	
	SNOW,	RM3	
SD9	SPENCER, William C	RM1	Lt '50
	SPICER,	RM	
	‡SPUHLER, Edward J	Lt	Lt '33
SD4	‡SWISHER, Grant D	RM1	
	TANZER,	CEM	
	TILFORD, Ray	CRM	
SD9	TODD, George B	RM2	Lt '52
	VIALL, H M	CRM	RMC '??
	WAGNER,	RM	
	WEIDEMAN,	CRM	

‡Deceased
MEMBER OTC SoCal and/or NorCal 1985 or earlier

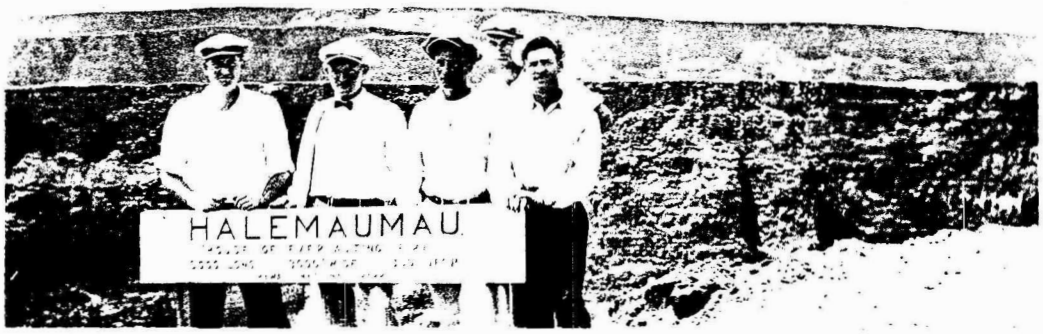
Names and highest rates from list provided by Todd as recalled from his tour at High-Power and Wailupe. San Diego and Bellevue class numbers added for cross reference. Any errors in first names are those made during research.

14TH NAVDIST COMMUNICATIONS — May 1925 to Nov 1926
Wailupe, Heeia, Hilo
(Partial list only)
Names NOT appearing on lists: May 1923 to May 1925
Apr 1926 to Apr 1928
or Dec 1926

RMS Cl#	Name	R/R	Retired
SD7	†ALLEN, Clarence W "Pop"	RM1	
	CASSIDY,	RM3	
22	COLVIN, William H	RM1	CWO2'50
15	COONCE, Orville C	RM2	CWO2'46
	DAVIDSON,	RM1	
20	ENGLISH, E Dudley	RM2	Lt '50
	FIKE (see FICK 12-26)	RM3	
SD6	HUDJOHN, Alexander	RM2	Cdr '53
	KANE	CRE	
	or		
	KENT (see '26-'28)	RE	
	LANDIS, John T "Tubby"	RM3	CWO2'46
	LaVELLE, William R	CRM	†CRE 11-36-39
	MANIS,	CRM	
	†McCUTCHAN, Will R	RE/CRE	LCdr'46
	PAULSON, LeRoy D	RM2	
	PEBBLES, P B	RM2	
	(see Gordon 12-26)		
SD7	†ROGERS, Jasper C	RM1	CWO2'50
	SULLIVAN,	RM2	
	VANN, A T	RM2	

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.

From names recalled by Colvin. San Diego and Bellevue class numbers, if known, added for cross reference. Any errors in first names are those made during research.



HILO, HAWAII, June 30, 1926.
Left to right: CRM Parsons, RinC NPH; RM1 Colvin (on leave from NPM); RM2 Mohler, duty NPH; RM2 Yaws, duty NPH; SC2 Kelly, duty NPH.

NPM RADIO WAILUPE (CONTROL) -- Dec 1926

RMS Cl#	Name	R/R	Retired
	ADAMS, Thomas H	RM1	
	†ADLER, Nathan	CRM	RMC '??
	BAIRD, Freeman A	F2	
	BEIDEMAN, Addison W	RM2	
	BERTONCINI, Alfred F	RM3	
	†BLACKARD, Willard D	RM3	CWO2'54
	BROWN, Urbin S	S1	
	CALVIN, Troy E	RM3	
	†CHAUNCEY, Dorman A	CRM	CWO2'42
	CLARK, Clarence M	Y2	
	COWART, Walter G	Y2	Lt '47
	†CROWELL, Zenas	CMM	CWO2'45
	EVANS, G L	CEM	
	FICK, Charles T	RM3	
	†GALLAGHER, D McK	CRM	CWO2'??
	†GRAY, Lloyd R	Lcdr	Capt'45
	GRIFFITHS, J C	RM1	
	HAMILTON, E C	CEM	
	HARCOURT, Garrett M	RM3	
	HILL, Francis V	Engl	
	HOLSAPPLE, James R	Y3	
	†HOVILLA, Richard J	RM1	
22	†HURST, Edward L	RM3	CWO2'54
	ISLEY, Donald D	PhM1	Ltjg'49
	†JOHNSON, Francis H	RM3	RMC '??
	†JONDREAU, Romeo J	Lcdr	Lcdr'36
	†KUSTEL, Alexis O	Lt	Capt'47
	LAVALOUIS, Ramond E	SC1	
	LLOYD, Joseph W	RM2	
	LOGAN, Herman L	RM2	
	McCAUGHEY, Omer L	RM2	
	McCLANAHAN, Lewis A	RM3	
	McCLELLAND, Thomas A	RM3	
	†MILNES, Russell E	CRM	CWO?'4?
33	MISEMER, Ernest L	RM2	CWO2'54
	PEBBLES, Gordon	RM2	
	PHILLIPS, Willis F	RM2	
	PINKHAM, Edward L	S2	
	POTTER, Laurence F	RM3	
	PUNINI, Joseph	S1	
	ROZUM, Charles F	RM2	
	RUCKER, F	CRM	
	STEPHENSON, Frank W	RM1	
	STEVENS, Andrew J	RM3	
	STOKES, Albert J	SC1	CWO2'47
	†TUTHILL, George F	RM2	CWO2'53
	WALKER, Winton W	RM2	
	WILANE, Paul V	RM3	
	YAWS, Robert A	RM2	

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From a copy in the OTC archives of a Xmas card belonging to Blackard. Bellevue class numbers, if known, added for cross reference.

14th NAVDIST COMMUNICATIONS — Apr 1926 to Apr 1928
Wailupe, HU and AD
Wailupe at Dec 1926 on separate page.

RMS Cl#	Name	R/R	Retired
	BUZZARD,	CRM	
25	†COLE, Wm Lafayette	RM1	CWO?'4'
	DEPEW, William K	PhM1	
20	ENGLE, Raymond C	RM1	CWO2'52
	†FARLOW, Alvin A	RE	CWO2'43
	HAMMOND,	CRM	
	†JUSTUS, U S	RM1	
	KENT, Harrison E	RE	Resig'26
	REDDEN, William W	RM2	
21	†REED, William A	RM2	Lt '54
	ROTTSOT,	Y1	
	SCHULTZ, Roy	RM1	
	SHARP	S1	
	SHAW,	MM2	
	SHAW,	RM2	
	or		
23	SHAW, Harvey C	RM2	CWO2'52
17	TERREBONNE, Thomas L D	RM1	ACRM'45
19	†WUNDER, William B	RM2/1	Lt '53

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From names recalled by Wunder. For carryover of some names, see 1928 to 1930 list, from memory, in the OTC archives. Bellevue class numbers, if known, added for cross reference.

NPM RADIO WAILUPE (CONTROL) -- 1928-1930

RMS Cl#	Name	R/R	Retired
SD6	‡ANDERSON, Leonard L D	RM1	RMC '46
	BARBER, Earl	RM	
	‡BOYLE, E "Pop"	RM1	
	‡CALDWELL, Elmer R	CRM	CWO2'42
	‡CHILDS, Roy (from Nov '30)	CRE	Ltjg'37
	‡CLARK, Ernest L or	RM1	
	‡CLARK, Ernest Emil	RM1	
	‡COMAN, Robert G	Cdr	Como'46
	‡CONNOR, Cecil B	RM1	CWO2'51
	DAMBLEY	RM	
	DEXTER, H B "Red"	RM1	
	‡FARLOW, Alvin A (from Feb '27 to ??)	RE	CWO2'43
	‡FISHER, P F "Pop"	CRM	
25	‡FOSS, Frank L	RM2	Lt '53
	FRANCIS, Stanley	CRM	
	‡GREEN, William Vernon	RM2	RMC '??
	GRIFFITH, G W	RM1	
	‡GUSTAFSON,	RM1	
	HAMMOND,	CRM	
	‡JUSTUS, U S	RM1	
	‡KUSTEL, Alexis O (rj'd Coman)	Lt	Capt'47
	‡LUCAS, William R	RM2	RMC '??
	McAFEE, Charles L	RM2	
	McCLELLAND, Thomas A	RM2	
SD6	‡McKILLOP, Oliver S	RM1	Lt '51
	‡McLIN, J L	RM1	
	McNAY, N L	RM3	
	McVICKER, G B or	RM	
	‡McVICKER, George R	RM	RMC '45
33	MISEMER, Ernest L	RM1	CWO2'54
	MULLINS, Grover	RM2	
	‡PERRY, Joseph A (May '29 to May '31)	CRE	CWO?'39
	STEINER, Joseph A	RM1	
	‡VOLKMANN, William J (Nov '28 to Dec '30)	CRE	Lcdr'47

‡Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

Names of RM from list provided by Lucas, relying on memory. (For carryover of some names, see lists '26-'28 and '30-'31, both from recall). San Diego and Bellevue class numbers, if known, added for cross reference. Any errors in first names or initials are those made during continuing research.

NPM RADIO WAILUPE (Control) -- 1930-1931

Names NOT appearing on lists for 1928-1930 (from memory) and Dec 1931, which see.

RMS Cl#	Name	Rate	Retired
	ADAMS,	RM2	
	ANDREWS,	RM1	
	†ARCHIBALD, Gerald L	RM1	
SD9	†ATKINS, John Bunyan	RM1	
6	ATKINS, "Tommy"	RM1	
	BAILEY,	RM2	
	BLANTON, "Joe"	EM2	
	BRIGHTMAN, Raymond B	CRM	LCdr'50
	BUZZARD, (at HU)	CRM	
	CHANG,	SC1	
	CHATFIELD,	Sea	
	CHESTNUT, Chas Benny	RM2	
	CHURCH, "Pat"	RM2	
	DAVIS, "Spic"	RM1	
	†DUBE, A A	RM2	
	EDWARDS,	RM1	
	FAILER, Vernon L	RM2	
	†GALLAGHER, Donald M	CRM	CWO2'??
30	†HARKER, Lewis S	RM2	RMC '??
	HOWARD,	CRM	
22	†HURST, Edward L	RM2	CWO2'54
15	HURTADO, Leon M	RM1	
	†KIEPLER, John T	CRM	Lt '46
	KING,	RM2	
	LOOMIS, "Whitey"	RM3	
	†LYNN,	RM1	
	PARCH/PARTCH,	RM3	
21	†REED, William A "Red"	RM2	Lt '54
	REESE, "Jerry"	RM3	
28	†REISS, Mathew C	RM2	Ltjg'53
	SANDERS,	RM2	
22	†SHRYACK, Louis A	RM1	LCdr'54
	SMITH,	RM3	
	STEVENS, L B R	RM2	
31	STOUT, Russell L	RM3	CWO4'58
	SWAFFORD,	PhM1	
23,30	TARRANT, Hubert "Joe"	RM2	RMC '40
	VIALL, H M "Pop"	CRM	
	WHITNEY,	RM2	
	WILLIAMS,	RM1	
19	†WUNDER, William B	RM1	Lt '53

†Deceased.
MEMBER OTC SoCal and/or Norcal 1984 or earlier.
ADDRESS on hand in 1984.

From names recalled by Blackard, Connor, Sams, Stout & Tarrant. Bellevue & San Diego class numbers, if known, added for cross reference. Any errors in first names are those made during research.

NPH RADIO STATION HILO — Dec 1930

Name	Rate	Retired
BROOKS, J H	RM3	
CURRAN, T A A T in '31	SC2	
DEXTER, H B	RM1	
†LONG, John A	CRM	†RE 7-11-44
KUNEY, C A	RM3	
McNEEL, W L	RM1	

†Deceased.

From a Xmas card donated to the OTC archives by Stoddard.

NPH RADIO STATION HILO — Dec 1931

RMS Cl#	Name	Rate	Retired
	CURRAN, A T T A in '30	SC2	
	†HUBBARD, Arthur G	RM3	CWO2'57
	†LONG, John A	CRM	†RE 7-11-44
	LOWE, Jack	RM2	
SD10	†SELL, Robert	RM1	CWO2'53
31	STOUT, Russell L	RM2	CWO4'58

†Deceased.
MEMBER OTC SoCal 1981 or earlier.

From a copy in the OTC archives of a Xmas card belonging to Stout, plus name of his relief. San Diego and Bellevue class numbers, if known, added for cross reference.

Later years:

From District Xmas cards:

1934	ALVERSON, George D CRM and DONEGAN, Thomas A RM2.
1935	BRADFORD, Raymond H RM1
1936,1937	MULLINS, Grover RM1
1938,1939	MURRAY, Arthur F RM1

Note: The U. S. Naval Radio Station at Hilo was dismantled early in 1942.

NPM RADIO WAILUPE (CONTROL) -- Dec 1931

RMS Cl#	Name	R/R	Retired
SD6	†ANDERSON, Leonard L D	RM1	RMC '46
20	†ATNIP, Floyd C	RM1	LCdr'54
	†BLACKARD, Willard D	RM2	CWO2'54
7	BOWEN, Frederick T	RM1	LCdr'51
	BRIDGES, Joe L	RM2	WO1 '52
	BRINDLE, Michael P	RM1	RMC '
23	BROUSSARD, Luke H	RM2	
	BROWN, Roy E	RM3	Lt '59
	†CHILDS, Roy	CRE	Ltjg'37
29	CLOUGH, Harold E G	RM1	CWO2'53
	COURTNEY, Townsend C	PhM1	Lt '50
	DAVIS, Jesse J	RM2	CWO4'59
	DESMOND, J H	S1	
32	†DONEGAN, Thomas A	RM2	LCdr'53
	EDWARDS, Joe R	CRM	CWO2'50
20	ENGLISH, E Dudley	RM1	Lt '50
	FLYNN, J B	RM2	
	FRAZIER, Alvin K	RM2	
	*GARDINER, George E	RM2	*RM1
	†GILPIN, Selby A	CEM	Lt '47
29	†HASTINGS, Robert W	RM2	†4-12-42ACRM
	HERRIOT, C W	RM2	
SD6	HORSLEY, Grant E	RM1	LCdr'53
	†INGRAHAM, Charles N	LCdr	Capt'59
	KEB, H W	MM1	
	KUNER, Joe F	SC1	CCStd'38

RMS Cl#	Name	R/R	Retired
SD7	†LEWIS, Ernest P	CRM	
	LONG, R W	SC1	
	LOOMIS, Jack C	RM2	
	LOWE, Jack J	RM2	
SD7	MacKAY, Allan G	RM1	Lt '53
	†MAGARIS, Paul L	RM1	†10-31-41CRM
	†MANRY, John T	CRM	Lt '46
	MORROW, Melvin D	RM1	CWO2'52
	MOUNTAIN, C E	CRM	
	MULLINS, Grover	RM2	
7	†PARKS, Paten E	CRM	Lt '49
18	†PETERSEN, Harry T	RM1	CWO2'53
	PRICKETT, Willie L	Y1	Ltjg'50
20	†ROLFSNESS, Edwin	RM1	CWO3'55
6	SAMS, George O	RM1	Lt '52
SD9	†SCHMIDT, Cyrenus I	RM1	WO1 '52
29	†SCHRAMM, Marshall G	RM2	Ltjg'57
SD8	*SHALES, Arthur F	RM1	*CRM
23	†SHAW, Harvey C	RM1	CWO2'52
32	SKINNER, Walter L	RM3	LCdr'58
	†SPARGER, Zeb E	RM2	Ltjg'51
	THOMAS, P	CY	
	†THOMPSON, Hugh O	RM2	CWO2'49
8	†VANDENBERG, Martin A	CRM	LCdr'51
	†WORKENTINE, Henry	RM1	RMC '??
	WRIGHT, Muriel	RM1	
	†YOTHER, Harold B	Y2	Ltjg'55

*Killed in action.
†Deceased.
MEMBER OTC SoCal and/or NorCal 1986 or earlier.
ADDRESS on hand in 1986.

From copy in OTC archives of Xmas card belonging to Skinner. San Diego & Bellevue class numbers, if known, added for cross reference. Any errors in first names are those made during research.

NPM RADIO WAILUPE (CONTROL) — Dec 1932

RMS Cl#	Name	R/R	Retired
31	†ALLEMAN, Stewart F	RM1	CWO3 '53
	ANDREW, A W	RM2	
14	†ANSAK, Joseph Jr	RM1	Ltjg'50
	†ARCHIBALD, Gerald L	RM1	
SD7	†BILLEHUS, Guy O	CRM	Ltjg'??
	BRIDGES, Joe L	RM2	WO1 '52
23	BROUSSARD, Luke H	RM2	
	BROWN, Roy E	RM2	Lt '59
	BURNETT, Sidney A	RM2	CWO2'57
	†CHILDS, Roy	CRE	Ltjg'37
29	CLOUGH, Harold E G	RM1	CWO2'53
28	†CONGDON, Carl L	RM2	Lt '47
24	CONNOLLY, Alexander J	RM2	CWO3 '55
15	†COONCE, Orville C	RM1	CWO2'46
	DESMOND, J H	S1	
32	†DONEGAN, Thomas A	RM2	LCdr'53
20	ENGLISH, Edwin D	RM1	Lt '50
	FAILER, Vernon L	RM2	
	FISHER, Bernie F	RM2	RMC '52
	FLEMING, Russell A	PhM1	Lt '49
	FLYNN, J B	RM2	
SD7	†FRASER, Wendell L	CRM	Lt '48
21	FRONDORF, Victor L	RM1	Lt '51
	†GARDINER, George E	RM2	
	†GREEN, Wallace V	RM2	RMC '5?
27	HARRISON, Russell B	RM1	CWO2'51
	HERRIOT, C W	RM2	
SD9	†HIDDE, Walter A	CRM	LCdr'53
SD6	HORSLEY, Grant E	RM1	LCdr'53
	†INGRAHAM, Charles	Lt	Capt'39
	†JOHNSON, Walter Howard	RM3	LCdr'59
	†KAHN, C L	EM1	
	†KIEPLER, John T	CRM	Lt '46
SD6	†KLOSS, Carl W	CRM	LCdr'50

RMS Cl#	Name	R/R	Retired
	LASLIE, P B	S2	
	LEE, Curtis M	RM3	CWO3'57
	LONG, R W	SC1	
29	†LONG, Victor L	RM2	WO1 '51
SD7	MacKay, Allan G	RM1	Lt '53
	†MAGARIS, Paul L RM1	†CRM	10-31-41
	MORROW, Melvin D	RM1	CWO2'52
27	†NOVAK, Antone	RM1	Lt '56
31	†PASSANISI, Joseph	RM2	WO1 '57
1	†PEDEN, S Ray	CRM	
SD6	PERREAULT, Edgar L	RM1	WO1 '45
	†PHILLIPS, W F	RM1	RMC '??
	PRICKETT, Willie L	Y1	Ltjg'50
	REDDEN, William W	RM2	
	†RIDER, Gilbert E	RM2	CWO2'56
	†SCHEKLESKY, Jack Leo J	MM1	WO1 '44
	†SCHLECT, Benjamin	RM2	†12-7-41
29	†SCHRAMM, Marshall G	RM2	Ltjg'57
22	†SHRYACK, Louis A	RM1	LCdr'54
	STEINER, Joseph A	RM1	
	THOMAS, P	CY	
	†THOMPSON, Hugh O	RM2	CWO2'49
	TROTT, John W	RM2	Cdr '54
15	TRUAX, Arthur K	RM1	CWO2'54
8	†VANDENBERG, Martin A	CRM	LCdr'51
	†YOTHER, Harold B	Y2	Ltjg'55

(See separate archives list for those at High Power, Pearl Harbor)

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

Names, initials and ranks/rates from Xerox in OTC file of Xmas card belonging to Kiepler. Any errors in first names are those made during research in 1970.,

NRM HIGH-POWER PEARL HARBOR — Dec 1932

RMS Cl#	Name	R/R	Retired
	‡ADAMS, Charles Speed	RM	
	ATKINS,	EM	
	BLYTHE, Archie Lee	SC	Ltjg'55
	BRITTAIN,	MM	
	CUSTIS, W H	RM3	
	‡FIKE, Myrven D	CRM	CWO2'46
	HALL, Franklin Shaubit	RM	RMC '
23	‡HERTER, Frank	RM1	LCdr'57
	‡HUSTED, Casper H	CRE	CWO4'40
13	KARLOTSKI, William	RM1	CWO2'50
	‡McCANLESS, E W	CRM	
20,30	MOORE, Joseph P	RM1	Lt '47
	‡POWELL, Lonnie	RM1	‡ACRM WW2
	ROBERTSON, L H	RM2	

‡Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From a copy in the OTC archives of a Xmas card belonging to Metz. Bellevue class numbers, if known, added for cross reference. Any errors in first names are those made during research.

NRM HIGH-POWER PEARL HARBOR -- Dec 1933

	‡ADAMS, Charles Speed	RM2	
	BEUKEMA, Donald R	Y2	CWO2'54
	BLYTHE, Archie L	SC2	Ltjg'55
	BRINDLE, Michael P	RM1	RMC '
	DISBROW, Elmer E	MM1	Lt '48
13	‡GUEST, James L	CRM	Lt '49
	HALL, Franklin S	RM2	RMC '
23	‡HERTER, Frank	RM2	LCdr'57
13	KARLOTSKI, William	RM1	CWO2'50
	KEARNS, M Kenneth	RM3	
	KENNEDY, W A	EM1	
SD10	‡SELL, Robert	RM1	CWO2'53
34	STEELE, Roy M	RM2	LCdr'59

‡Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From a Xmas card copy donated to the OTC archives by Steele. San Diego & Bellevue class numbers, if known, added for cross reference. Any errors in first names are those made during research.

NPM RADIO WAILUPE, N.C.O HONOLULU, N.C.O PEARL HARBOR -- Dec 1933

RMS Cl#	Name	R/R	Retired
31	†ALLEMAN, Stewart F	RM1	CWO3'53
	ANDREW, A W	RM2	
14	†ANSAK, Joseph Jr	RM1	Ltjg'50
	†ARCHIBALD, Gerald L	RM1	
	BARBA, L C	RM2	
	†BRADLEY, Donald H	CRE	LCdr'46
23	BROUSSARD, Luke H	RM2	
32	BROWN, Albert L	RM2	CWO4'57
	BROWN, RoyE	*RM2	Lt '59
	†CAMERON, Harvey C	RM1	LCdr'51
	CLARK, F F	RM2	
24	CONNOLLY, Alexander J	RM2	CWO3'55
	DESMOND, J H "Tony"	S1	
32	†DONEGAN, Thomas A	RM2	LCdr'53
	ELLIOTT, Alton Edward	SC2	CSC '??
	FISHER, Bernie F	RM2	RMC '52
SD7	†FRASER, Wendell L	CRM	Lt '48
21	FRONDORF, Victor L	*RM1	Lt '51
25	†GRAY, Theodore R	RM2	Cdr '60
	†GREEN, Wallace V	RM2	RMC '5?
	GRIFFITH, H F (or HW)	RM2	
27	HARRISON, Russell B	RM1	CWO2'51
SD6	HARWOOD, Raymond	CRM	Lt '48
SD9	†HIDDE, Walter A	CRM	LCdr'53
	†INGRAHAM, Charles N	Lt	Capt'39
	†JOHNSON, Walter Howard	RM2	LCdr'59
	†KAHN, C L	EM1	
	†KIEPLER, John T	CRM	Lt '46
30	†KITCHENS, Bernard R	RM2	
SD6	†KLOSS, Carl W	CRM	LCdr'50
	LEE, Curtis M	RM3	CWO3'57

*Left 12 Dec on Cuyama.
#Left 2 Dec on Chatteau Thierry.

†Deceased.
MEMBER OTC SoCal and/or NorCal
ADDRESS on hand in 1985.

RMS Cl#	Name	R/R	Retired
SD7	MacKAY, Allan G	RM1	Lt '53
	†MAGARIS, Paul L	RM1	†CRM 10-31-41
12	†MALONEY, Jack G	RM1	CWO2'52
	†McDOLE, Frank	*MM1	LCdr'52
	MORROW, Melvin D	RM1	CWO2'52
27	†MYERS, Arthur R	RM2	Cdr '54
25	†NEWCOMB, George A	RM2	CWO2'56
1	†PEDEN, S Ray	CRM	
SD6	PERREAULT, Edgar L	RM1	WO1 '45
	†PETTIT, Robert L	*RM2	
	†PHILLIPS, W F	RM1	RMC '??
	PHILLIPS, W R	CY	
	†POJAWIS, John L	#PhM1	Lt '46
	PUGH, William L	Y2	CWO2'52
	RADECKY, S C	RM2	
	REDDEN, William W	RM2	
	†RIDER, Gilbert E	RM2	CWO2'56
	SCHILLING, J U	Y1	
	†SCHLECT, Benjamin	RM2	†12-7-41
29	†SCHRAMM, Marshall G	*RM2	Ltjg'57
22	†SHRYACK, Louis A	*RM1	LCdr'54
	STEINER, Joseph A	RM1	
	STEWARD, Norman J	CY	CWO2'49
	STOUT, John J	RM2	
	SUSSMAN, J M	RM2	
	†THOMPSON, Hugh O	RM2	CWO2'49
	TROTT, John W	RM2	Cdr '54
15	TRUAX, Arthur K	RM1	CWO2'54
	†YOTHER, Harold B	Y2	Ltjg'55
	ZUTTERMEISTER, C H	RM2	

Reported on board in December 1933:

	†BECK, John A	RM1	WO1 '53
17	†BECKER, Joseph M	RM1	CWO2'52
	CLARK, Ernest E	RM1	
	DAVIS, Lindell E	RM2	
	†FRANCISCO, Joseph E	PhM1	Cdr '58
	NEWTON, Joseph W	RM2	
SD8	SMITH, James S	RM1	LCdr'50
33	WILLIAMS, Kenneth J	RM3	LCdr'57

From a copy of a Xmas card belonging to Kiepler. San Diego & Bellevue class numbers added for cross reference. Any errors in first names or initials are those made during research.

COMMUNICATIONS PERSONNEL 14th NAVAL DISTRICT — Dec 1934

RMS Cl#	Name	R/R	Retired
	†ADAMS, Otis R	CRE	LCdr'49
31	†ALLEMAN, Stewart F	RM1	CWO3'53
SD7	†ALVERSON, George D	CRM	CWO2'48
26	ANDREWS, Carroll C	RM2	LCdr'57
	†BECK, John A	RM1	WO1 '53
17	†BECKER, Joseph M	RM1	CWO2'52
17	†BRADFORD, Raymond H	RM1	RMc '??
	†BRADLEY, Donald H	CRE	LCdr'46
	BRENCHICK, J H	MM2	
23	BROUSSARD, Luke H	RM2	
32	BROWN, Albert L	RM2	CWO4'57
7	†BRUMFIELD, Roy L	RM1	LCdr'53
	†BURNS, William B	RM1	Lt '??
	†BURTON, Alfred	RM3	LCdr'56
	BUSCHERT, Robert J	PhM1	
	†CAMERON, Harvey C	RM1	LCdr'51
	CLARK, Ernest E	RM1	
	CLARK, F F	RM2	
24	CONNOLLY, Alexander J	RM2	CWO3'55
	CONOVER, J K	RM2	
	†CYR, Hilary E	RM2	CWO4'57
	DAVIS, Lindell E	RM2	
	DIEHL, G S	RM2	
32	†DONEGAN, Thomas A	RM2	LCdr'53
	ELLIOTT, Alton Edward	SC2	CSC '??
	†ESTES, Frank E	RM3	Lt '54
	FISHER, Bernie F	RM2	RMC '52
SD7	†FRASER, Wendell L	CRM	Lt '48
	FULLER, E R	S2	
	GERDING, E F	Y1	
	†GIVLER, Eugene S	RM2	CTC '
	†GRAVER Richard C	RM2	CWO3'55
25	†GRAY, Theodore R	RM2	Cdr '60
	GREEN, Jasper E	CEM	Lt '53
	†GREEN, Wallace V	RM2	RMC '5?
	GRIFFIN, A H	SC2	
	GRIFFITH, H W (or HF)	RM1	
	†GROUNDWATER, Benjamin	RM2	LCdr'58
	HALL, Franklin S	RM2	RMC '
	HAMILTON, Gavin J	RM2	
27	HARRISON, Russell B	RM1	CWO2'51
SD6	HARWOOD, Raymond	CRM	Lt '48
23	†HERTER, Frank	RM1	LCdr'57
SD9	†HIDDE, Walter A	CRM	LCdr'53
	†HOLDEN, Carl F	LCdr	VAdm'52
	JOHNS, C F	RM2	
	JONES, James Oscar	RM2	CWO2'54

RMS Cl#	Name	R/R	Retired
	KENNEDY, W A	Em1	
	†KIDDER, Harry	CRM	RMC '4?
29	KISNER, Homer L	RM2	Capt'56
30	†KITCHENS, Bernard R	RM2	
SD6	†KLOSS, Carl W	CRM	LCdr'50
	†LINEBARGER, Ray C	CY	Lt '46
	†LUSK, Truett C	CRM	LCdr'49
	†LYNCH, William A	Lt	Capt'50
SD7	MacKAY, Allan G	RM1	Lt '53
	†MAGARIS, Paul L RM1	†CRM	10-31-41
	MALLETTE, E P	SC2	
12	†MALONEY, Jack G	RM1	CWO2'52
	MASON, Wilson L	RM2	LCdr'60
	McDONNELL, J E	RM1	
33	MITCHELL, Ralph	RM3	CWO4'58
27	†MYERS, Arthur R	RM2	Cdr '54
18	MYERS, Laurence F	RM1	CWO2'50
25	†NEWCOMB, George A	RM2	CWO2'56
1	†PEDEN, S Ray	CRM	
SD6	PERREAULT, Edgar L	RM1	WO1 '45
	†PHILLIPS, W F	RM1	CWO2'??
	PUFFER, C K	MM1	
	PUGH, William L	Y2	CWO2'52
	RADECKY, S C	RM2	
	†RAMSIER, Jesse C	Y2	WO1 '51
	RAPIER, W H Jr	S2	
	REDDEN, William W	RM2	
	†RIDER, Gilbert E	RM2	CWO2'56
	†ROBINSON, Francis H	RM1	CWO2'46
	SARGENT, G A	RM2	
	SCHILLING, J U	Y1	
	†SCHLECT, Benjamin	RM2	†12-7-41
	†SMITH, Markle Tobias	RM3	Cdr '57
	†SMITH, William Millard	RM1	CWO?'48
SD7	†SROCZYNSKI, Eugene S	RM1	Ltjg'??
34	STEELE, Roy M	RM2	LCdr'59
	STEINER, Joseph A	RM1	
	STEWARD, Norman J	CY	CWO2'49
	STOUT, John J	RM2	
	SUSSMAN, J M	RM2	
17	TERREBONNE, Thomas L D	RM1	ACRM'45
SD9	TODD, George B	CRM	Lt '52
	TROTT, John W	RM2	Cdr '54
15	TRUAX, Arthur K	RM1	CWO2'54
	VAN PELT, C E	RM2	
33	WILLIAMS, Kenneth J	RM2	LCdr'57
	ZUTTERMEISTER, C H	RM2	

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

Names, initials, ranks/rates from Xerox in OTC archives of Xmas card belonging to Todd. Any errors in first names are those made during research.

COMMUNICATIONS PERSONNEL 14th NAVAL DISTRICT -- Dec 1935

See separate page for Lualualei

RMS Cl#	Name	R/R	Retired
	ADAMS, Otis R	CRE	LCdr'49
32	ALDERMAN, Harmon P	RM2	
SD7	ALVERSON, George D	CRM	CWO2'48
26	ANDREWS, Carroll C	RM1	LCdr'57
	ARGABRIGHT, Samuel C	RM2	
	AUBREY, L Jr	Y2	
	BAKER, James L	RM2	RMC '??
17	BECKER, Joseph M	RM1	CWO2'52
	BLEVINS, Harrison H	CRE	LCdr'46
	BLOOM, August J	RM1	RMC '45
	BLOWERS, J R	RM2	
17	BRADFORD, Raymond H	RM1	RMC '??
32	BROWN, Albert L	RM2	CWO4'57
7	BRUMFIELD, Roy L	CRM	LCdr'53
	BURNETT, Sidney A	RM1	CWO2'57
	BURNS, William B	CRM	Lt '??
	BURTON, Alfred	RM2	LCdr'56
	BUSCHERT, Robert J	PhM1	
	CARTIER, Edmond E J	RM2	
20	CHANCE, Emmett W	RM1	CWO4'57
	COLBERT, T F	SC2	
	CONNELLY, Frank E	RM1	CWO2'53
	CONNOR, Cecil B	RM1	CWO2'51
	CONOVER, J K	RM2	
	CYR, Hilary E	RM2	CWO4'57
21	DANIELS, Charles E	CRM	LCdr'51
	DAVIS, Lindell E	RM2	
	DEVILBISS, C F	S1	
	DIEHL, G S	RM2	
	DREW, Walter Harold	CMM	Lt '50
	DUBE, A A	RM1	
	ESTES, Frank E	RM2	Lt '54
	FLETCHER, Russell J	RM1	CWO2'53
	GIVLER, Eugene S	RM2	CTC '
	GRAVER, Richard C	RM2	CWO3'55
	GREEN, Jasper E	CEM	Lt '53
	GREEN, Wallace V	RM1	RMC '5?
	GROUNDWATER, Benjamin	RM1	LCdr'58
30	HALPIN, John B	RM1	Cdr '57
	HAMILTON, Gavin J	RM2	
3D6	HARWOOD, Raymond	CRM	Lt '48
	HETTLINGER, Alex R	Y1	Lt '57
18	HIGHSMITH, Clifford	RM1	CWO2'52
	HOLDEN, Carl F	LCdr	VAdm'52
20	HOWREN, "J" "D"	RM1	CWO3'53

RMS Cl#	Name	R/R	Retired
	JOHNS, C F	RM2	
	JOHNSON, F F	RM2	
	JOHNSON, Robert D	RM2	CWO2'59
	JOHNSTON, Allan G	RM2	RMC '??
5	JONES, E O	CMM	
	JONES, James Oscar	RM2	CWO2'54
	KENNEDY, W A	EM1	
29	KISNER, Homer L	RM2	Capt'56
16	KOEGLER, George H	RM1	
	LARSON, Clarence John	RM1	RMC '
	LEMON, Vance S	RM2	CWO2'57
SD7	LEWIS, Ernest P	CRM	
	LINEBARGER, Ray C	CY	Lt '46
	LUSK, Truett C	CRM	LCdr'49
	LYNCH, William A	Lt	Capt'50
25	MAGENNIS, Arthur J	RM1	RMC '??
12	MALONEY, Jack G	RM1	CWO2'52
	MASON, Wilson L	RM2	LCdr'60
	McDONNELL, J E	RM1	
	McGINNIS, Edwin W	RM2	CWO2'53
	METRAS, G H	SC2	
33	MITCHELL, Ralph	RM2	CWO4'58
	MURRAY, Frank Joseph	RM2	
	NANCE, P H	RM2	
25	NEWCOMB, George A	RM1	CWO2'56
	NORMAN, John A	RM2	
30	PARTCH, John C	RM1	LCdr'55
	PHILLIPS, R	S1	
19	PUMPHREY, William F	RM1	CWO2'50
	RAMSIER, Jesse C	Y2	WO1 '51
	RAPIER, W H Jr	S2	
21	REED, William A	RM1	Lt '54
21	RHINEHART, George R	RM1	Lt '50 (1)
	ROBINSON, Francis H	RM1	CWO2'46
	ROGERS, Donald A	Y1	
	SARGENT, C A (or G A)	RM2	
	SEARS, Charles A	RM2	CWO2'55
	SMITH, Markle Tobias	RM3	Cdr '57
	SMITH, William Millard	RM1	CWO?'48
SD7	SROCZYNSKI, Eugene S	RM1	Ltjg'??
34	STEELE, Roy M	RM2	LCdr'59
	STEWARD, Norman J	CY	CWO2'49
	SUSSMAN, J M	RM2	
	TEAR, H C	SC2	
17	TERREBONNE, Thomas L D	RM1	ACRM'45
	THOMPSON, P L	RM2	
SD9	TODD, George B	CRM	Lt '52
	VAN PELT, C E	RM2	
33	WILLIAMS, Kenneth J	RM2	LCdr'57

Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.
(1) RHINEHART to RINEHART in 1936.

Names, initials and ranks/rates from Xerox in OTC files of Xmas card belonging to Todd. Any errors in first names are those made during research.

NPM HIGH-POWER LUALUALEI -- Dec 1935

RMS Cl#	Name	R/R	Retired
	ARMSTRONG, T L	SC2	
SD9	†ATKINS, John B	RM1	
	BARNHILL, Paul E	RM1	LCdr'51
	†BEAN, Russell C	RM2	
	BRIGGS, Ernest P	CRM	Lt '48
	†CARNER, Donald E	RM1	WO1 '55
	DILLON, J	RM1	
	or		
	†DILLON, Joseph Jr	RM1	
12	†DYE, Harold M	CRM	Lt '50
	ERLANDSON, A F	MM1	
	FAHEY, J F	RM1	
	GRIFFITHS, J C	RM1	
	†JAM, Frederick H	EM1	
	†JOHNSON, Franklin L	RM1	
	†KENDALL, Clyde E	RM1	CWO4'57
	LAMDIN, D W	Y3	
34	LANGDON, Russell A	RM2	LCdr'56
	LOWELL, Robert H	QMM	CWO2'40
	†MANRY, John T	CRM	Lt '46
	MULLINS, Grover	RM1	
	NELSON, Roy F	QM1	CWO2'53
	NIGRO, A A	RM1	
	†OSBORNE, Harold	CRM	LCdr'37
	†ROSENECK, Clarence	SK1	Lt '52
	†ROSS, William D	CRM	
	†TRACY, Delbert W	RM2	†CRM
	VAUGHAN, Leonard B	RM2	RMC '
	WILSON, W H	SC1	
	ZILKER, Frederick J	RM2	RMC '

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From a Xerox in the OTC archives of a 14th NavDist Xmas card belonging to George Todd. Bellevue and San Diego class numbers, if known, added for cross reference. Any errors in first names are those made during research.

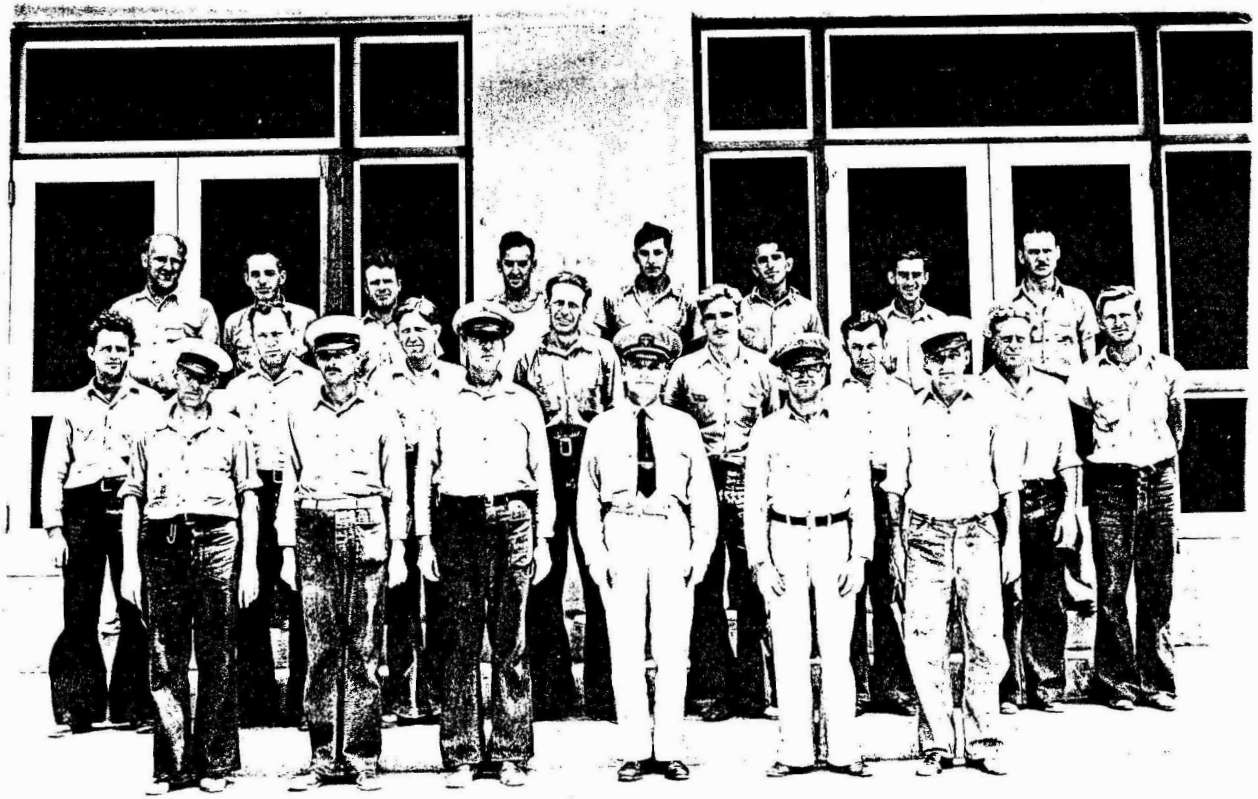
COMMUNICATIONS PERSONNEL 14th NAVAL DISTRICT -- Dec 1936
See separate page for Lualualei

RMS Cl#	Name	R/R	Retired
32	†ALDERMAN, Harmon P	RM2	†CRM POW
SD6	†ANDERSON, Leonard L D	RM1	RMC '46
	ARGABRIGHT, Samuel C	RM2	
SD9	†ATKINS, John B	RM1	
	AUBREY, L Jr	Y2	
	†BAKER, James L	RM2	RMC '??
	BARNHILL, Paul E	RM1	LCdr'51
	†BLEVINS, Harrison H	CRE	LCdr'46
	BLOOM, August J	RM1	RMC '45
	BLOWERS, J R	RM2	
7	BOWEN, Frederick T	CRM	LCdr'51
	BURNETT, Sidney A	RM1	CWO2'57
	†BURNS, William B	CRM	Lt '??
	CARTIER, Edmond E J	RM2	
20	†CHANCE, Emmett W	RM1	CWO4'57
	CONLEY, D D	CY	
	CONNELLY, Frank E	RM1	CWO2'53
	CONOVER, J K	RM2	
	COVEN, Frank M	RM2	LCdr'60
	DALPE, Edmond A	RM2	CWO3'53
	DEVILBISS, C F	S1	
	DICKEY, Elmer	RM2	LCdr'59
	DIEHL, G S	RM1	
	†DREW, Walter H	CMM	Lt '50
	†DUBE, A A	RM1	
	†DYER, Thomas H	Lt	Capt'55
	†ESTES, Frank E	RM2	Lt '54
	FLETCHER, Russell J	RM1	CWO2'53
	GREEN, Jasper E	CEM	Lt '53
	†GRIESE, Arthur A	Lt	LCdr'46
30	HALPIN, John B	RM1	Cdr '57
	†HETTLINGER, Alex R	Y1	Lt '57
18	HIGHSMITH, Clifford	RM1	CWO2'52
31	HORRALL, Eugene F	RM2	Cdr '58
20	HOWREN, "J" "D"	RM1	CWO3'53
	JOHNS, Charlie J	RM2	WO1 '59
	JOHNSON, F F	RM2	
	JOHNSON, Robert D	RM2	CWO2'59
	†JOHNSTON, Allan G	RM2	RMC '??
22	JONES, Idris H	RM1	
	JONES, James Oscar	RM2	CWO2'54
	†KIME, Frederick D	LCdr	RAdm'51
16	†KOEGLER, George H	RM1	

RMS Cl#	Name	R/R	Retired
	†LANKFORD, Leroy A	CRM	LCdr'54
	LAYMAN, Harold E	RM3	LCdr'58
	LEDFORD Robert H	RM3	Lt '62
	LEMON, Vance S	RM2	CWO2'57
SD7	†LEWIS, Ernest P	CRM	
	LILES, W W	S1	
	†LINEBARGER, Ray C	CY	Lt '46
	†LUSK, Truett C	CRM	LCdr'49
	MASON, Wilson L	RM2	LCdr'60
	†McGINNIS, Edwin W	RM2	CWO2'53
	METRAS, G H	SC2	
33	MISEMER, Ernest L	RM1	CWO2'54
33	MITCHELL, Ralph	RM2	CWO4'58
	MORGAN, E A	RM2	
	MULLINS, Grover	RM1	
	†MURRAY, Arthur F	RM1	CWO2'54
	†MURRAY, Frank Joseph	RM2	
	NANCE, P H	RM2	
	NORMAN, John A	RM2	
30	†PARTCH, John C	RM1	LCdr'55
	PHILLIPS, R	S1	
	†POINDEXTER, Gale A	LCdr	Cdr '39
19	†PUMPHREY, William F	RM1	CWO2'50
	†RAMSIER, Jesse C	Y2	WO1 '51
21	†REED, William A	RM1	Lt '54
	RINEHART, Geo Richard	RM1	Lt '50 (1)
	†RIPLEY, Charles H	CRE	LCdr'47
	ROGERS, Donald A	Y1	
	†ROSS, William D	CRM	
	SARGENT, C A (or G A)	RM2	
SD9	†SCHMIDT, Cyrenus I	RM1	WO1 '52
	†SEARS, Charles A	RM2	CWO2'55
22	†SHRYACK, Louis A	RM1	LCdr'54
	†SMITH, Markle Tobias	RM2	Cdr '57
	TAYLOR, Clarence P	RM3	LCdr'57
	TEAR, H C	SC2	
	THOMPSON, P L	RM2	
SD9	TODD, George B	CRM	Lt '52
	VAN PELT, C E	RM2	
	WALSER, D A	RM2	
	WHITTEN, Rodney L	RM2	Ltjg'47
11	†ZAMBA, John	CRM	CWO3'50

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.
(1) RHINEHART to RINEHART this year.

From a Xmas card facsimile donated to the OTC archives by Todd. Bellevue & San Diego class numbers, if known, added for cross reference. Any errors in first names are those made during research.



NPM HIGH-POWER LUALUALEI -- 1937

See complete list of personnel on opposite page (Appendix A-19). Readers are requested to help identify the persons not named. Please do not mark the pages. Send your ideas either to John W. Trott or George B. Todd.

Front Row:	Middle Row:	Back Row:
1. Nelson	1.	1. Anderson (See A-17 & 20)
2. Waterous	2. Jones	2.
3. Manry	3. Carner	3.
4. Zimmerman	4. Kendall	4. Armstrong
5. Briggs	5.	5. Langdon
6. Jenson	6. Bartko	6.
	7. Connor	7.
	8. Mullins	8.

NPM HIGH-POWER LUALUALEI -- Dec 1936

RMS Cl#	Name	R/R	Retired
	ARMSTRONG, T L	SC2	
21	†BARTKO, John J	RM1	Cdr '57
	†BEAN, Russell C	RM2	
	BRIGGS, Ernest P	CRM	Lt '48
	BOWEN, C		
	†CARNER, Donald E	RM1	WO1 '55
	†CONNOR, Cecil B	RM1	CWO2'51
	GARRETT, Carter E	RM1	RMC '
	HARMON, John W	SF1	LCdr'55
	†JENSEN, Andy F	CRM	LCdr'49
19	†JONES, John Marland	RM1	LCdr'56
	†KENDALL, Clyde E	RM1	CWO4'57
34	LANGDON, Russell A	RM2	LCdr'56
34	†LARSEN, Stanley L	RM2	Lt '56
	LARSON, Clarence J	RM1	RMC '
	LOWELL, Robert H	CMM	CWO2'40
	†MANRY, John T	CRM	Lt '46
	MILLS, David Riley	RM2	LCdr'56
	NELSON, Roy F	CQM	CWO2'53
	RYLIE, L F	RM2	
	TALBERT, F G (F C '37)	EM1	
SD9	†WATEROUS, William L	CRM	CWO3'53
	WEST, H P	Y1	
	ZILKER, Frederick J	RM2	RMC '
W4	†ZIMMERMAN, Philip R	CRE	LCdr'47

NPM HIGH-POWER LUALUALEI -- Dec 1937

	ANDREWS, R H	S1	
	ARMSTRONG, F L (or TL)	SC2	
	BALDWIN, J A	S1	
	†BEAN, Russell C	RM2	
	BOWEN, C	S1	
	†CARNER, Donald E	RM1	WO1 '55
	CLIFFORD, Frank E	CM1	CWO2'53
	†FLETCHER, Russell J	RM1	CWO2'53
	GARRETT, Carter E	RM1	RMC '
	HARMON, John W	SF1	LCdr'55
	†JENSEN, Andy F	CRM	LCdr'49
19	†JONES, John Marland	CRM	LCdr'56
	†KENDALL, Clyde E	RM1	CWO4'57
15	KNUTSON, Neil J	CRM	
34	LANGDON, Russell A	RM2	LCdr'56
34	†LARSEN, Stanley L	RM2	Lt '56
	LARSON, Clarence J	RM1	RMC '
	LOWELL, Robert H	CMM	CWO2'40
34	MILLS, David R	RM2	LCdr'56
	RYLIE, L F	RM2	
13	†TANNER, Walter E	CRM	†Ltjg'46
SD9	†WATEROUS, William L	CRM	CWO3'53
W4	†ZIMMERMAN, Philip R	CRE	LCdr'47
	ZUKOWSKY, S F	S1	

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From Xmas cards in the OTC archives belonging to Manry and Partch. San Diego, Bellevue and Warrant Officers class numbers, if known, added for cross reference. Any errors in first names are those made during research.

See photo of 1937 personnel - Appendix A-18.

RMS Cl#	Name	R/R	Retired
	ADAMS, L O	RM2	
32	†ALDERMAN, Harmon P	RM2	†POW CRM
SD6	†ANDERSON, Leonard L D	RM1	RMC '46
	ARGABRIGHT, Samuel C	RM2	
SD9	†ATKINS, John B	RM1	
	AUBRY, L Jr	Y2	
	†BAKER, James L	RM2	RMC '??
	BARNHILL, Paul E	RM1	LCdr'51
SD7	†BILLEHUS, Guy O	CRM	Ltjg'49
	BLOOM, August J	RM1	RMC '45
7	BOWEN, Frederick T	CRM	LCdr'51
	BROWN, Louis Milton	Y1	Lt '56
	CARTIER, Edmond E J	RM2	
	†CHURCHILL, Stewart W	RM2	RMC '??
	CONNELLY, Frank E	RM1	CWO2'53
	COVEN, Frank M	RM2	LCdr'60
	DALPE, Edmond A	RM2	CWO3'53
	†DAWSON, James W	RM2	CWO2'62
	DeHART, Honin L	CMM	Lt '52
	DICKEY, Elmer	RM2	LCdr'59
	†DUBE, A A	RM1	
	†DYER, Thomas H	Lt	Capt'55
	FARRINGTON, Derby W	CY	LCdr'53
	FLOWERS, Hulbert E	CY	LCdr'50
W12	†FROST, William H	CRE	CWO4'48
	†GEIKEN, Albert H	RM1	CTC '50
	†GIBBS, Victor E	PhM1	Lt '51
18	†GOODWIN, Keith E	CRM	LCdr'53
	†GRIESE, Arthur A	Lt	LCdr'46
	HALL, Sherman V	Y2	CWO2'56
30	HALPIN, John B	RM1	Cdr '57
	†HETTLINGER, Alex R	Y1	Lt '57
18	HIGHSMITH, Clifford	RM1	CWO2'52
31	HORRALL, Eugene F	RM2	Cdr '58
20	HOWREN, "J" "D"	RM1	CWO3'53
22	†HURST, Edward L	RM1	CWO2'54
	JOHNSON, F F	RM2	
	JOHNSON, Robert D	RM2	CWO2'59
	†JOHNSON, Walter H	RM2	LCdr'59
	†JOHNSTON, Allan G	RM2	RMC '??
22	JONES, Idris H	RM1	
	JULE, Rex H	RM2	Lt '55
	†KITCHIN, Howard W	LCdr	LCdr'42
	†KNUTSON, Victor J	Y1	CWO?'??
	†LANKFORD, Leroy A	CRM	LCdr'54
	LEMON, Vance S	RM2	CWO2'57
SD7	†LEWIS, Ernest P	CRM	
	LILES, W W	S1	
34	LOEBS, Earl W	RM2	Ltjg'61
	†McGINNIS, Edwin W	RM1	CWO2'53
SD6	†McKILLOP, Oliver S	CRM	Lt '51
	METRAS, G H	SC1	
33	MISEMER, Ernest L	RM1	CWO2'54
	MULLINS, Grover	RM1	
	†MURRAY, Arthur F	RM1	CWO2'54
	†MURRAY, Frank J	RM2	
	NANCE, P H	RM2	
	NORMAN, John A	RM2	
30	†PARTCH, John C	RM1	LCdr'55
	†PETKE, Charles H	RM3	
	PHILLIPS, R	RM3	
	†POINDEXTER, Gale A	Cdr	Cdr '39
21	†REED, William A	RM1	Lt '54
21	RINEHART, George R	RM1	Lt '50
	†RIPLEY, Charles H	CRE	LCdr'47
	†ROSS, William D	CRM	
23	†RUDY, Clyde W	RM1	CWO2'49
33	RUPPRECHT, Fred C	RM2	Cdr '60
SD9	†SCHMIDT, Cyrenus I	RM1	WO1 '52
	†SEARS, Charles A	RM2	CWO2'55
	SHOLES, Roy C	RM2	CTC '
22	†SHRYACK, Louis A	CRM	LCdr'54
	†SMITH, Markle Tobias	RM1	Cdr '57
	TALBERT, F C (or FG)	EM1	
	TAYLOR, Clarence P	RM2	LCdr'57
	TEAR, H C	SC1	
	WALSER, D A	RM2	
	†WEILAND, Frank J	RM2	†Ltjg'46
	WHITTEN, Rodney L	RM2	Ltjg'47
	WILDMAN, Theodore J	RM2	LCdr'56
	YOUNG, William C	RM2	CWO4'63
11	†ZAMBA, John	CRM	CWO3'50
	ZILKER, Frederick J	RM1	RMC '

†Deceased.
MEMBER OTC SoCal and/or NorCal 1986 or earlier.
ADDRESS on hand in 1986.

From copy in OTC archives of Xmas card belonging to Partch. San Diego, Bellevue & WORES class numbers, if known, added for cross reference. Any errors in first names are those made during research.

14th NavDist COMMUNICATIONS -- Dec 1938

RMS Cl#	Name	R/R	Retired
W5	ANDERSON, James W	CRE	LCdr'50
	ARGABRIGHT, Samuel C	RM2	
27	BARK, Durward A	RM1	LCdr'55
22	BARRETT, Sidney H	RM1	Lt '53
	BAYLEY, E L	RM2	
7	BOWEN, Frederick T	CRM	LCdr'51
	BROWN, Louis Milton	Y1	Lt '56
	BURNS, Albert A	RM1	RMC '
	CALLAGHAN, James G	RM1	Lt '58
	CAMPBELL, W J T	RM2	
	CARDINALE, Louis J	RM1	Lt '58
	CARTIER, Edmond E J	RM1	
	†CHURCHILL, Stewart W	RM2	RMC '
33	CLOW, George B	RM2	
	COVEN, Frank M	RM2	LCdr'60
	DAVIS, James C	RM1	CWO2'50
	†DAWSON, James W	RM2	CWO2'62
	†DYER, Thomas H	Lt	Capt'56
	†FARLOW, Alvin A	CRE	CWO2'43
	FLOWERS, Hulbert E	CY	LCdr'50
	FRANK, Samuel	RM1	RMC '
	†FRIESEMA, Garret	EM1	CWO2'54
	†GIBBS, Victor E	CPhM	Lt '51
22	GRIPPEN, Wilford C	RM1	
	HALL, Sherman V	Y2	CWO2'56
	HOUCK, Benjamin F	Y2	Lt '53
	JOHNSON, Robert D	RM1	CWO2'59
	KILLIAN, John F	RM1	RMC '
	†KITCHIN, Howard V	LCdr	LCdr'42
SD7	†LEWIS, Ernest P	CRM	
34	LOEBS, Earl W	RM2	Ltjg'61
	MacTAGGART, R H	MM1	
	MALONEY, James D	S1	CWO4'68
	McDONALD, John L	RM2	ACRT'55
	McDONNELL, J E	RM1	
SD6	†McKILLOP, Oliver S	CRM	Lt '51
	MINICH, G E	SC1	
	†MURRAY, Arthur F	RM1	CWO2'54
	†MURRAY, Frank J	RM2	
	NEFZGER, Homer C	RM2	
	PHILLIPS, J H	RM3	
	PLACE, A E	RM1	
	†ROSS, William D	CRM	
23	†RUDY, Clyde W	RM1	CWO2'49
33	RUPPRECHT, Fred C	RM2	Cdr '60
	SARGENT, C A	RM2	
	SCHANZE, Edwin S	Lt	RAdm'56
	SCOTT, John Earl	RM1	RMC '
22	†SHRYACK, Louis A	CRM	LCdr'54
26	†SMITH, Howard L	CRM	Lt '57
28	STEIN, Sam	RM1	
	TARDY, Sidney A	RM1	Lt '50
	†THIBAULT, Edgar J	RM2	RMC '??
	†THOMPSON, Harry L	Cdr	RAdm'59
2-43	TRACEY, Don M	RM2	LCdr'59
	VERNON, Lee H	RM2	LCdr'58
23,24	WAISWILOS, Edward A	RM1	LCdr'58
	WILTSEY, D V	RM1	
	†WIMBERLY, Claude L	RM1	RMC '??
24	WOLFORD, Elmo Wm	RM1	
	WOOD, R M	RM2	
11	†ZAMBA, John	CRM	CWO3'50
	ZILKER, Frederick J	RM1	RMC '

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From a Xmas card copy donated to the OTC archives by Mrs. Cornman. San Diego, Bellevue & WORES class numbers, if known, added for cross reference. Any errors in first names are those made during research.

NPM HIGH-POWER LUALUALEI -- Dec 1938
See separate page for others in 14th ND

RMS Cl#	Name	R/R	Retired
	ANDREWS, R H	S1	
	ATENCIO, Henry	S1	CWO2'53
	CHENEY, H E (HR IN'39)	RM2	
	CLIFFORD, Frank E	CM1	CWO2'53
	CORDER, B	SC1	
W1	†DELWORTH, Lee J	CRE	LCdr'50
	DOYLE, Peter J	Y1	CWO2'57
	†FLETCHER, Russell J	RM1	CWO2'53
	GARRETT, Carter E	RM1	RMC '
	HARMON, John W	SF1	LCdr'55
	ISDAL, Conrad R	RM1	RMC '
	†JENSEN, Andy F	CRM	LCdr'49
	KITCHIN, R W	RM2	
15	†KNUTSON, Neil J	CRM	†CRM WW2
	†MARTIN, Gerald O	RM2	CWO2'64
	MARTINSON, Harold L	RM2	RMC '
	McDERMOTT, H A	CMM	
	MIHELNIK, S L	S1	
34	MILLS, David R	RM1	LCdr'56
33	MISEMER, Ernest L	RM1	CWO2'54
	MOE, Andrew C	RM2	LCdr'57
	NELSON, M L	S1	
	PARNELL, Roger M	RM2	RMC '63
	PHILLIPS, R	RM2	
	RYLIE, Lewis F	RM1	RMC '
	SCHROEDER, T E	EM1	
	SHORT, D J	RM2	
13	†TANNER, Walter E	CRM	† '46Ltjg
	VIGH, Louis F Jr	RM2	CWO3'62
SD9	†WATEROUS, William L	CRM	CWO3'53

†Deceased.
MEMBER OTC SoCal and/or NorCal 1986 or earlier.

From Xmas card copy donated to OTC archives by Mrs. Cornman. San Diego, Bellevue and WORES class numbers, if known, added for cross reference. Any errors in 1st names are those made during research.

14th NavDist COMMUNICATIONS -- Dec 1939

RMS Cl#	Name	R/R	Retired
	ATENCIO, Henry	S1	C 02'53
27	BARK, Durward A	CRM	LCdr'55
22	BARRETT, Sidney H	CRM	Lt '53
	BAYLEY, E L	RM2	
	BKEVINS, Edwin K	RM2	LCdr'57
7	BOWEN, Frederick T	CRM	LCdr'51
	BRAUN, William B	Lt	Capt'61
	BURNS, Albert A	RM1	RMC '
	BU LER, Roy E	RM2	LCdr'60
	CALLAGHAN, James G	RM1	Lt '58
	†CAMPBELL, Edward	RM1	RMC '??
	CAMPBELL, W J T	RM2	
	CARL, Robert E	Y1	LCdr'56
	CARTIER, Edmond E J	RM1	
	CHENEY, H R	RM2	
	†C URCHILL, Stewart W	RM2	RMC '??
	†CLARK, William A	CRM	Lt '52
33	CLOW, George B	RM2	
	COVEN, Frank M	RM2	LCdr'60
	†DANHOFF, Joseph B	Lt	Cdr '45
	DAVIS, James C	RM1	CWO2'50
	†DAWSON, James W	RM2	CWO2'62
W1	†DELWORTH, Lee J	CRE	LCdr'50
	DICK, Kenneth S	Y2	Cdr '66
	†DYER, Thomas H	LCdr	Capt'55
	ELLIOTT, T	Y3	
	FLOWERS, Hulbert E	CY	LCdr'50
	FRANK, Samuel	RM1	RMC '
	†FRIESEMA, Garret	EM1	CWO2'54
22	GRIPPEN, Wilford C	CRM	
	HELM, Ervine J	CY	Lt '53
	HOUCK, Benjamin F	Y1	Lt '53
	ISLEY, Donald D	PHmL	Ltjg'49
	JOHNSON, Robert D	RM1	CWO2'59
	KETLINSKI, J	RM2	
	KILLIAN, John F	RM1	RMC '
	†KRAFT, Paul W	CY	CWO2'49
	†LAMB, Raymond S	Lt	RAdm'56
SD7	†LEWIS, Ernest P	CRM	
34	LOEBS, Earl W	RM1	Ltjg'61
	MacTAGGART, R H	MM1	
	MALONEY, James D	S1	CWO4'68
	McDONALD, John L	RM2	ACRT'55
	McDONNELL, J E	RM1	
SD6	†McKILLOP, Oliver S	CRM	Lt '51
	MINICH, G E	SC1	
	†MURRAY, Arthur F	RM1	CWO2'54
	MURRAY, Frank J	RM1	
	NEFZGER, Homer C	RM2	
	PHILLIPS, J H	RM2	
	PLACE, A E	RM1	
	†ROSS, William D	CRM	
23	†RUDY, Clyde W	RM1	CWO2'49
33	RUPPRECHT, Fred C	RM1	Cdr '60
22	†SHRYACK, Louis A	CRM	LCdr'54
26	†SMITH, Howard L	CRM	Lt '57
28	STEIN, Sam	RM1	
	TARDY, Sidney A	RM1	
	†THIBAULT, EdgarJ	RM1	RMC '??
	†THOMPSON, Harry L	Cdr	RAdm'59
2-43	TRACEY, Don M	RM2	LCdr'59
	TUCKER, Edwardean A	RM1	Cdr '61
	VERNON, Lee H	RM2	LCdr'58
24,34	WAISWILOS, Edward A	RM1	LCdr'58
	WILTSEY, D V	RM1	
	†WIMBERLY, Claude L	RM1	RMC '??
24	WOLFORD, Elmo W	RM1	
	WOOD, R M	RM2	
11	†ZAMBA, John	CRM	CWO3'50
	ZILKER, Frederick J	RM1	RMC '

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1979.

From Xmas cards donated to the OTC archives by Johnson & Delworth. Bellevue & San Diego class numbers, if known, added for cross reference. Any errors in first names are those made during research.

14th NAVAL DISTRICT - OFFICER COMMUNICATORS - July-December 1941.

Name	Rank	Retired	Duty Station
ALVERSON, James G	Lt	LCdr'55	District Communication Office
ANDERSON, James W	CRE	LCdr'50	NY Pearl
BRIAND, Robert L	Ens	Cdr'67	NY Communication Office
CLODIUS, Richard W	Ens		Assistant DCO
†COOK, Francis L	CRE	CWO2'45	NAS Pearl
†COX, John M Jr	Ltjg	Capt'55	NY Communication Office
†CRAVEN, Conrad W	Ltjg	Cdr ??	NY Radio & Sound Supt.
†DELWORTH, Lee J	Ens	LCdr'50	OinC Naval Radio Station, Wailupe
†ENDERLIN, Arthur	Lt	Capt'63	NY Pearl
†FULLINWIDER, Ranson	LCdr	RAdm'56	14th NavDist
†GRAHAM, Roy W M	Cdr	RAdm'50	District Communication Officer
†GUITAR, Wallace E	LCdr	RAdm'54	NY Communication Office
HEINRICH, Joseph A	Ltjg	Cdr'59	RMO NY
†HORD, Paul W	LCdr	RAdm'47	Radio Material Officer NY
KANGETER, John H	LCdr		Radar Planning Asst. NY
KENNEDY, Gordon F	Ens		NY Communication Office
LAGLE, Robert D	CRE	Cdr '56	OinC Radio & Sound Lab NY Pearl
MORGAN, Milton J	Ens	Cdr '61	NY Communication Office
MULLER, Harry P	Ltjg	Capt'60	NY Communication Office
RIZK, Josef S	Ens	LCdr'66	RMO Office NY
THOMAS, Hubert E	Lt	Capt'60	RMO Office NY
THOMPSON, Perry	Ltjg	Cdr '61	RMO Office, Inshore Patrol (temp)
UNDERKOFLER, Oliver H	Ens	Capt'65	NY Communication Office
WARREN, Guy W	RE	Cdr '54	OinC Naval Radio Station, Lualualei
†WARREN, Harold E	Ens	Cdr '64	NY Communication Office
WOOLVERTON, Robert J	Ens	Cdr '61	NY Communication Office

†Deceased.

From 14th NavDist Directory July 1941 and
14th NavDist roster of officers 1 Jan 1942.

NPM RADIO WAILUPE (CONTROL) — 7 Dec 1941
Partial list only

RMS Cl#	Name	R/R	Retired
	ACHESON, "Bob"	RM2	
	ALTERMATT,	RM	
	ALVEY, Anthony G	RM1	RMC '48
	BAKER, "Bill"	RM2	
	†BEAN Max S	RM2	
	or		
	BEAN, Roy	RM1	
	BIGGERSTAFF, John	RM3	
	BOKI, Sam	RM1	
	BOYER, Karl E	RM3	
	†CARROLL, Carlton C	RM1	CWO2'56
	CLEMENS,	RM1	
15-43	†CLINGAN, George M	RM1	LCdr'58
	CRAMER, William	RM3/RM2	
W20	DAWSON, James W	RM1	CWO2'62
W1	†DELWORTH, Lee J	Ens	LCdr'50
	DILL, Donald M	RM3	CWO2'58
	DOYLE, Otti W	RM3	
	DURFEE,	RM3	
	FEARS, Lucius "Red"	RM1	
	FEATHERS, "Moxie"/"Joe"	RM2	
	FITZPATRICK,	USMC	
	FULLER,	RM	
	GIVENS,	SM1/RM1	
	GOODEN,	Sea/SC	
	†GRAHAM, Roy W M	Cdr	RAdm'50
29	HAGLUND, Russell M	CRM	Cdr '58
	HARLESS,	?Yeo	
	HATCHER, Robert E	?Yeo	CWO3'61
W20	HILL, James W	RM2	CWO2'57
	HOWARD,	CRM	
	IDLER, Elden "Red"	RM3	
	JACOB,	RM	
W26	JESSUP, Charles R	RM2	LCdr'65
	JOHNSON, I N E	RM3	
	or		
	JOHNSON, Robert D	RM1	CWO2'59
	JUSTIC,	Sea/SC	
	KEMPTON,	RM3	
	KINSFATHER,	Sea/SC	
	LESH,	RM	
W17	†LOBDELL, Wilbur C "Bob"	RM1	CWO2'50
	†LOWTHER, Charles O	RM3/RM2	RMC '??

RMS Cl#	Name	R/R	Retired
	MADSEN	RM	
	MARKELOFF, Sergi	AS	
W21	†McBRIDE, Whiteley	RM?	CWO2'5?
	McELVEEN,	???	
	McGUIRE, Edgar	RM2/RM1	
	MEDEIROS, Manual	USMC Pvt	Capt'61
	MILBRADT,	USMC	
	MORAN,	Sea/SC	
15	†MORRIS, Leo William	CRM	RMC '??
	NARDIN,	USMC	
	NASH, Charles N	RM3	
	NELSON,	RM1	
22	†NOONER, Joseph W	CRM	Lt '53
	OTT, Casper D	RM1	LCdr'64
	PALKO, "Steve"	RM1	
	PANIKU,	USMC	
	PIERCE, Charles	RM2/RM1	
12	†PORTER, Clarence A	CRM	Lt '46
	REED,	RM1	
23	†RUDY, Clyde W "Joe"	RM1	CWO2'49
	StCLAIR, Neil E	EM?	CWO2'56
	SCOTT,	RM	
	SERAFIN,	RM	
26	†SMITH, Joward Laverne	CRM	Lt '57
	SNIDER,	RM	
	SPAULDING,	RM3	
	SPIRO, George J	RM3	
	STALEY,	RM3	
	STEINER, Abraham	RM	
	TAYLOR,	RM	
	THORPE,	USMC	
2-43	TRACEY, Don M	RM1	LCdr'59
	TUTT, Richard E	RM2	RMC '57
	VERNON, Lee H	RM1	LCdr'58
	VERVA, Joe	SR	
	WALDEN,	USMC	
	WALKER,	RM3	
	WARREN,	USMC	
	WATT,	USMC	
	WILKINSON,	RM	
	WOODS,	RM	
	WRIGHT,	MM?/EM?	
29	†YETTER, Donald A	CRM	Cdr '56

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

Space for additional names:
STEVENS, Richard O

This list was researched from a copy, provided by Tutt, of a two section watch list posted on 7 Dec 1941 by C. A. Porter, right after the Japs struck Pearl Harbor. Bellevue & WORES class numbers added for cross reference. Any errors in first names, initials or rates are those made during research and assists. Officer names added.
(See Appendix X-6 for a copy of the watch list.)

14th NAVDIST OFFICER COMMUNICATORS — Dec 1944 Partial List.

Name	Rank	Retired	Duty Assignment
BRYAN, W D Jr	RE		Lualualei
CALLAGHAN, James G	Lt	Lt '58	OinC Radio Station, Haiku
JONES, J G	Capt		District Communication Officer
KOZACKO, Walter H	LCdr	Cdr '57	CO Radio Stations 14th NavDist
LEUIN, Harvey D	Lt	LCdr'54	Executive Officer, Wahiawa
LEWIS, Ernest P	Ltjg		OinC Communication Office, Honolulu
MAYS, Charles E	CRE	CWO2'49	Asst to OinC Radio Station, Heeia
†MORRIS, Hedley B	Cdr	Capt'59	Asst District Communication Officer
OLNEY, P E	Lt		Asst OinC Radio Station, Lualualei
†PORTER, Clarence A	Lt	Lt '46	Communications Officer, Wahiawa
PUMPHREY, William F	CRE	CWO2'50	Radio School Officer, Wahiawa
RIETZKE, Robert D	Ens	Lt '59	Asst Radio Officer, Lualualei
SMITH, A W	LCdr		OinC Security Unit, Wahiawa
SWEARINGEN, R W Jr	LCdr		OinC Radio Station, Lualualei
TUCKER, Edwardean A	Lt	Cdr '61	Communication Liaison
WALLING, Walter W	RE	CWO4'59	Radio Material Officer, Radio Stations

From 14th NavDist Directory - Dec 1944

14th NAVDIST OFFICER COMMUNICATORS - 1945-1946 - Partial List

†ALVERSON, George D	CRE	CWO2'48	DCO's Office
CLARK, G Warren	Cdr	Capt'59	Executive Officer, Radio Material Office
†FORSTER, Kenneth L	Capt	Capt'52	District Communication Officer
†MORRIS, Hedley B	Cdr	Capt'59	Asst District Communication Officer
†PORTER, Clarence A	Lt	Lt '46	Communications Officer Wahiawa
THOMAS, Hubert E	LCdr	Capt'60	Asst RMO - Shore Stations
TUCKER, Edwardean A	Lt	Cdr '61	Communication Liaison
†WARREN, Harold E	LCdr	Cdr '64	Communication Officer, Port Director

†Deceased

From Administrative History of the 14th NavDist during WWII and from personal knowledge.

NPM RADIO WAHIAWA (CONTROL) -- Mar 1947

RMS Cl#	Name	R/R	Retired
	ADAMS, C L	Sea	
	ASH, R K	CRM	
	BALLARD,		
	BEAVEN,		
	BERRY, K L		
	BOYLE, P B	CRM	
	BRANDSTETTER	Sea	
	BROSCHA, Donald E	Ltjg	LCdr'58
	BROWN,		
	BROWN, P B		
	CANNON,	Sea	
	CAULFIELD, J F		
	CLEMMONS,		
28	CLOUD, Warren T	Lt	LCdr'55
	COOK, G T	CRM	
	CRAIG,		
	DAIGLE,		
	DANIELS,		
	DORMAN,		
	DUGGAN, Arthur G	CRE	CWO4'67
	FITZPATRICK,	CRM	
	FOSTER, A O		
	FREDERICK, Orville D	CRM	
	FULLER,		
	FUNSTON, Leslie L	RE	CWO3'60
	HALE, C B		
	HARRIS, J		
	HELM, J D	CRM	
	HERRING,		
	HESSION,		
	HOGAN, D L		
	JENKINS, John J	CRM	
	JOHNDY,		
	†JOHNSTON, Allan G	CRM	RMC '??
	JOHNSTON, G A		
	KAHL, L R		
	KARIM,		
	KNOERZER,		
	KOENIG, Paul W	CRM	
	LEACH,		
	LEAHY,		
11-43	LEDBETTER, Bud A	Ens	LCdr'57
	LEE, R E	RM1	
	LOPER,		
	MARCKS,		
	MARSHALL, S Y		
	MAWYER, Ralph A	ETC	CWO3'61
	MAY,		
	McCLELLAND,		
	McCOOK,		
	McKEOWN,		
	McMANIGAL, D L		
	MITCHELL,		
	MONROE,		
	MYRICK,		
	NELSON,		
	NEWBY,		
31	†NEWELL, Demcey B	CRM	RMC '5?
	NICHOLSON,		
	NYBERG, T R	Yeo	
	ODELL,		
	O'DONNEL,		
	OSTERHOLZ, L E		
	PATTON,		
	PEDERSON,		
	PETERSON,		
	PROVOST,		
	RICKE, C J		
	ROACH,		
	ROBB,		
	SCHAEFFER, R J or F J		
	SEDGLEY, G A		
	SERNIAK, W R		
	SIROTIAK, A J		
	SISSON, G E	RM1	
	SMITH,		
	SMITH, G A		
	STEWARD,		
	STOCKDALE,		
	SUITS, R E		
	SUMMERS,		
	SWANSON,	CRM	
	†SWEARINGEN, Ralph W Jr	LCdr	LCdr'37
30	†SWITZER, Leo C	CRE	CWO?'5?
	TEACH,	Sea	
	THOMPSON, Harry E	CRM	LCdr'67
	TUTT, Richard E	CRM	RMC '57
	VALESQUEZ, E D		
	VanDUSKIRK,		
	VanPATTEN,		
	VanVALKENBERG,		
	WADE, N G	CRM	
	WEAVER,		
	WELCH,		
	WEST,		
	WHITE,		
	WILLIAMS,		
	WILSON,		
	WINTERS, Harold M	Ltjg	LCdr'59
	WITTKE,		
	YOUNG,		

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From 17 Mar list belonging to Tutt & Comm Activities fone book. Bellevue class numbers, added for cross reference. (May, Provost and Stockdale on temporary duty)

NPM RADIO WAHIAWA (CONTROL) — Dec 1947

RMS Cl#	Name	R/R	Retired
	ADAMS, C L	S1	
	ADAMS, J W	ET3	
W5	ANDERSON, James W	LCdr	LCdr'50
	ASH, R K	CRM	
	AUTHIER, L D	S2	
	BANKS, J H	S2	
	BARTH, H P	RM3	
	BERRY, K L	S1	
	BILLETT, A R	S1	
	†BISHOP, John L	LCdr	Cdr '??
	BOWEN, J D	S2	
	BOXELL, J S	RM2	
	BOYLE, P B	RM1	
	BUCK, W D	S2	
	CABINESS, G M	RM3	
	CANTERBURY, J	S1	
	CARROLL, R J	S1	
	CAULFIELD, J F	S1	
	CAVINESS, C R	CRM	
	CLIFT, G	S2	
	CONNOR, F J	S2	
	CONROY, J P	S1	
	COOK, G T	CRM	
	CORTEZ, R	S2	
	DAVIS, M G	S2	
	DAVIS, R	S1	
	DAWDY, N R	RM2	
	DUGGAN Arthur G	CRE	CWO4'67
	EGGERS, W J	S2	
	FABIAN, Rudolph J	Cdr	Capt'61
	FOSTER, A O	S1	
	FOSTER, G	S1	
	FREDERICK, Orville D	CRM	
	FRENCH, J B	S1	
	FRIEND, B J	S1	
	FUREY, John J	ET1	Lt '67
	GILBERT, E E	S2	
	GLASER, B J	ET2	
	GOODMAN, David	CRE	CWO4'58
	GRUPA, S M	ET2	
	HAGEDORN, F E	ET3	
	HALE, C B	S2	
	HARRIS, J	S1	
	HESTAND, J Q	S2	
	HILDEBRANT, E G	MaM3	
	HILL, B R	S1	
	†HILL, Lester M	Cdr	Capt'57
	HIXON, J T	RM2	
	HOGAN, D L	RM1	
	HOOPER, J E	ET3	
	JENKINS, John J	CRM	
	JEPSON, M R	ET3	
	†JOHNSTON, Allan G	CRM	RMC '??
	KOBE, R G	RM2	
	KRAEMER, G T	ET2	
	KRESCH, W	S1	
	LAGAMBINA, F P	S1	
	LEATH, B W	S1	
	LEE, R E	RM1	
	LEGARE, L L	RM2	
	LONG, E D	S1	
	LOWER, R F	S1	
	MARCHESE, S	RM3	
	MARSHALL, J Y	S2	
	MARTIN, B J	S1	
	MATHEWS, R W	S1	
	MAWYER, Ralph A	ETC	CWO3'61
	McCARTY, W M	S1	
	McMANIGAL, D L	S2	
	MOURAS, L	RM2	
	MULKEY, Madison H	CRM	CWO2'61
	NEWELL, D E	S1	
31	†NEWELL, Demcey B	CRM	RMC '??
	NOVASIO, R A	S1	
	NYBERG, T R	Y3	
	†OLMSTEAD, Robert W	ETC	ETC '??
	OSTERHOLTZ, L E	S1	
	PIOSKE, William C	ETC	LCdr'68
	RICKE, C J	S1	
	ROONEY, E J	ET3	
	San FILIPPO, C J	MaM3	
	SCHAEFER, F J	ET3	
	SEDGLEY, G A	S1	
	SERNIAK, W R	S1	
	SHAEFER, R J	S1	
	SHEALY, R L	S1	
	SHIVELEY, J E	CRM	
	SHUCKAHOSSE, L	S1	
	SIROTIAK, A J	RM3	
	SISSON, G E	RM1	
	SKRUKRUD, C E	RM1	
	SPANN, B W	S2	
	SUITS, R E	RM2	
	TEICHERT, W P	S2	
	TELLER, G E	S1	
	THOMAS, H L	ET3	
	THOMPSON, Harry E	CRM	LCdr'57
	VALERO, A A	RM3	
	VALESQUEZ, E D	S2	
	WEILER, J R	S1	
	WINTERS, Harold M	Ltjg	LCdr'59
	WOLLENBERG, R I	ET2	
	WOODWARD, J E	ET3	
	ZEICH, R M	S1	
	ZIRKELBACK, L S	S2	

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.

From Xmas card donated to the OTC archives by Tutt. WORES & Bellevue class numbers added for cross reference. Any errors in first names are those made during research.

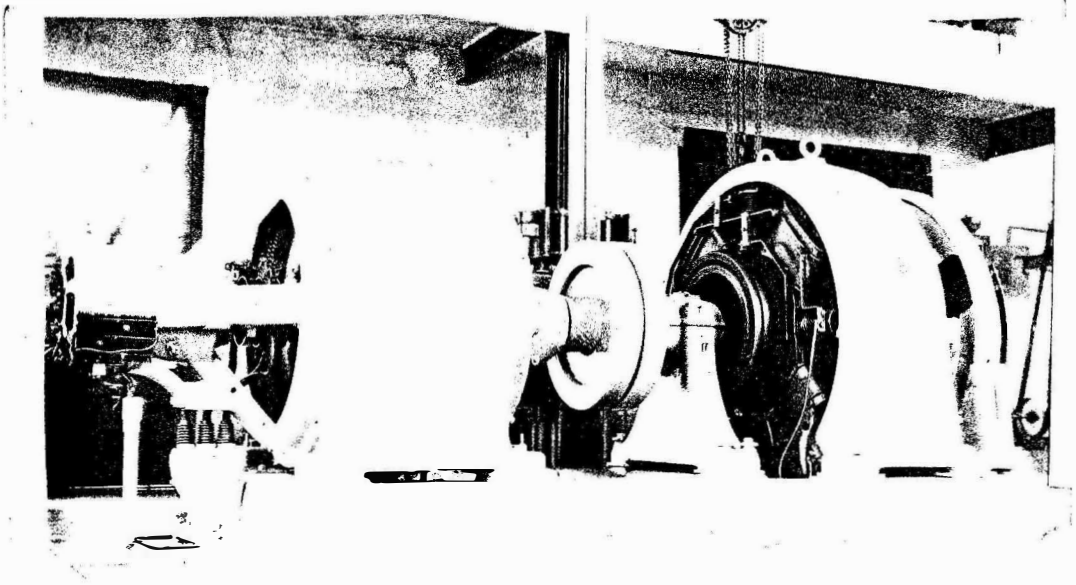
NPM COMMUNICATION STATION PEARL HARBOR -- Dec 1950
First Class & Up; omitting TEs, LIs, WAVES
Including Haiku, Makalapa, Wahiawa

RMS Cl#	Name	R/R	Retired	
	ANDERSON, J D	RMC		
	ANDERSON, M E	RMC		
	BARNUM, R L	RMC		
	BASSETT, Melvin E	RMC	LCdr'71	
ex-Y	BAST, Lester G	Lt	LCdr'63	
	BERRY, Byron B	Lt	LCdr'70	
	BIRD, Gerald T (2)	Ltjg	LCdr'67	
	BOWERS, L E	CSC		
	BOWNAS, R A	BMC		
	BRENNAN, George L	LCdr		
	BRUNSON, G S	ET1		
	BURNETT, Donald M	LCdr	Cdr '68	
	BUTNER, D W	ETC		
	CANNADAY, Oscar F Jr	Lt	Cdr '68	
W20	CAPPS, Elton	ETC	WO1 '56	
30	†CARTER, Delmar W	LCdr	Cdr '57	
ex-PN	CHANDLER, Troy K	Ltjg	LCdr'59	
	CORKERN, Willis D	RMC	CWO2'58	
	COVERT, Lawrence W	Ltjg	LCdr'64	
	†CRAIGHEAD, Garland R	Ltjg	LCdr'56	
	CURREY, C G	RMC		
	DUGGER, R W	ETC		
	FORBES, Richard F (2)	Lt	Cdr '65	
	FORD, R C	RMC		
	†FORSTER, Kenneth L	Capt	Capt'52	
	FRANCISCO, J M	RM1		
	GAZAWAY, W I	RM1		
	GESSLER, J A	RMC		
	GILMORE, Carl L	Lt	LCdr'65	
	GILSTRAP, W O	RMC		
	GRIFFITH, T H	PNC		
	HARPHAM E O	ETC		
	HENDRICKS, H L	RMC		
	HIGHFILL, Harold C	Lt	LCdr'58	
	HIGHTOWER, B F	CSC		
	HILL, L M	Cdr		
	HINMAN, J C	RM1		
	†HOPKINS, John Paul	Ltjg		
	HULS, P K	CTC		
	HUTTON, J G	ET1		
	JOHNSEN, Robert E	RE	CWO4'62	
	JOHNSON, Harold Louis	ETC	CWO3'60	
	KASNICKI, Edward J	ETC	Cdr '73	
	KESLER, Benjamin R	Lt	LCdr'63	
	†KING, Leslie E	LCdr		
	KIRKWOOD, B M	ETC		

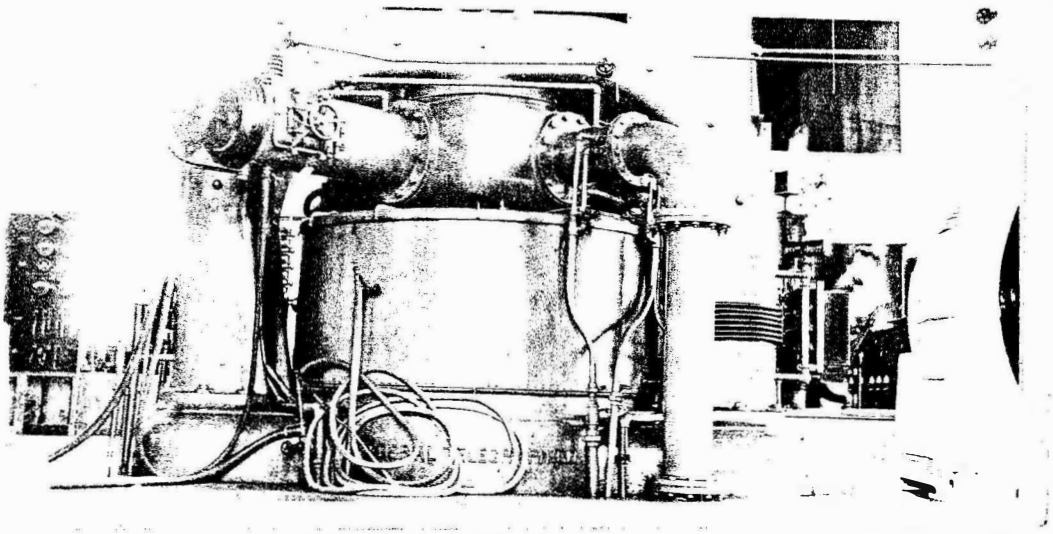
RMS Cl#	Name	R/R	Retired	
34	KLOMBIES, Carl B	Ltjg	LCdr'59	
	KNEPPER, Edward W	Cdr	Capt'62	
	KOVALEC, S	RM1		
	KOZLOWSKI, Vincent Jr	Lt	LCdr'58	
	LAWRENCE, J R	RM1		
	LEE, Hershel	CS1		
	†LIETWILER, John M	Cdr	Capt'60	
	LONG, E C	RM1		
	LOTTER, A L	YNC		
	MAJORS, J R	RM1		
	MARTHE, A S	BMC		
	MARTIN, Robert H	BMC	LCdr'70	
	McFARLANE, John G	Lt	LCdr'59	ex-EM
34	McLANE, Albert R	Lt	LCdr'56	
34	MERRILL, Frank F	Lt	LCdr'58	
34	MERRY, Harold A	ETC	Lt '57	
	MELLARD, J R	HM1		
	MINION, Gerald W	Lt	LCdr'59	ex-Y
	MOERSCHELL, Russell C	CBsn	CWO3'56	
	NAVE, Lincoln D Jr	RM1	LCdr'71	
	PALMER, Wendell S CHC	Lt	Cdr '68	
	PHILLIPS, Howard T	CRE	CWO4'58	
	PICKRELL, T W	RMC		
	RATLIFF, H C	RM1		
	†RITCHIE, Billy R	RM1	RMC '??	
	ROBERTS, Morris E	RMC	RMC '	
	ROBERTS, William M	Lt	LCdr'69	
	ROBINSON, J H	RMC		
	ROHRBACH, J J	BMC		
	ROOFENER, Paul B (d)	Ltjg	LCdr'58	ex-AD
	SCHOBERLIN, Melvin H	Lt	Cdr '67	
	SCOLES, Albert J	ETC	Cdr '72	
16	†SHEA, Raymond J	Lt	LCdr'56	
	SMITH, Gilbert M	ChSClk	CWO3'58	
	SMITH, Jack Donald	Ltjg	Lt '59	
	†SNOW, Jack D	RMC	RMC '	
	STOCKDALE A V	RMC		
	TAYLOR, Cecil O (2)	Ltjg	Cdr '69	
	VanBLARCOM, R W	BMC		
	†WALLING, Walter W	CRE	CWO4'59	
	WATERS, Kermit W (2)	Ltjg	Lt '61	
	WILSON, Edmond W	RMC	CWO2'60	
	WILSON, R H	RMC		
	WRIGHT, C G	Ltjg		
	ZAHLER, R	ET1		
	ZIEBA, Henry J	Ltjg	LCdr'63	
	ZOOK, Lester E	Ltjg	LCdr'65	

†Deceased.
MEMBER OTC SoCal and/or NorCal 1985 or earlier.
ADDRESS on hand in 1985.
(2) Designated Naval Aviator.

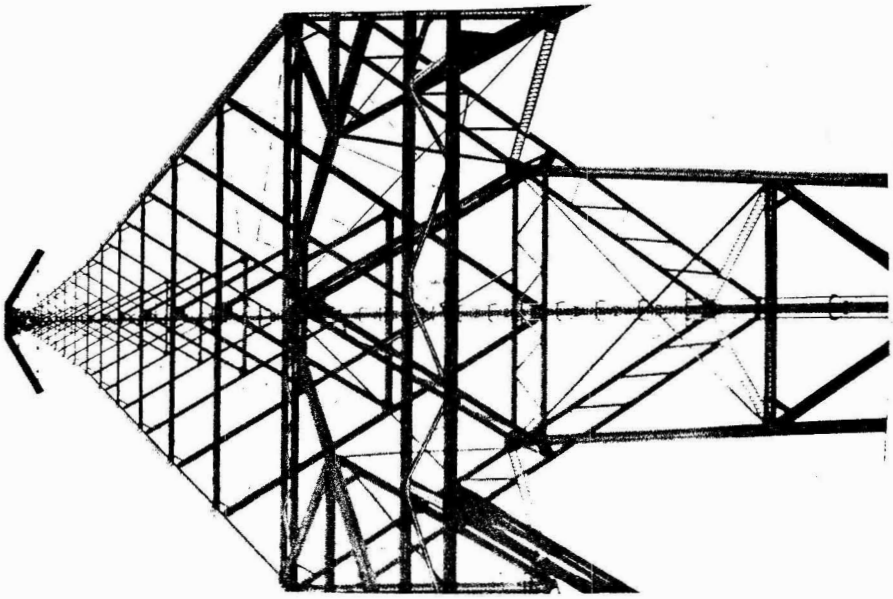
From a Xmas card donated to the OTC archives by Klouck. Bellevue and WORES class numbers, if known, added for cross reference. Any errors in first names are those made during continuing research.



One of the two motor-generator units for the 500 kw arc transmitter, Pearl Harbor

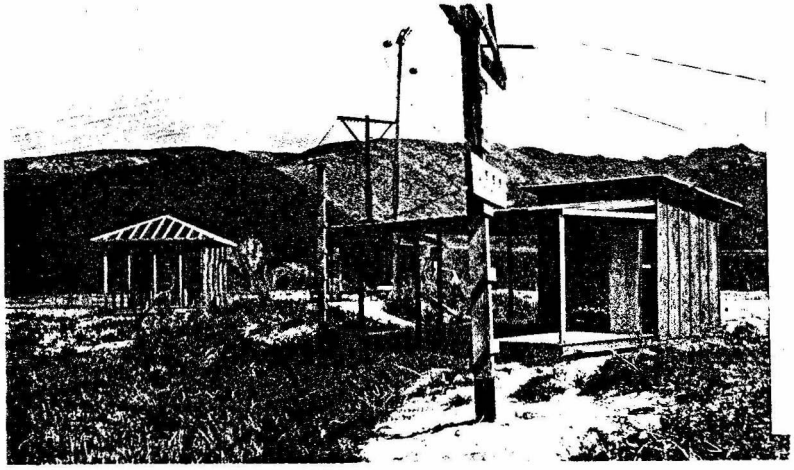


500 kw arc chamber, Pearl Harbor 1920, showing copper anode at left, magnetic field coils, water cooling connections. "Arc engineer" at right.



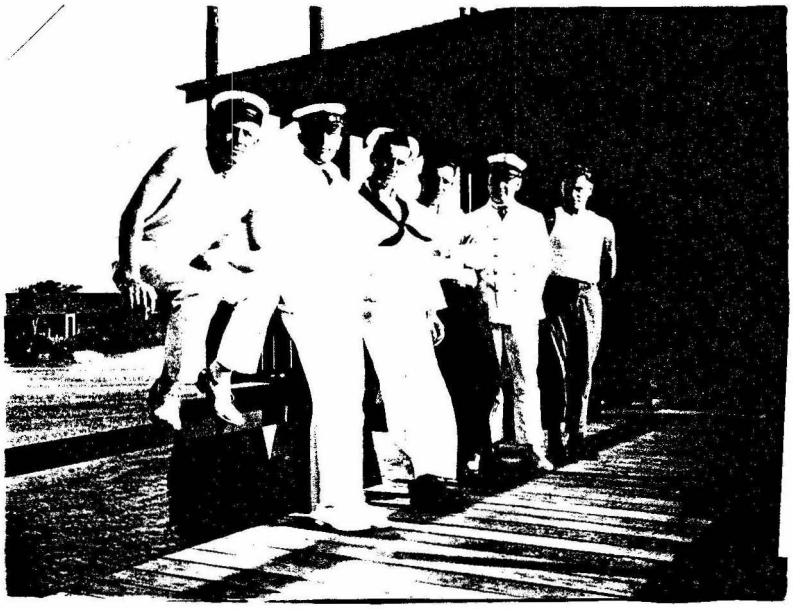
View of one of the three 600 foot towers at Pearl Harbor, 1920.

Harold B. Phelps' collection.

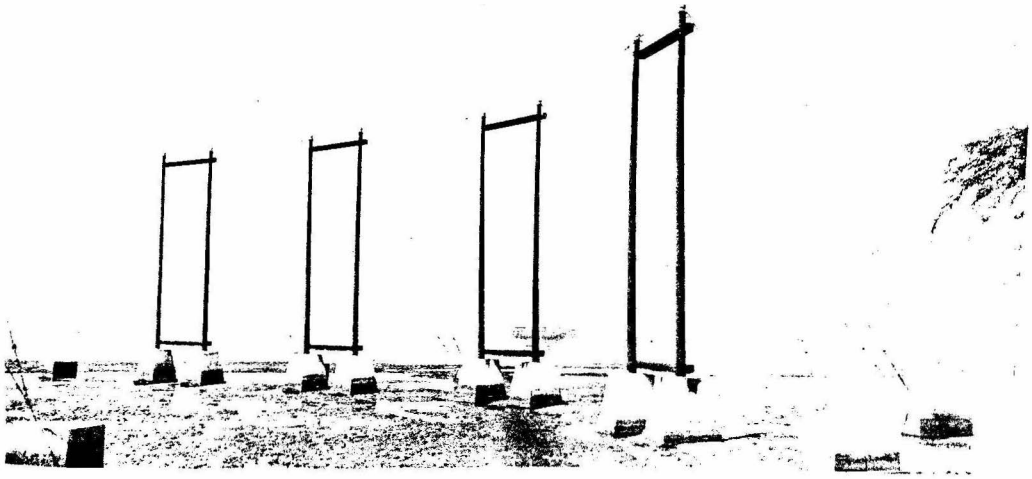


Original temporary Wailupe station, 1919.

E.L.Harris, W.G.Tichenor, O.H.Scott and H.B.Phelps, all CRM, Wailupe 1919



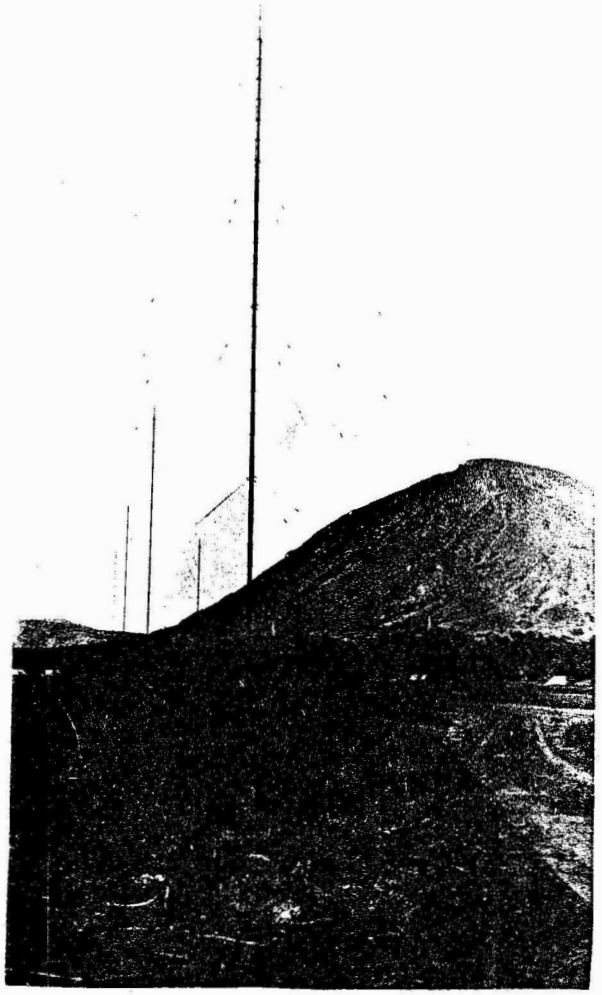
On the boardwalk at Wailupe, 1921: N.B. "Red" Estes CRM; H.B. "Skinny" Phelps CRM, "Hook" Adams RM2; unknown; L.R. Windser CRM & Merrill RM2.



Fixed, directional loop antenna, Wailupe, 1921.

Harold B. Phelps' collection.

Bridge over the water, operating building
C.R. "Shorty" Spicer, Wailupe, 1921

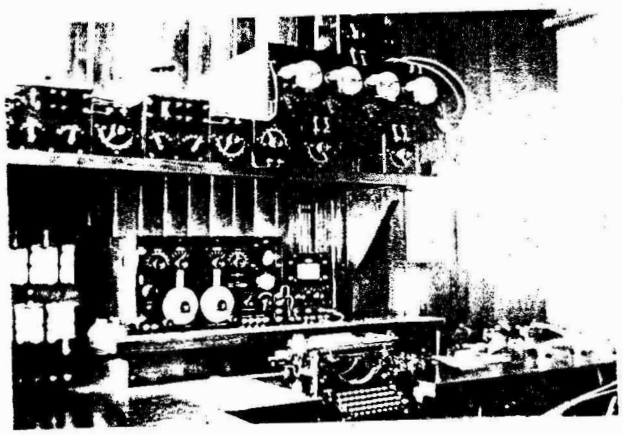


Marconi, Koko Head Control Station
Receiving antennas, 1919

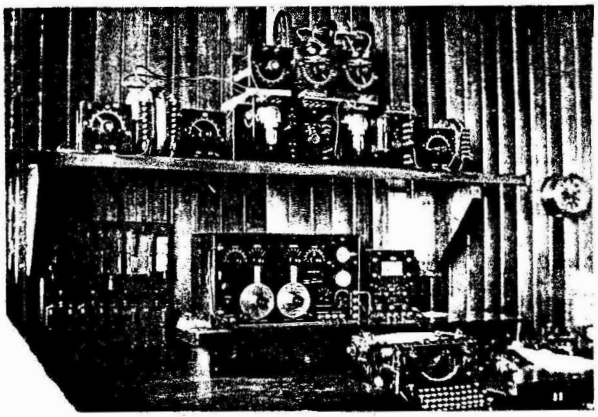
Overhead view of Wailupe Naval Radio Station 1921
(Temporary station was located to left of fish pond).

Harold B. Phelps' collection.

Operating building, Wailupe (NPM) taken from the Koko Head side, 1921.



One of the operating booths, Wailupe, 1921

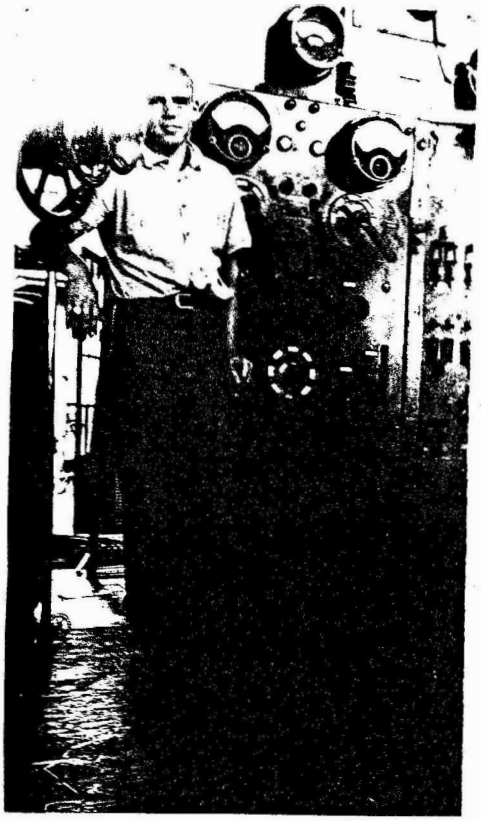


Another operating booth, 1921

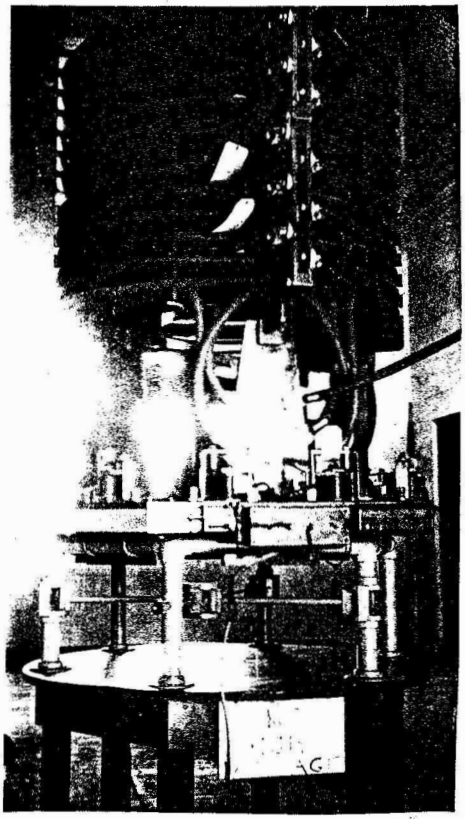
Single men's barracks, U. S. Naval Radio Station, Wailupe, 1921.

APPENDIX B-4 Harold B. Phelps' collection.

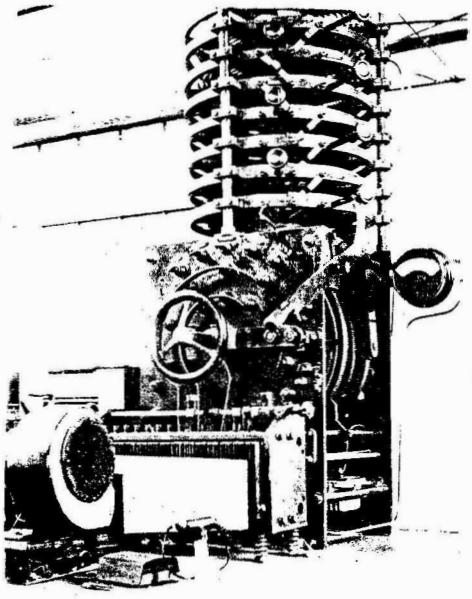
Transmitter building, High Power Radio Station, Pearl Harbor 1923



Control Panel, 500 kw arc, Pearl Harbor 1923

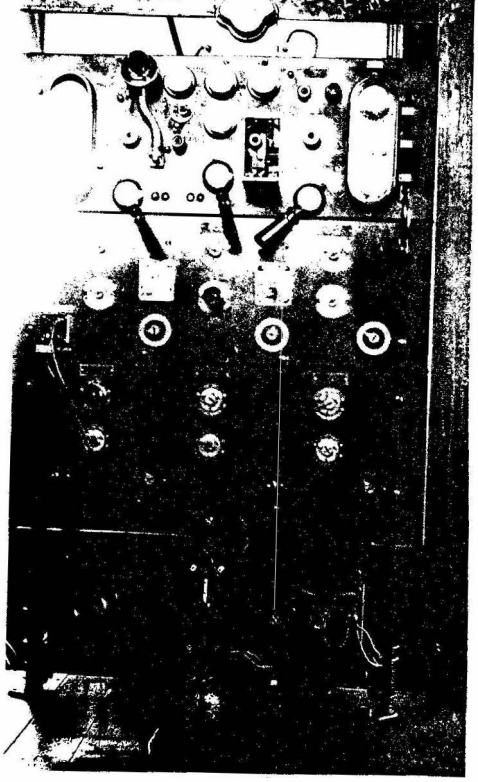


Arc helix with keying relays Pearl Harbor 1923

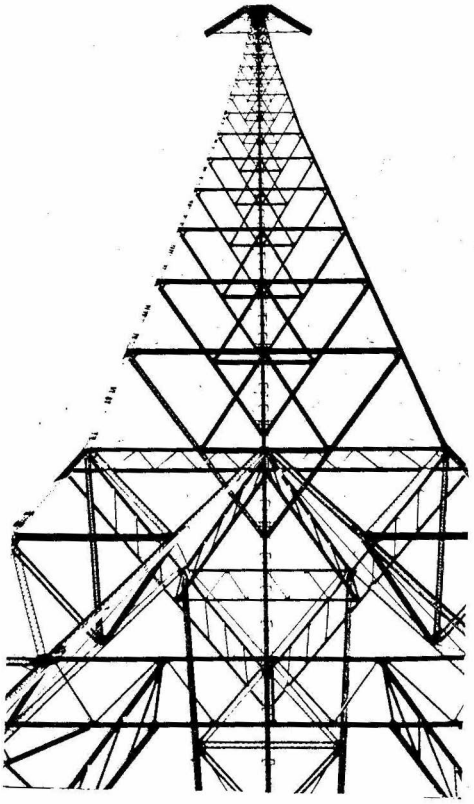


Photos by George B. Todd

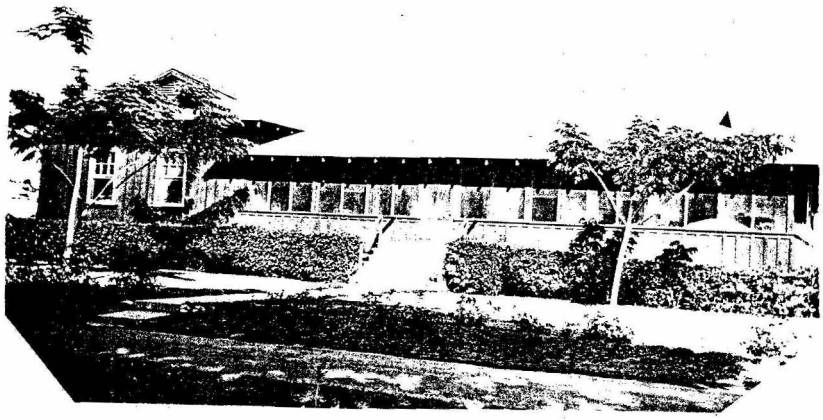
5 kw quench-gap spark transmitter, Pearl Harbor 1923



Model TD tube transmitter
Pearl Harbor 1923



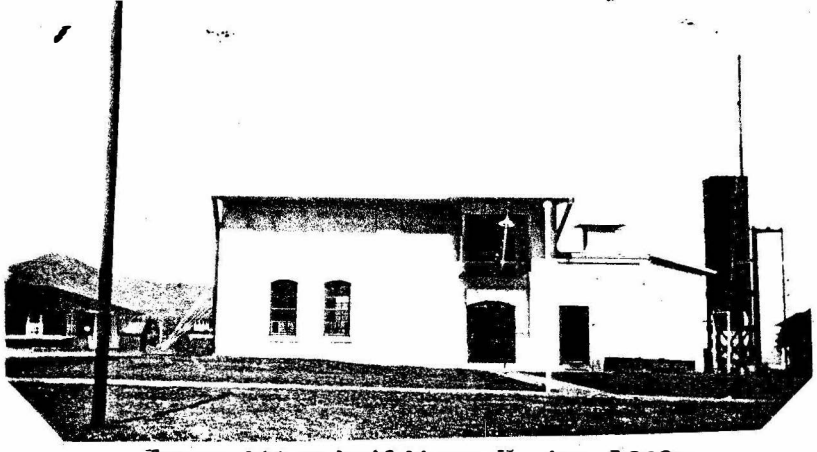
One of three 600 foot antenna
towers, Pearl Harbor 1923



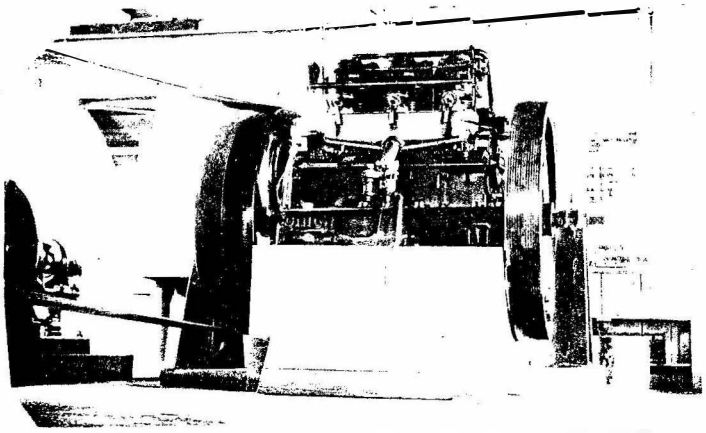
Single men's barracks, Pearl Harbor 1923

Photos by George B. Todd

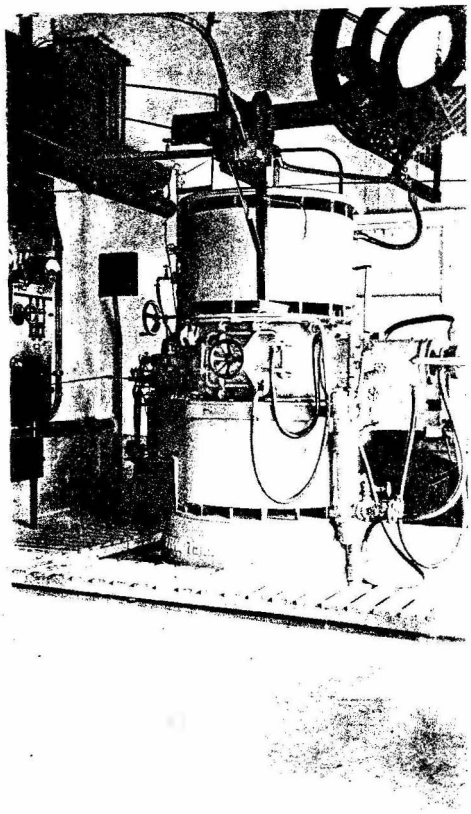
CRM in charge Nathan Adler
& station CRM, Pearl Harbor 1923



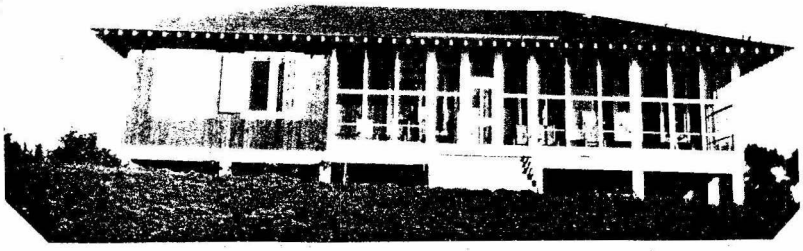
Transmitter building, Heeia, 1923.



Emergency power gas engine - motor generator, Heeia 1923



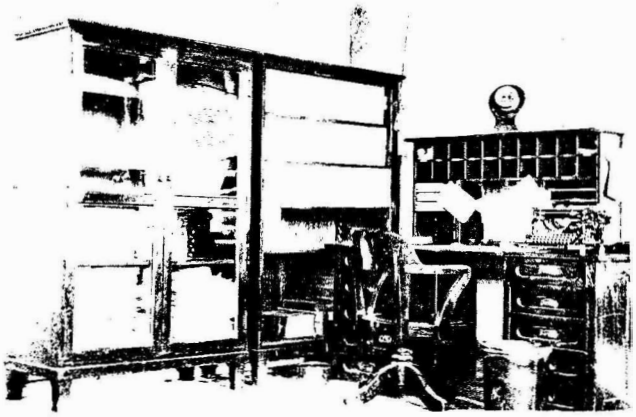
100 kw arc transmitter, Heeia 1923



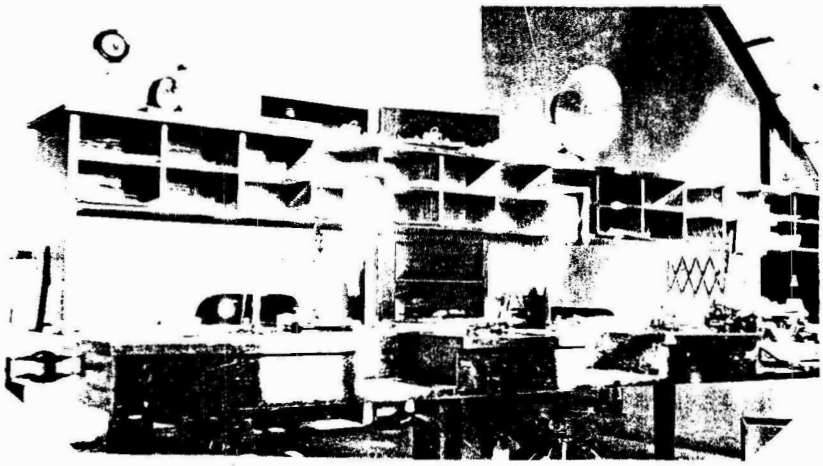
Single men's barracks, Heeia 1923.

Photos by George B. Todd

Operating building, Wailupe 1924

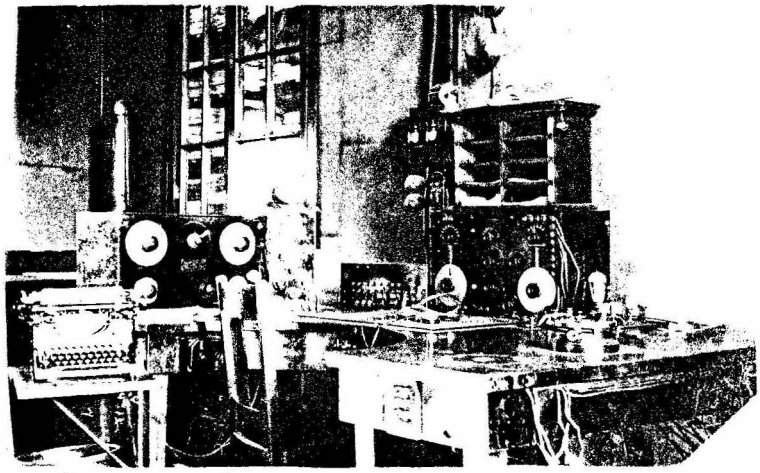


Traffic Chief's booth, Wailupe, 1924

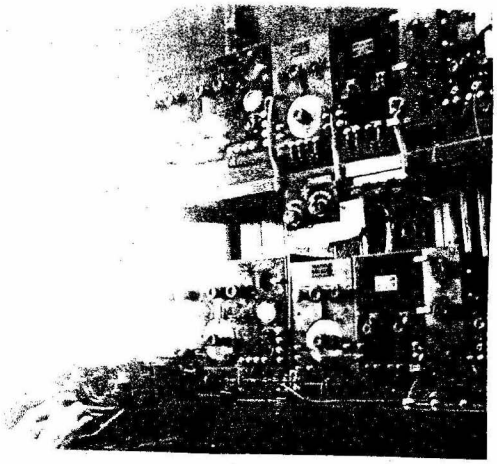


Wire room, Wailupe 1924

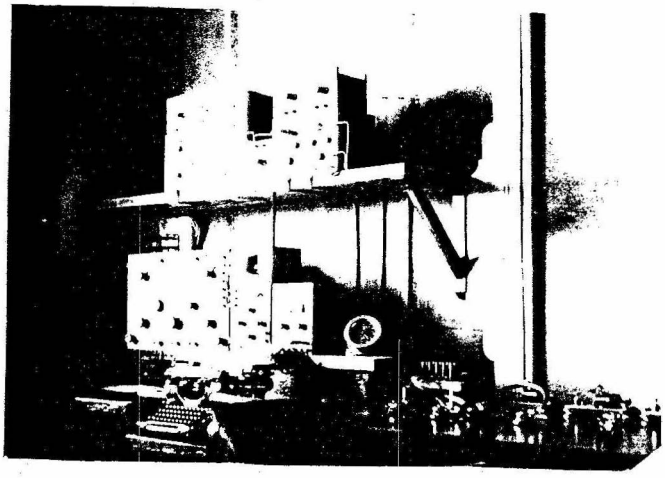
Photos by George B. Todd



Ship-shore booth, Wailupe 1924

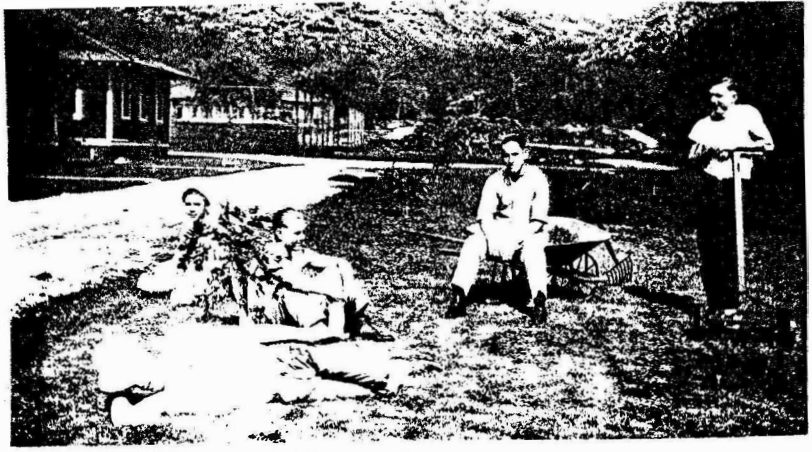


San Francisco (NPG) booth, Wailupe 1924

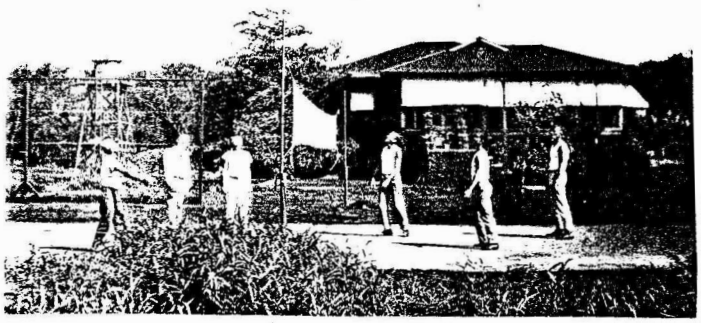


San Diego (NPL) Fleet intercept
booth, Wailupe 1924

Photos by George B. Todd

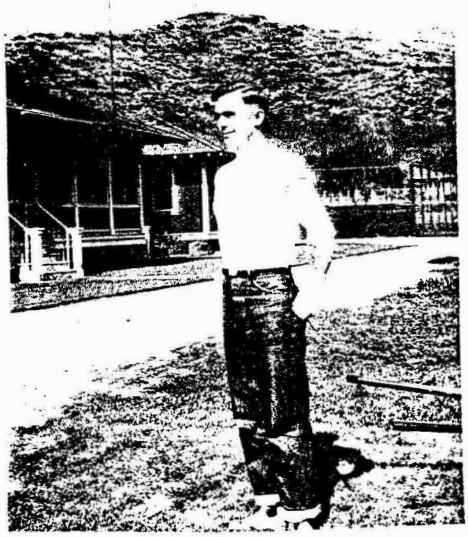


Working party, McNally, Wagner, Palmer, Richardson.
Single men's barracks & volley ball court. Wailupe 1924

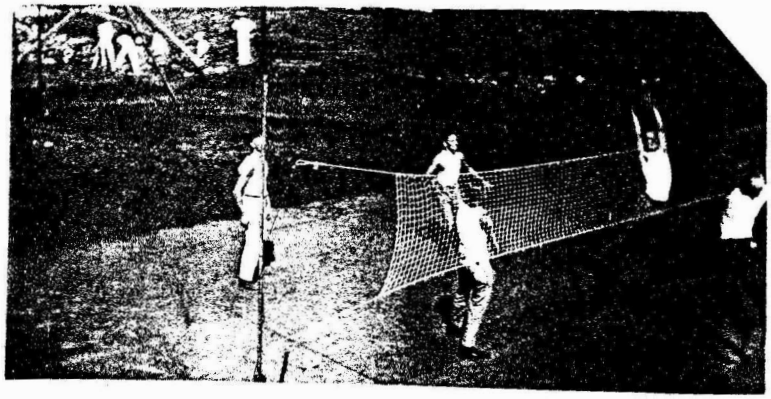


Volley ball court; DCO's quarters with
pump house on left; Wailupe 1924

Richardson with CRM Chauncey's
quarters in background - Wailupe
1924

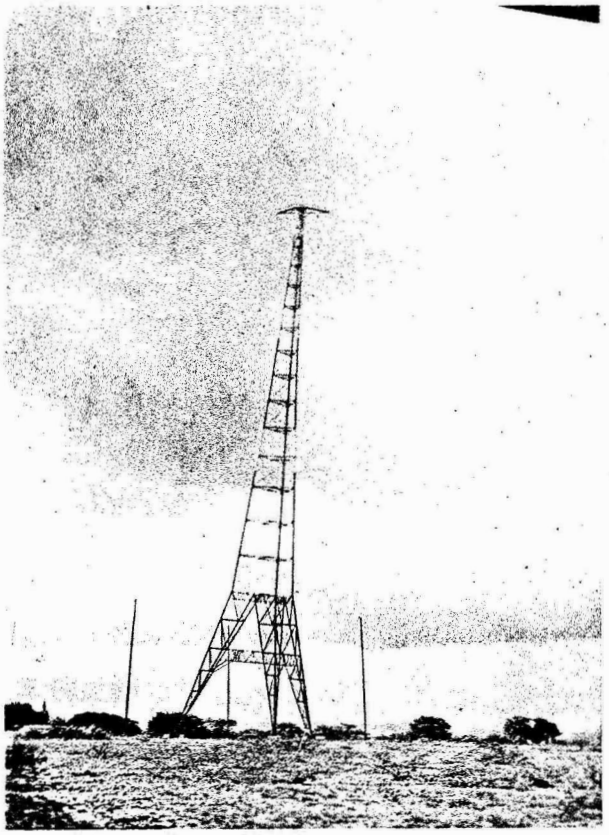


Richardson with single men's
barracks at left, Wailupe 1924

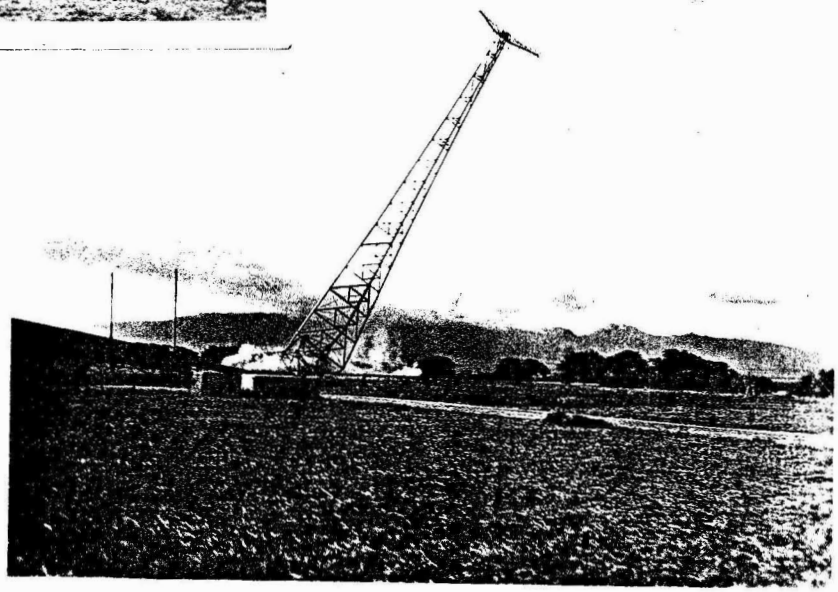


Volley ball court; DCO Frank Loftin LCDR USN
inspecting working party; Wailupe 1924

Photos by George B. Todd



Down go the 600 foot towers at the U. S. Navy High Power Radio Station Pearl Harbor, Territory of Hawaii. (About the latter part of 1937. Does anyone know the exact date?)



RADIO WAILUPE (partial)

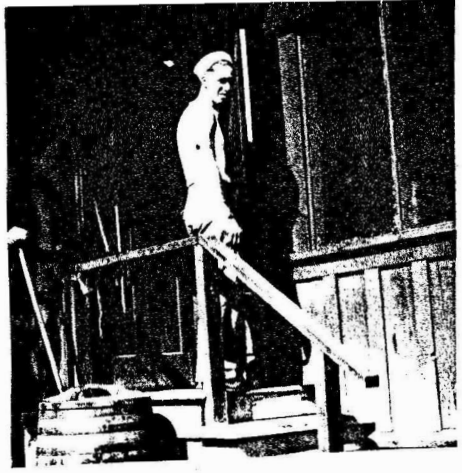
1933 or 1934

From left,

Top row:	J. T. Kiesler,	CRM		B. R. Kitchens,	RM2		L. A. Shryack,	RM1
	D. H. Bradley,	CRE		F. F. Clark,	RM2		J. W. Trott,	RM2
	W. A. Hidde,	CRM		A. G. Mackay,	RM1		A. E. Elliott,	SC2
4th row:	C. H. Zuttermeister,	RM2		M. D. Morrow,	RM1		W. L. Pugh,	Y2
				H. B. Yother,	Y2	2nd row:	G. A. Newcomb,	RM2
	H. O. Thompson,	RM2	3rd row:	J. L. Pojewis,	PhM1		H. C. Cameron,	RM1
	T. A. Donegan,	RM2		A. K. Tracy,	RM1	Front row:	A. J. Connolly,	RM2
	J. Ansak,	RM1		J. W. Schilling,	Y1		J. H. Desmond,	S1

Front entrance, operating building
Wailupe, 1933 or 1934.

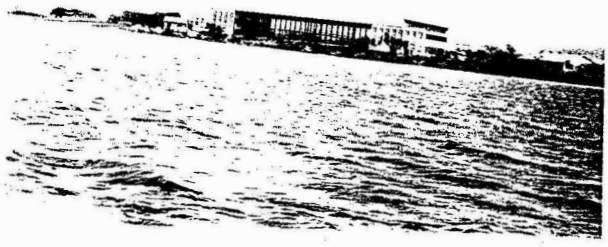
Photo from collection of
John W. Trott CDR USN RET



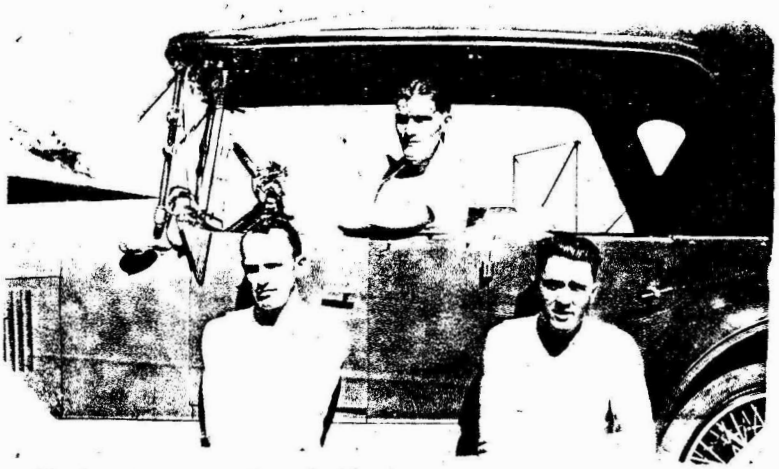
C. B. Dobyns RM3c
HiPower Pearl 1923

C. J. Parsons CRM
HiPower Pearl 1923

Single Mens' Barracks Heeia 1923
J. J. Glevanik 2nd fm L - front row
C. Highsmith 3rd fm L - Top row



Hangar - NAS Ford Island
1923

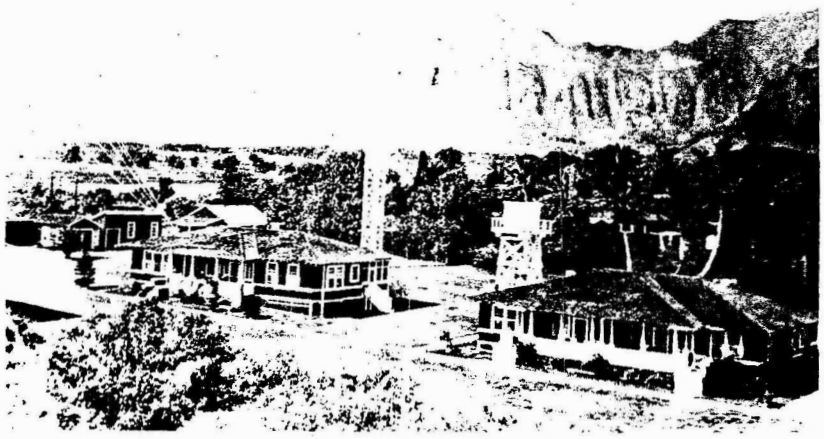


High Power - Pearl Harbor 1923
D. S. Green CRM - left on running board
J. W. Fairweather - at wheel
it was Parson's car!

W. V. Green RM3c
off Heeia

Photos by George B. Todd

U. S. Naval Radio Station, Heeia, Oahu, T.H.
View from the Pali - 1931?



Quarters for Radioman in Charge and other CRM's
U. S. Naval Radio Station, Heeia, Oahu, T.H.
Early 1930's - 100 kw arc and several
self-excited 1 kw transmitters.

Photos from collection of
Raymond B. Brightman LCDR RET

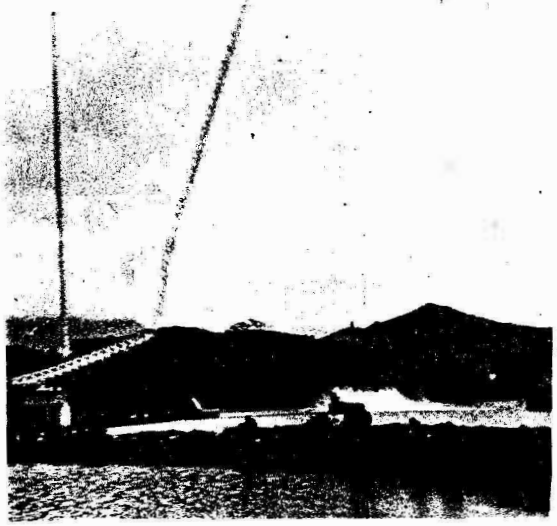
U. S. Naval Radio Station (T)
Heeia, Oahu, T.H. (NHP)

Tallest wooden tower in the world!

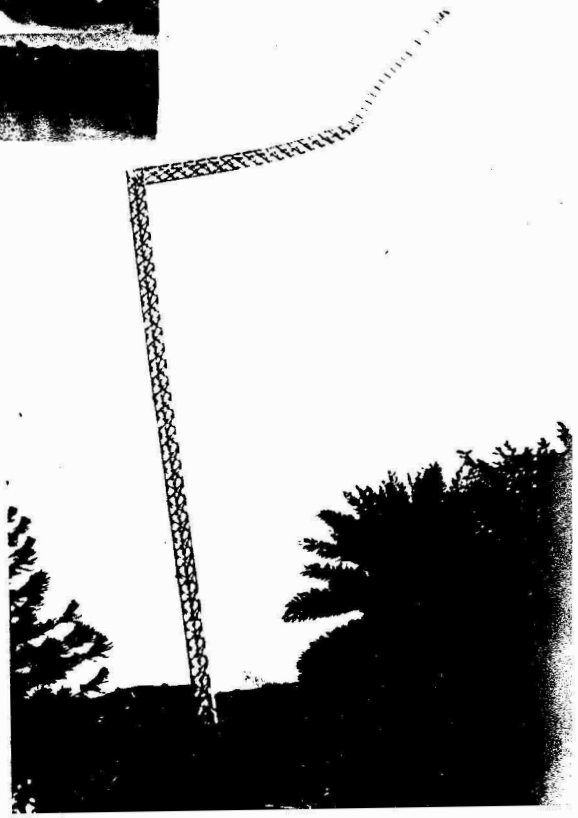
608'

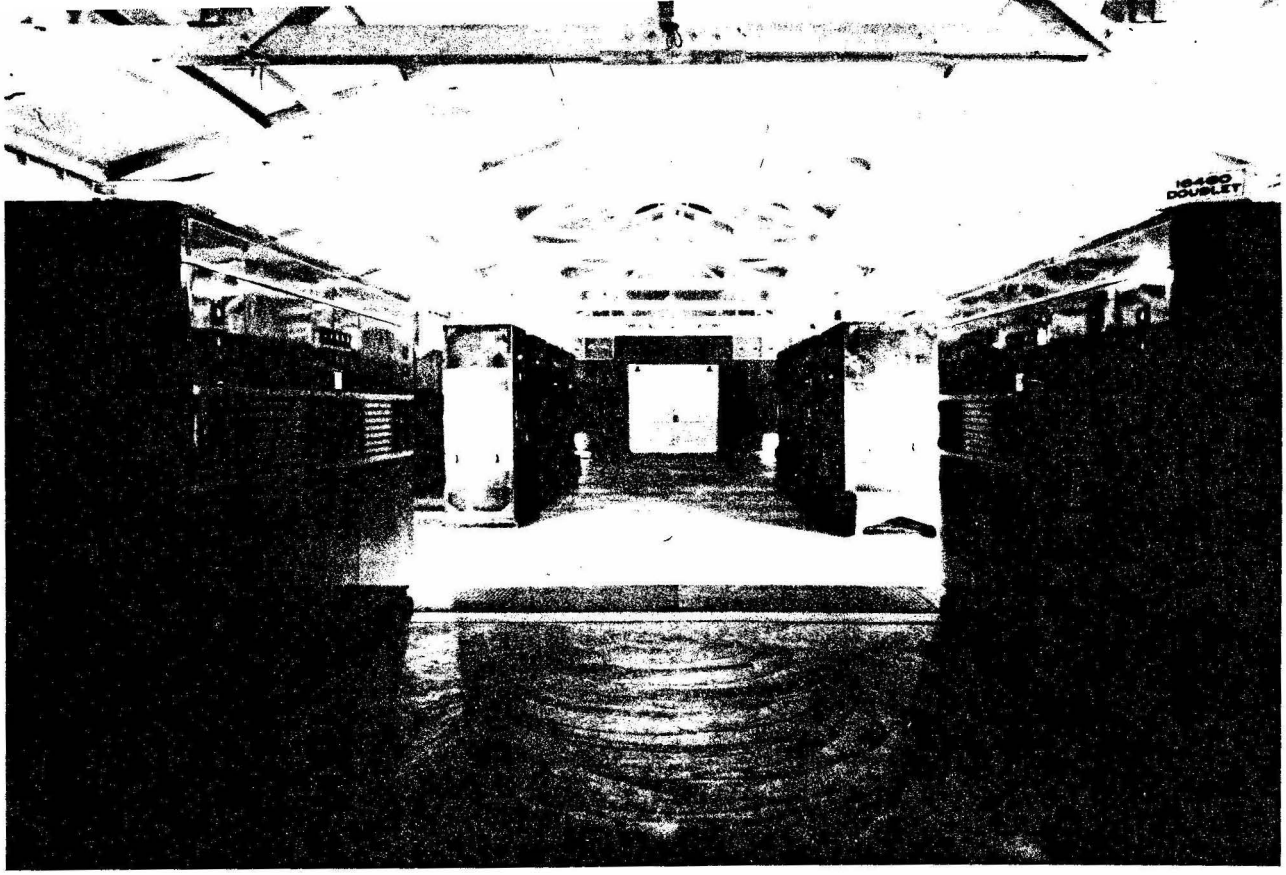
Down she goes!

1933?



On the way!

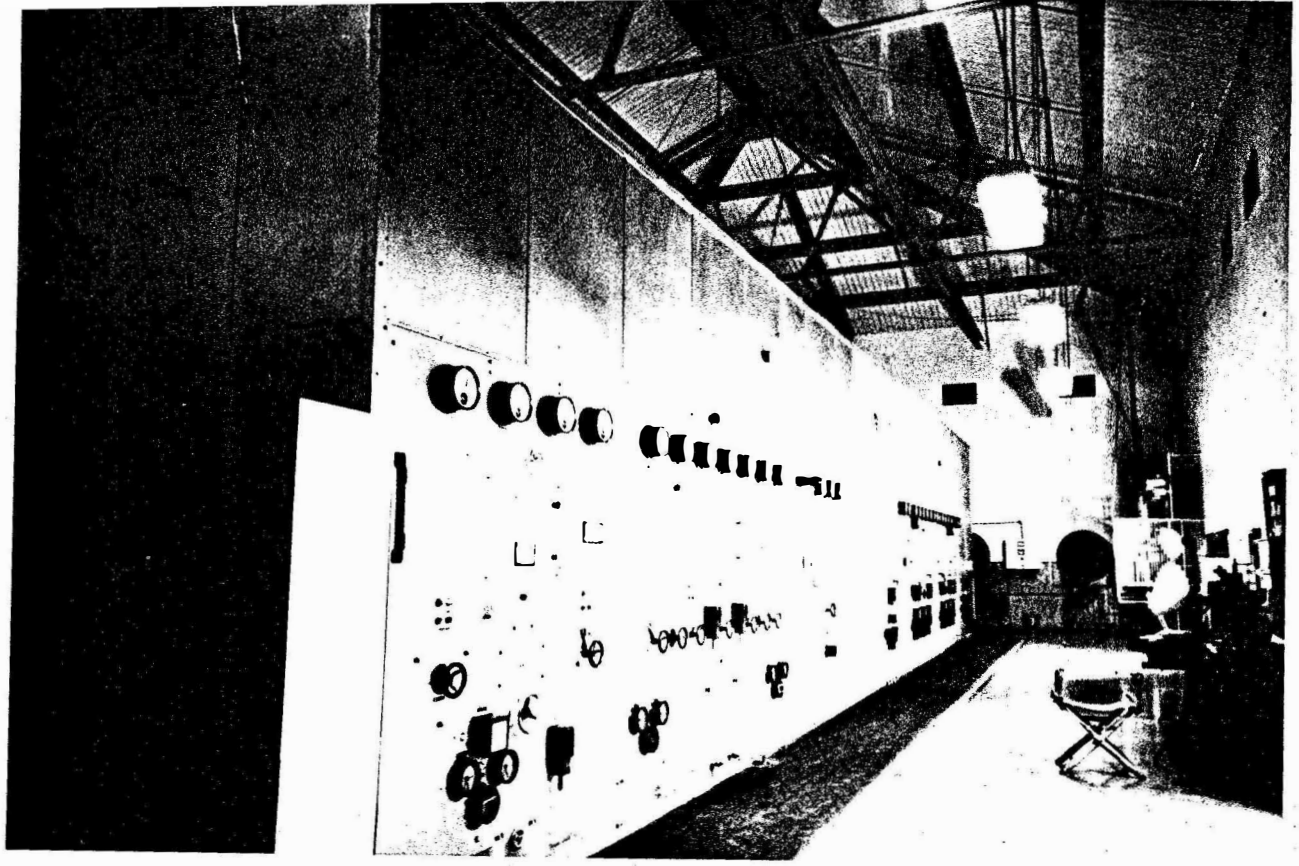




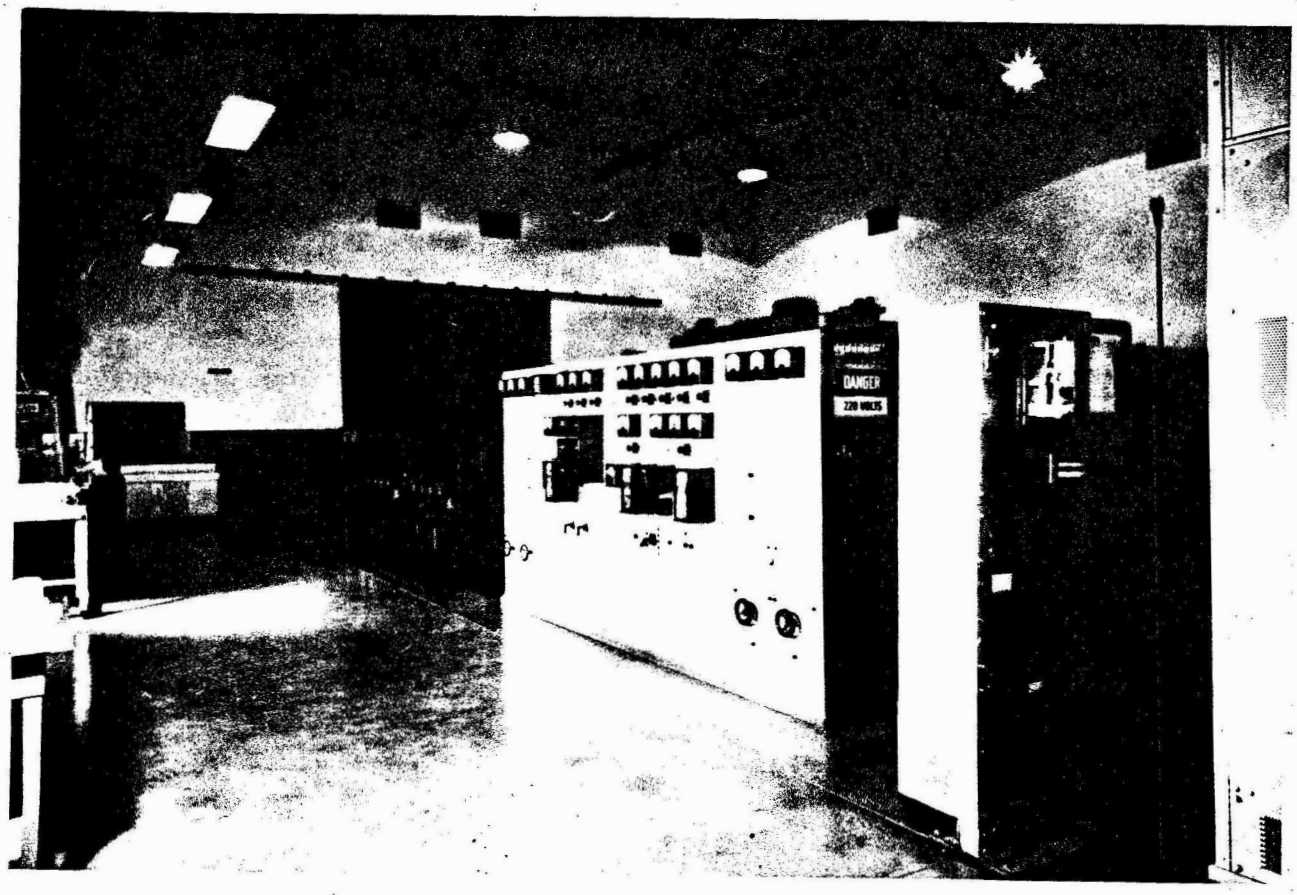
U. S. Naval Radio Transmitter Station, Lualualei, Oahu, T. H. April 1944. "H" Building during installation. Photo shows one leg of "H" Building. The building was in a cross form with transmitter control console at the apex. Transmitter nearest to viewer - TBC 50/40 Kw with frequency range of 4-26 mHz. Models shown are TBC-2. 12 were installed by May 1944.

Lualualei had 44 transmitters on April 1944 and more were being installed, ranging from TBK .5 Kw; TBA at 1 Kw; TAB at 2 Kw; TDH at 3 Kw; TBB at 5 Kw; TBC at 50/40 Kw and the big one - the TAW-A at 500 Kw.

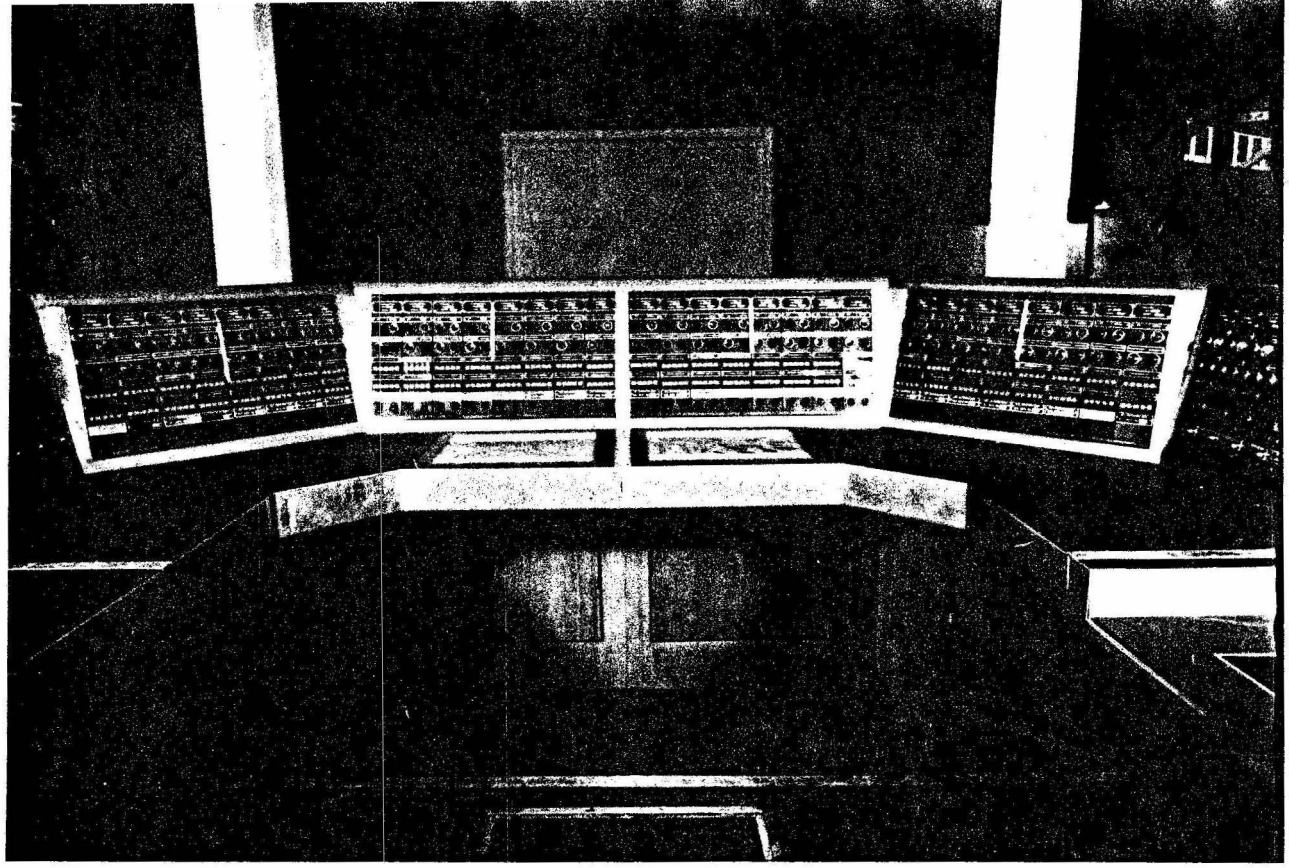
Photo from collection of Walter H. Kozacko
CDR USNR RET



TAW-A 500 Kw tube transmitter (50 x 10 Kw water-cooled tubes).
Range 15 - 30 kHz. "H" FOX on 26.1 kHz. U.S.N. Radio Station, Lualualei, T.H.



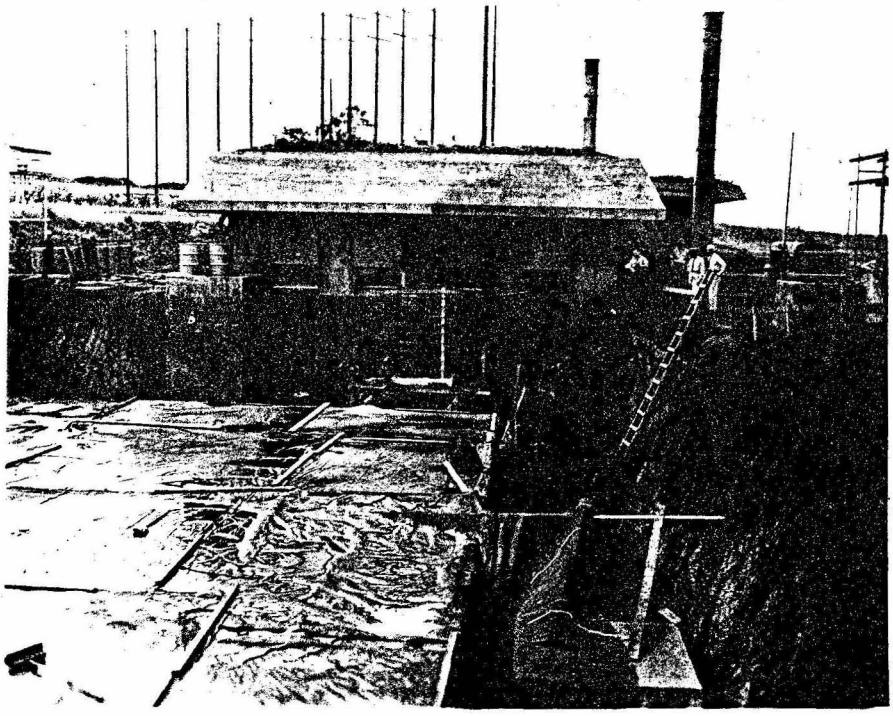
Power Control for TAW-A transmitter, Lualualei, April 1944.
Photos from collection of
Walter H. Kozacko CDR USNR RET



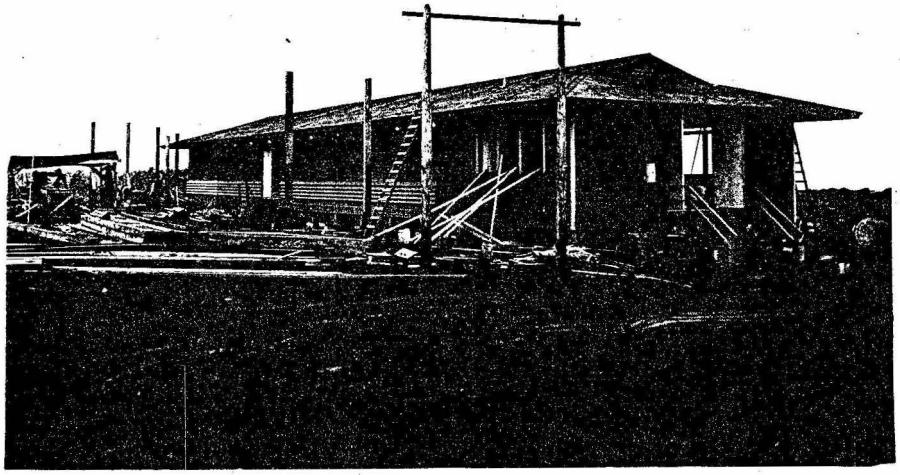
Transmitter control console at "H" Building - NPM - Lualualei, 1944.

A few of the transmitters at Lualualei - NPM - 1944.

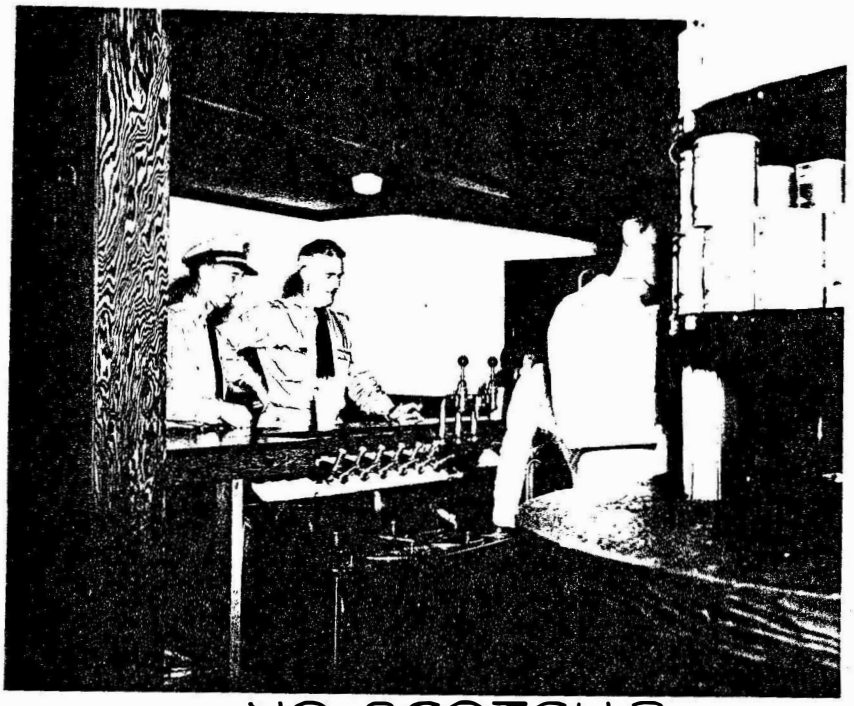
Photos from the collection of
Walter H. Kozacko CDR USNR RET



U. S. Naval Radio Station, Wahiawa, June 1944
Project 125-R-52. Top of new Radio Teletype building, prior to covering up.



Project 125-R-257 Wahiawa, May 31, 1944.
Diversity Receiver Building. (Getting ready for Iwo Jima - given six weeks to prepare facilities - were operational in 4½ weeks. CB's did this outstanding job).



NO SCOTCH ?

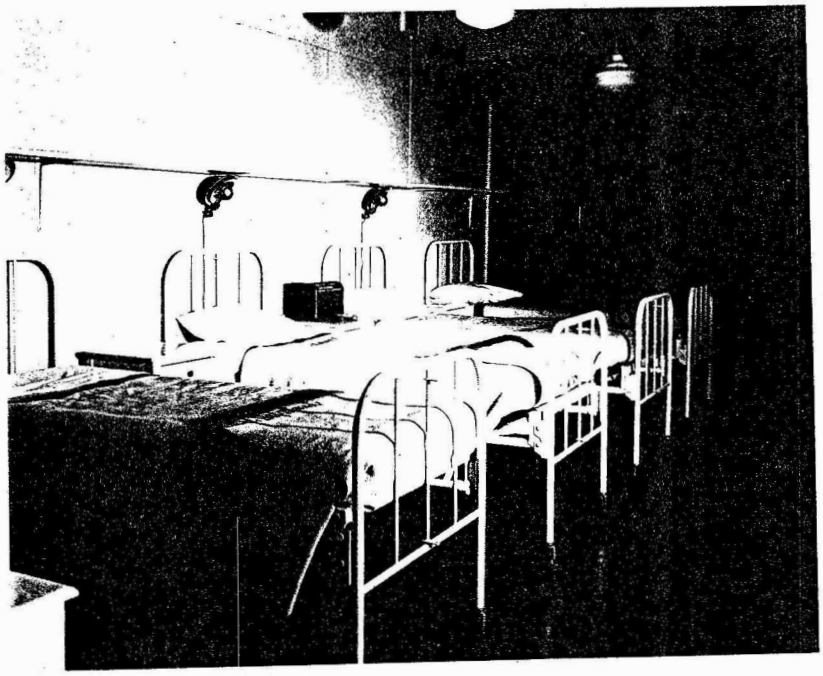
U. S. Naval Radio Station, Wahiawa, 1944.
LT. Clarence A. "MO" Porter on left with
LCDR Underwood at newly completed Ships
Service "gedunk" counter.

SHIPS' SERVICE STORE

U. S. Naval Radio Station, Wahiawa, 1944.

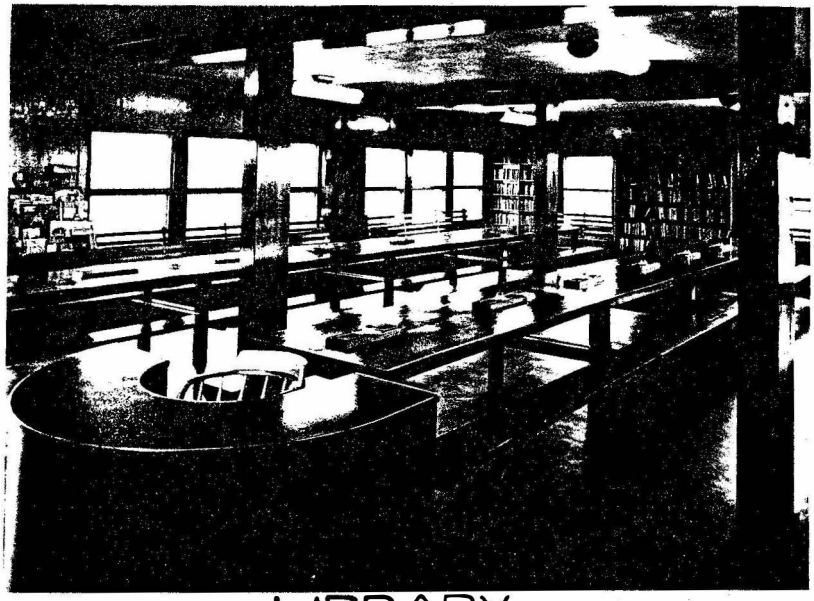
CANDY, GUM & MAGAZINES

Ships Service Store, Wahiawa - 1944.



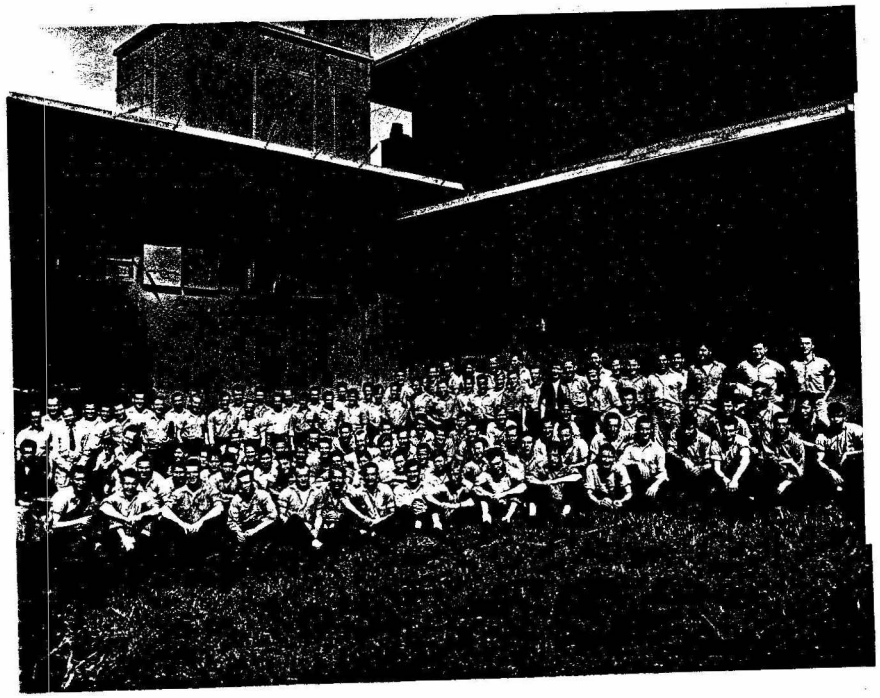
PART OF WARD

Sick Bay - Wahiawa - 1944.

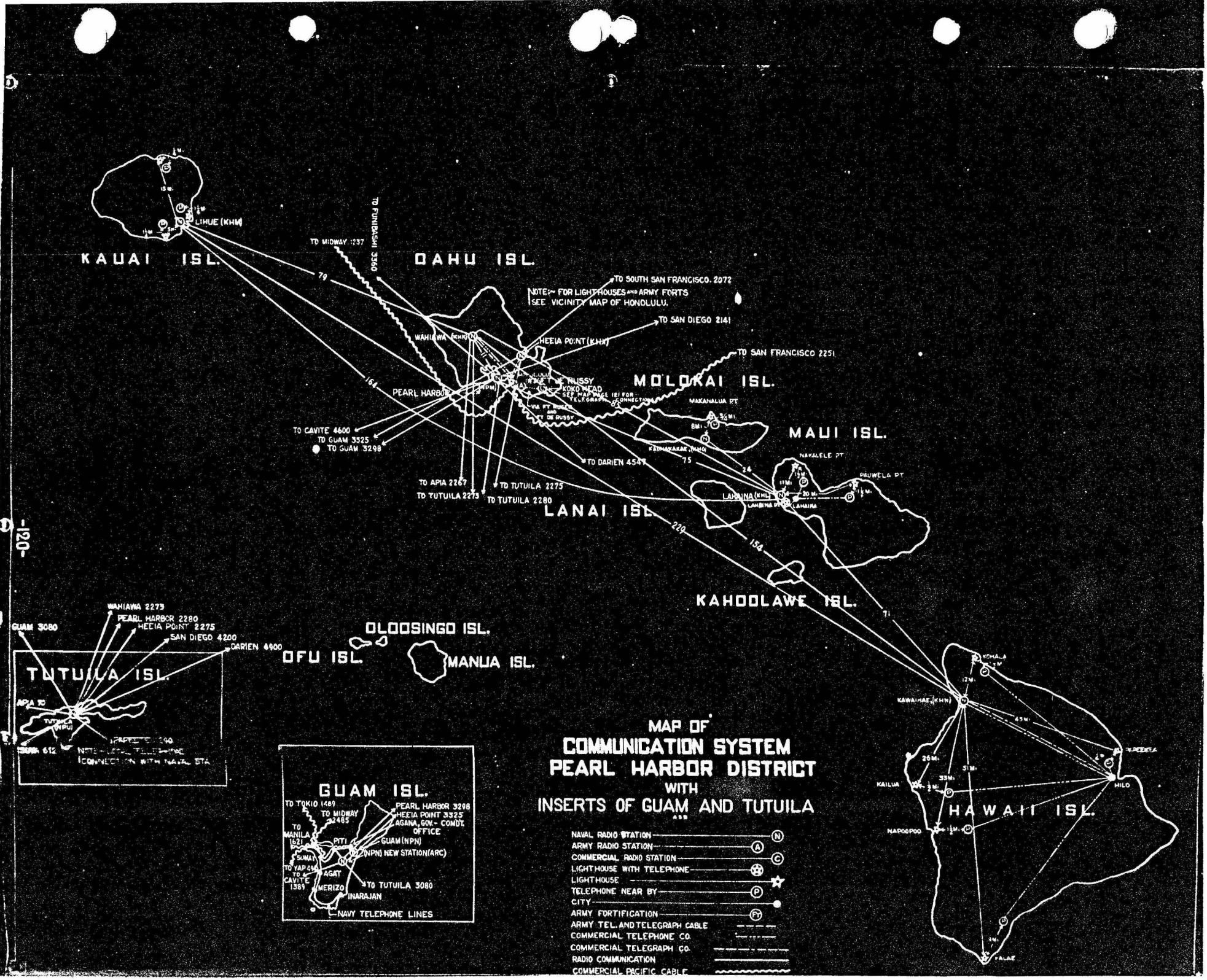


LIBRARY
NRS. WAHIAWA, OAHU, T.H.

U. S. Naval Radio Station, Wahiawa, 1944

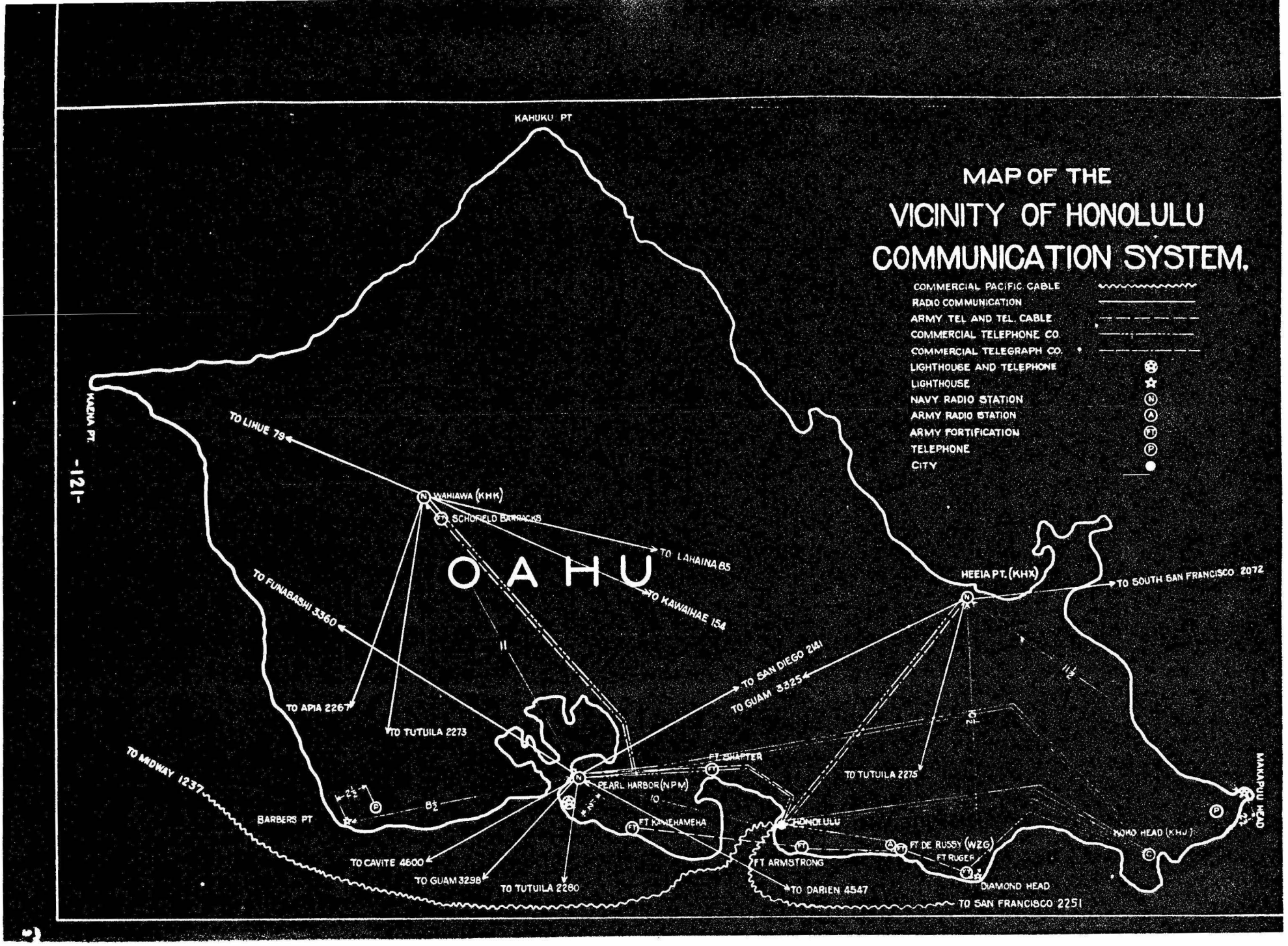


Radio School, U. S. Naval Radio Station, Wahiawa, 1944.
CRE W. E. Pumphrey, Officer in Charge, on left, 2nd row.



MAP OF COMMUNICATION SYSTEM PEARL HARBOR DISTRICT WITH INSERTS OF GUAM AND TUTUILA

- NAVAL RADIO STATION — (N)
- ARMY RADIO STATION — (A)
- COMMERCIAL RADIO STATION — (C)
- LIGHTHOUSE WITH TELEPHONE
- LIGHTHOUSE
- TELEPHONE NEAR BY — (P)
- CITY
- ARMY FORTIFICATION — (Ft)
- ARMY TEL. AND TELEGRAPH CABLE
- COMMERCIAL TELEPHONE CO.
- COMMERCIAL TELEGRAPH CO.
- RADIO COMMUNICATION
- COMMERCIAL PACIFIC CABLE


MAP OF THE
VICINITY OF HONOLULU
COMMUNICATION SYSTEM.
COMMERCIAL PACIFIC CABLE
RADIO COMMUNICATION
ARMY TEL AND TEL. CABLE
COMMERCIAL TELEPHONE CO.
COMMERCIAL TELEGRAPH CO.
LIGHTHOUSE AND TELEPHONE
LIGHTHOUSE
NAVY RADIO STATION
ARMY RADIO STATION
ARMY FORTIFICATION
TELEPHONE
CITY
KAHUKU PT
KAENA PT.
OAHU
TO LIHUE 79
WAHIAWA (KHK)
SCHOFIELD BARRACKS
TO LAHAINA 85
TO KAWAIHAE 154
TO FUNABASHI 3360
TO APIA 2267
TO TUTUILA 2273
TO MIDWAY 1237
BARBERS PT
TO CAVITE 4600
TO GUAM 3298
TO TUTUILA 2280
TO SAN DIEGO 2141
TO GUAM 3325
PEARL HARBOR (NPM)
FT. SHAFTER
FT. KAMEHAMEHA
HONOLULU
TO TUTUILA 2275
TO DARIEN 4547
TO SAN FRANCISCO 2251
FT. ARMSTRONG
FT. DE RUSSY (WZG)
FT. RUGER
DIAMOND HEAD
HEEIA PT. (KHX)
TO SOUTH SAN FRANCISCO 2072
KOKO HEAD (KHJ)
MAKAPUU HEAD

From Naval Institute Proceedings, May 1952

For Old Timer Communicators' archives, 1977

THE NAVY'S SUPER ANTENNAE

By Staff, P.I.O.,
Department of Defense

Next time you feel put out because you have to reach out the window to clean a connection on your radio antenna lead in, give a thought to the problems which confront the Navy men who operate the Naval Radio Station at Haiku, Hawaii. Theirs is the job of maintaining an antenna array which stretches 7,500 feet across a valley at a height on either end of 2,000 feet above the ground. No masts are needed to support the five radiators in the array. The Navy suspended the wires by simply anchoring them at either end on the tops of two mountains which form a mile-wide box canyon.

From the valley floor, the five antennae overhead are almost invisible, and the huge twenty foot anchor insulators appear as tiny dots against the clouds. Nothing can be seen of the actual anchor sites on the tops of the mountains.

Construction of the unique antenna system was begun early in 1942 when the Navy faced the need for a high-powered low frequency transmitter to communicate with Navy raiders on their distant forays into the Japanese home waters. The breadth of the valley suited the requirements for a resonant antenna to radiate low frequency signals with maximum efficiency. By the summer of 1943 Radio Haiku was in operation, and the whine of its 200,000-watt alternator replaced the eerie voices of ghostly warriors of the past who, according to Hawaiian lore, had made the haunted valley of Haiku their headquarters.

In addition to the 200,000-watt alternator transmitter, the station has a 50,000-watt vacuum tube transmitter. The transmitters feed the six miles of antennae through 1,250-foot vertical leads to the center of each of the five spans of antenna.

This installation is one of the Navy's largest and most powerful low-frequency transmitting stations.

In addition to its constant communications with the raiders, the station served to augment the regular Navy communications to far-flung Pacific Fleet and island bases.

Each of the stainless steel, copper-sheathed antennae is about 1-inch in diameter. They are connected to the 7/8-inch anchoring cable by a series of insulators totalling almost twenty feet. The outer ends of the over-all insulators are protected by corona shields which are about 3½ feet in diameter.

The vertical leads are built in the form of eight-wire cages, the wires being riveted to 6-inch spacer rings. One-ton counterweights, attached to the bottom of the vertical leads with 300 feet of cable, compensate for the swing of both the antenna and the vertical leads.

The largest transmitter is multiple-tuned, having four 125-ampere coils; one for each of the four main antennae. When using only one antenna, the transmitter can load that antenna with 450 amperes at 130,000 volts.

The generator for the larger transmitter is driven by a 600 horsepower electric motor. For emergency operation the station has a 1,000 horsepower diesel engine which drives a 750 KW generator--enough to supply power for both transmitters and the entire installation.

Every Monday, rain or shine, and it rains almost every day in winter, the maintenance crews climb into the cage-cars at the valley floor and are whisked to the top of the cliffs for a check of the anchor sites and the high frequency relay station. The cable cars make the 2,000-foot ascent in about eight minutes, but there is also a stairway built to the summit almost straight up from the valley floor. During the war a Marine climbed the stairs as fast as he could "just to keep in condition." His time for the backbreaking climb, two and a half hours, is a record that has not been equalled.

From the cage-car landing, a concrete anchored steel ladder threads its way along the three foot wide razor-back summit to the high frequency relay stations which relays [sic] line-of-sight transmissions from stations on one side of the island to receivers on the other side. Buffetted by high winds and as often as not enveloped in fog, the ladder provides an awe-inspiring stroll. Two thousand feet down, through an occasional hole in the clouds, the buildings of the radio station and the banana plantations appear in miniature.

From this vantage point, the antennae stretch down and across the valley into nothingness. They become invisible long before they begin to curve upward to the anchors on the opposite cliff.

- -

Picture captions, pages 532-535:

THE NAVAL RADIO STATION AT HAIKU, HAWAII This picture was taken from one of the anchor sites and shows the installation in the valley 2,000 feet below.

750 KILOWATT EMERGENCY GENERATOR The 1,000 horsepower diesel engine which drives the generator is shown in the background. It can provide enough power for the entire installation.

CLOSE-UP OF 8-WIRE VERTICAL LEAD The antennae themselves are stretched 7,500 feet across the valley, being anchored at either end on the tops of mountains.

ANCHOR FOR NUMBER ONE MAIN ANTENNA The high frequency antenna used for receiving line-of-sight transmissions from Pearl Harbor is shown immediately behind the anchor.

ANCHOR CABLE, ANTENNA, AND LEAD By tracing the cable from its anchor, the insulator marking the beginning of the antenna may be seen. The vertical lead may be made out connecting the installation on the valley floor with the antenna.

- -

Add below, as determined in 1977 and later, the names of members of the Old Timer Communicators involved with planning, installation, operation, keying control, reception, etc., of Radio Haiku.

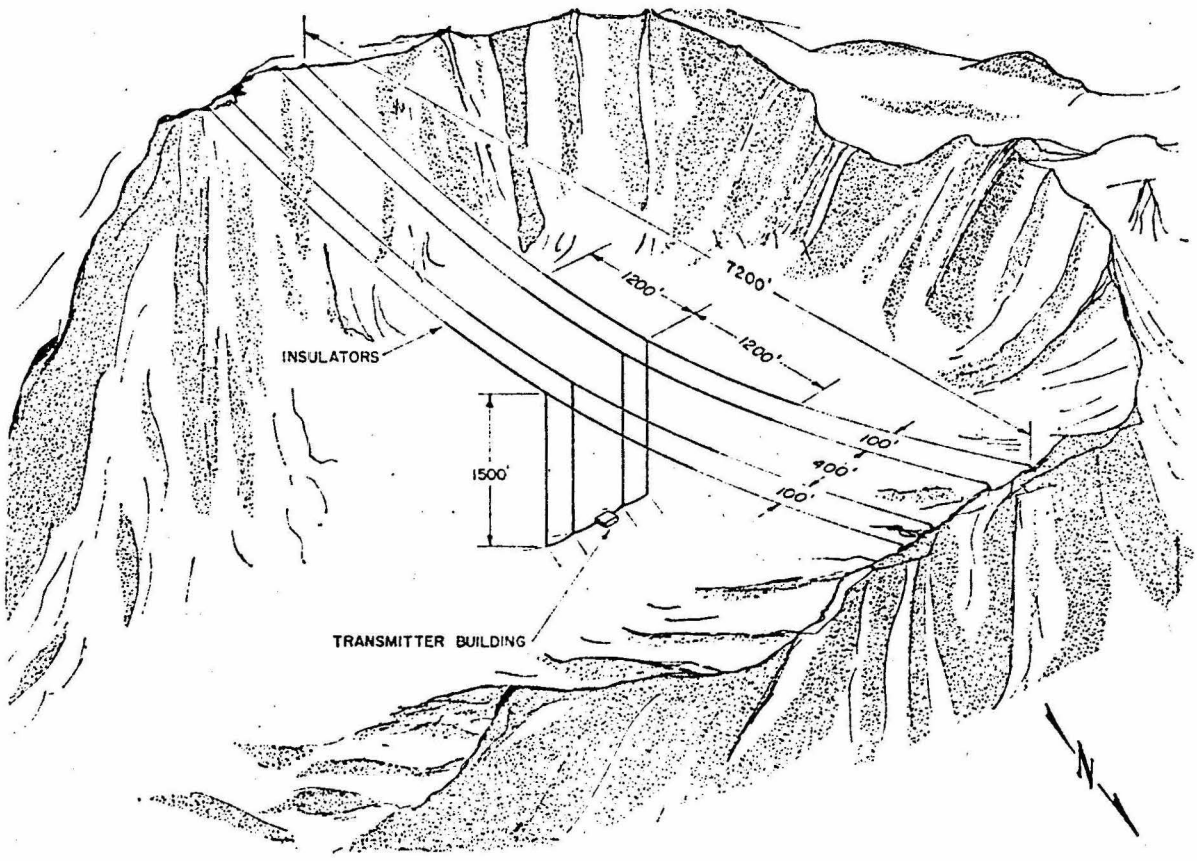


FIG. 2.8.20. Pictorial view of Haiku antenna.

Readers Digest October 1950

Thousands of lives, millions of dollars' worth of equipment hinged on the audacity of —

THE HIGH-SCALERS OF HAIKU

Condensed from Empire Magazine David O. Woodbury

WHEN I visited the U. S. Navy's radio installation on Haiku volcano in Hawaii, I was alarmed — and mystified. The Navy people hauled me in a sort of bosun's chair 2000 feet straight up the sheer side of the mountain to the place where one end of a giant radio antenna was anchored. How, I wondered dizzily, could men ever have got up here to do the necessary work? When the Navy brought me down to earth again, I found out.

THE STORY started after the victorious Battle of Midway in the summer of 1942. The whole Pacific was opening up, vast, perhaps conquerable. The Navy commander in chief at Pearl Harbor had to maintain radio contact with every naval command, even to be able to "speak" an American submarine on the bottom of Tokyo Bay, 4500 miles away.

Radio engineers said the only way to achieve such extremes of communication was via a high-flung antenna network at least 2000 feet above the ground. It was not practical to try to build steel towers to this height. The only solution was to string the wires between the peaks of two Hawaiian mountains.

The site chosen was a dozen miles from Honolulu in the Valley of Haiku, a broad amphitheater held in the almost vertical horseshoe crescent of an ancient volcano, one side of which had eroded away. Masses of concrete were to be set on the two wings of the horseshoe and cables strung nearly 8000 feet across the abyss between.

No man had ever been known to visit the top of Haiku. Perhaps no man *could* do it.

Boss-rigger Ray Cotherman assembled a gang of "high-scalers" in the jungle at the base of the south cliff, and called for volunteers. High-scalers are a rugged lot. Their job is to climb cliffs so that cables can be secured and materials hauled up for following construction crews. This job looked tough, but two men lounged forward immediately: Bill Adams and Louis Otto, both veterans of the Hoover Dam job on the Colorado River.

"There isn't a foothold in those 2000 feet of sleazy rock," said Cotherman. "But you've got to make it, boys. Three months is our deadline to put this radio station on the air!"

Adams and Otto fought their way through the underbrush to the mountain's foot. Then they began to claw and scratch their way upward, a foot at a time, side by side, so one would not deluge the other with falling rock. A hundred feet up Otto suddenly lost his foothold. He shot downward, tumbling and bouncing. Adams froze to a precarious fingerhold, scarcely breathing.

Half an hour later Otto, fortunately only bruised by his fall, was clawing his way back up again, this time with steel spikes lashed to his belt, together with a sledge and rope. He climbed to a point just below Bill and drove a spike deep into the rock. "Stand on that!" he shouted.

Adams slid back and rested his foot on the spike. His strength was nearly gone.

As Otto said soberly, the fun was over and the real climb ahead. Now they hacked out a narrow shelf in the cliff — a kind of base of operations for the main push upward. Then Adams stuffed a few spikes in his pocket, grabbed the sledge and set out. Reaching high up, he drove home a spike. Otto, close behind him with the rope, tossed a noose over the protruding steel end, then tested it with his weight. Though the rock was nothing but a compacted mass of volcanic cinders, it held. With this help Adams wriggled himself up to a foothold on the spike. The effort had taken 20 minutes.

All that day the two men alternated at the frightening task: one driving spikes and hauling himself painfully up, while the other followed a couple of spikes below, tended the rope and, as they admitted afterward, prayed. Twice they took turns sliding back down the ever-extending rope to the valley floor for a new load of spikes and more rope. By midafternoon they had risen nearly 200 feet virtually straight up. They slid back to earth again, exhausted but still cocky.

"I'll call for more volunteers in

the morning," Cotherman told them.

"Naw!" growled Adams. "Leave us alone. One of these days we'll get there!"

For five straight days Adams and Otto inched their way aloft, setting spike after spike, and securing the rope firmly around each one. Helpers were now scrambling up to the shelf with more spikes and rope, which saved much time. Then, at an elevation of 800 feet, a spike gave way as Adams stood on it. He dropped suddenly on Otto's shoulders. The shock dislodged Otto's spike and the two of them began to hurtle down. Only instinct saved them. Grasping desperately for the rope, they brought up with a fearful jerk against the face of the cliff — dazed, bruised, but still in the land of the living.

On the ninth day, now 1400 feet above the valley, the men disappeared into dense cloud so thick that they were completely hidden from each other. They had no way of gauging how much farther they had to go, nor what the texture or shape of the rock might be directly overhead.

About noon of the 13th day Otto, working above Adams in the mist, yelled suddenly, "Hey! There's a bush up here!"

Adams shouted back, but his companion did not answer. Over and over Adams cried out. Still no reply. Alarmed, he hauled himself rapidly up. As he did so, his face plunged painfully into the bush. He reached beyond, to pull himself past it. There was no beyond. The mountain wall had come to an end. They had gained the top.

But where was Otto? In the dense fog Adams crawled in a circle feeling in the matting of bushes. Maybe Otto had knocked himself out and was lying there unconscious. Adams stood up and yelled: "Louis! Where are you?"

The icy, wet wind snatched the cry away. He yelled again and again. No answer. Snatching up the rope, he thrashed forward. Louis must be at its end, somewhere.

What saved his life, and Otto's also, was the fact that the bushes were so rank and heavy on the mountaintop that he could not run, but had to crawl. As he moved thus, tracing the rope, he heard a faint cry, "Bill! Bill!" It was directly ahead — but far off. What had the idiot done?

Then, suddenly, he knew. As he crawled through the bushes on hands and knees, his arms abruptly ceased to support him. He found himself lying prone, his head and shoulders projecting over another cliff, which fell straight down and was lost in the swirling fog. The mountain at this spot was less than ten feet wide! Otto had gotten to his feet as he gained the crest, lurched a few steps and plunged over the far side.

Where was he now?

Just then the cloud mass suddenly fell away. Brilliant sunlight washed down over the razorback pinnacle, exposing the cliffs on both sides for hundreds of feet down. Adams saw his companion lying, perhaps 70 feet below, tangled in the bushes on a tiny shelf of rock.

Otto saw him and waved. "Greetings!" he sang out. "I'll be right up for lunch!"

To a high-scaler, the rest was routine: lowering a rope for Otto to fasten about his middle, and then hauling mightily to help him claw his way back up the cliff.

Now the whole cloud structure that had hugged the Haiku range cleared. Below them lay the green valley, stretching northward to the brilliant turquoise of the sea. The barrier reef far out scribed a curved line of intense white along the coast.

"Just like a map, ain't it?" Otto said in a voice full of wonder. "Like we was looking down at it from heaven."

"You would be at that," Adams answered, "if it wasn't for your crazy luck."

Luck or not, the Navy got its radio within three months. The rest of the job — stringing cables for a lift to haul materials up the mountain — was comparatively easy. Thousands of lives and countless millions in equipment in the Pacific depended on Haiku radio, which would not have existed but for the steel nerves of two high-scalers.

"IN ONE EAR" ... by BOB KRAUSS ... The Honolulu Advertiser, November 17, 1958

This friend of mine says over the phone, "How about taking a ride with me over to Haiku Valley? I want to get some pictures from the top of the ridge. Want to come?"

It was a slow day. "Don't mind if I do. Where's Haiku Valley?"

KRAUSS

That's the way it always starts. Innocently. The next think you know you're hanging by a thread 800 feet above the ground. If you don't believe me, listen!

Haiku Valley, I discovered on the way, is on the Windward side behind Kaneohe. During World War II, the Navy built a top secret radio station there.

This station was so powerful its signals were heard in Long Island, New York and Bombay, India at the same time.

It has five, mile-long antennas, each weighing eight tons, strung between mountain tops, both higher than the Pali.

Getting the cables up there required the combined efforts of mountain climbers and high wire men who often worked in the clouds out of sight from below.

• • •

Today the station is de-activated with only a Navy chief boatswain and a civilian rigger in charge.

But the antennas are still there. So are the cable cars that carried workmen from the valley floor to the dizzy heights where the antennas are anchored to eight-inch steel I-beams set in 10 feet of concrete poured into solid rock on the ridge line.

The cars are little cages closed over with steel mesh on three sides. They're the size of big packing crates.

• • •

I took a look at the open air car hanging from the puny cable. Then my eye followed the spectacular sweep of the steel thread as it soared up to the platform on top.

"You don't have any screwball notion of going up in this thing, do you?" I asked.

My friend nodded happily. "Sure, that's what we came for."

"How long is the cable?"

Robert Roberts, the rigger, answered, "Eight thousand feet. About a mile and a third."

• • •

"Has it ever broken?"

"Only once," said Roberts. "One strand snapped and got fouled in the block on the cable car. We had to slack tension on the cable, and let the car down on the face of the cliff so the passengers could work their way down. This cable is much better."

"How high up are you at the top?"

"Three thousand feet."

"How long does it take to get up there?"

"About 10 minutes."

• • •

When Chief Joe Gross said he was going up with us I felt better. But not much. Especially when I stepped into the cage. It swayed back and forth like a ball on the end of a string. There are benches on two sides.

We began to move. In a few seconds I was looking down on the cars parked below. They began getting smaller. The wind whipped through the

Here's how Haiku Valley looks from a cable c as it nears the station at the top of the cliff.

cage. I noticed my friend was also sitting as sti as possible to keep from rocking the cage.

• • •

"Ahem," I said, "what happens if the cable sta slipping?"

"We've had it," the chief answered casuall

There was a long silence.

My friend looked up at a lever at the top of the cage. "What's this thing here?" he asked.

"Well, it was a brake but it's disconnected."

There was another long silence.

"Don't feel bad," said the chief soothingly. "I've seen Air Force pilots who get scared in this thing. Once I had to pry a guy's fingers loose from the cage before he'd get out on top."

• • •

By this time the autos were far, far below. We were moving up the face of a sheer wall of rock only a few yards away. But straight down it was a good 800 feet.

"You should go along when they grease the cable," said the chief. "They have to ride on top to do it."

"Thanks just the same," I said.

A few minutes later the car began tilting.

"We're almost there," said the chief.

• • •

We stopped, hanging in midair about six inches from the open door of a concrete block house. As the other two men got out, they set the cage to swinging again.

I stepped across that six inches of nothing. Then we hiked out along the ridge. The view is spectacular.

You can see the whole of Kaneohe Bay. Look the other way and you gaze down on Pearl Harbor You can see Barber's Point and Makapuu Po by simply turning your head.

• • •

We spent a good half an hour just looking down on the vast, spreading panorama below. It was almost worth the trip. I would even do it again except for the fact that it would probably be too cloudy to see anything. At least that's the best excuse I can think of.

-Copy-
(from M. G. Abernathy files)

Commanding Officer
USCG Omega Station, Hawaii
P. O. Box H
Kaneohe, Hawaii 96714

15 July 1976

Dear Mr. Mayes:

I received your very interesting letter concerning the Alexanderson transmitters.

The sets in Hawaii were operated until 1946 and then turned off, as you mention. However, they were returned to operation within a year and were used actively until 1957 when the Naval facility at Haiku was secured.

The Alexanderson sets were then mothballed in the same building until 1969 when they were sold for salvage and destroyed (the company they were sold to may have been the Kreger Co. of California, but we're not sure of this). Apparently the decision to sell the sets for salvage was made because an Alexanderson set given to the Smithsonian Institute (from someplace on the east coast) was salvaged. At any rate, sets #1 and #2 did not survive 1969.

The main building that housed the Alexanderson sets is still here and is now the administration and transmitter building for the U. S. Coast Guard Omega Station Hawaii. In 1971, work began to renovate the station. The first floor was remodeled to provide office space and a shielded room for timing and control equipment. A third floor was constructed to provide space for the antenna tuning equipment. In 1973, installation of the present six span antenna and buried ground system began. This work was completed in mid 1974. There are eight Omega stations worldwide which send out VLF navigational signals on a phase difference principle.

I hope this information can be of some help to you and would very much like a copy of your paper which must be most interesting and informative.

Sincerely,

Francis J. Kishima
LT USCG
Commanding Officer
USCG Omega Station Hawaii

-Copy- (from M. G. Abernathy files)

21120 Sullivan Way
Saratoga, Calif. 95070
July 21, 1977

Mr. Warren Clark
591-H Ave., Sevilla,
Laguna Hills, Calif. 92653

Dear Mr. Clark:

July 18 while on our way to the Bolinas Station, Mrs. Mayes and I stopped in to see Mrs. Morris. She gave me your letter of July 11 to Hedley, requesting data on the operation of the Haiku VLF station.

Around six years ago I started collecting material on the 200 kw Alexanderson transmitters for I had been a radio amateur since 1915 and had worked with Dr. Alexanderson when in Schnectady 1927-1930. The enclosed paper is the result and much of the material on West Coast and Hawaii was furnished by Hedley. For the past six years I have had many letters from him with frequent meetings. We had much in common and I have greatly enjoyed his friendship, his recollection of details and early events was remarkable.

Since completing the paper I have had two letters from the Commanding Officer of the Omega Station that are enclosed. I have letters from those in charge of both Bolinas and Marion confirming that alternator sets were shipped from both stations to Haiku in 1942.

An unanswered question is whether the set from Bolinas went directly to Haiku or to Guam. Hedley remembered seeing one complete transmitter in the receiving yard at Guam and was checking with the then officer in charge of Guam to get details. The CO at Haiku also thought that one of the sets came from Guam. If you or your friend have any information on this question I would appreciate your letting me know.

I have the specifications written for Haiku by an RCA installation engineer, J. L. Finch Dec. 11, 1942 #2075 - 27 pages titled "Haiku Valley Long Wave Transmitting Station, Design and Erection," that covers listing of all parts used and description of the antenna. This Spec. covered only <u>one</u> transmitting set and Hedley did not remember when the second set was added.

The Spec. states that the alternator being supplied from the mainland has 1220 poles and gear box ratio of 2.675 to 1 which gives a motor slip of 4% a wavelength of 12,760 meters and at a motor slip of 20% - 15,320 meters. These sets were designed to operate with driving motor slips from 4 to 20%. The Spec. calls for changing the alternator poles from the 1220 to 976 which gives the following range of operation, 4% slip 15,945 meters or a frequency of 18.798 Kc and at 20% slip 19,139 meters or 15.665 Kc. As I have not seen the Specs on the second set or any published data on its operation I do not know its operating frequency.

This paper was published by the Wireless Pioneers in PORTS OF CALL #4 in 1975 so Mr. Abernathy may have a copy, if not, I would be glad to send him one.

Please let me know if I can be of further assistance, and I am very interested in what Mr. Abernathy learns of Haiku.

Sincerely,

Thorn Mayes.

-Copy-
(from M. G. Abernathy files)

21120 Sullivan Way
Saratoga, Calif. 95070
August 1, 1977

Dear Mr. Clark:

You gave your home address in your letter but Mrs. Morris said you usually spent 2 or 3 months over here in the summer so am taking the chance this will find you in Southern California.

You mentioned that you were with Mackay Radio so am enclosing copy of a paper I gave this spring to the Society of Wireless Pioneers that has been published by them. In 1946 there was a history of Federal, Mackay and ITT published by ITT but it did not give much information of the early days of Federal and the problems they faced in developing the large arc transmitters and of the extreme importance of those sets to our Navy. The enclosed paper covers those days and the outstanding job done by Federal.

Mr. Fuller lives in Palo Alto and at 87 is in excellent physical condition. We see them at least twice a month and he supplied much of the statistical material for this paper.

I am very interested in your comment that there was only one of the Alexanderson transmitters at Haiku until after the close of the war and am in hopes that Mr. Abernathy can shed some light on this situation. Hedley did not think that the set he saw on Guam was ever assembled there as there was no indication of the VLF antenna that would go with it.

My first home-made loose coupler and piece of galena went into service in 1919 but did not get my first license until 1920. After almost 40 years with General Electric, I retired in 1963 also.

Next time you are in this area, please stop in as I have quite a selection of gear used during WW-I and before but never started collecting broadcast equipment.

I have thought that the history of commercial wireless development in Hawaii would be very interesting. Has anyone ever documented it?

Hope you have a pleasant stay over there and don't get caught in any of the fires in Los Angeles.

Best 73's

Thorn Mayes.

-Copy-

Laguna Hills, California
6 Sept 1977

Dear AB: (Marlo G. Abernathy, CRE USN RET)

I am now prepared to answer questions re Haiku, which you propounded in your letter to me dated 16 May. I was Asst. RMO at Pearl, in charge of Shore Stations when the Haiku Station was in the planning stage. I remained in the RMO office as Exec. to the RMO, at which time Hubert Thomas took over the Shore Stations billet.

Hedley Morris was a former RCA Engineer with much experience with Alternators. He was Asst. DCO at Pearl and was heavily involved with the Haiku planning. After your letter, I wrote to him, only to find that he had died. His wife passed my letter on to Thorn Mayes who was with GE in the Alexanderson Alternator Division. He gave me some answers and asked me some questions and we have had several exchanges since.

I will be attending the SOWP whing-ding at Oceanside on Saturday and will bring my whole file and discuss with you.

Answering the questions in your 16 May letter: The first Alternator came from Marion, Mass. It operated on 19.2 Kc and 21.6 Kc. It normally was keyed by Boehme at about 20 WPM. This slow speed was not due to slowness of the equipment. The Haiku messages were on a FOX broadcast and were sent at a speed that everyone could copy. Capt. Thomas tells me that they were capable of 70 WPM and even could operate on/off teletype but I doubt that Haiku did that. He also said they could send FAX. Their range was such that day or night, submarines laying on the bottom of the China Sea, could copy Haiku. The original ground was a distributed ground, that is, wires radiated from the station on poles, like a counterpoise and were grounded at the far ends with ground rods driven into the earth. The fifth antenna was used with a TCG 50 kw transmitter operating on 56 Kc. I am not sure what its purpose was, possibly also FOX broadcasts.

At home (Hawaii) I have two magazine articles; one from Readers Digest, relative to the "High Scalers of Haiku" who first got up on the mountain top to build anchors for the antennas. The other article is from the U. S. Naval Institute. When I go home I can have Xerox copies of those articles made for you, if you wish.

Thorn Mayes TA-1 member of SOWP and is a contributor to the SOWP Bulletins. He is closely associated with the museum up near Los Gatos. He would like to communicate with you for any mutual exchange of information about alternators. You will find his address in the SOWP directory.

The Haiku Alternators have both been junked and the station is now under the USCG for Omega navigational use.

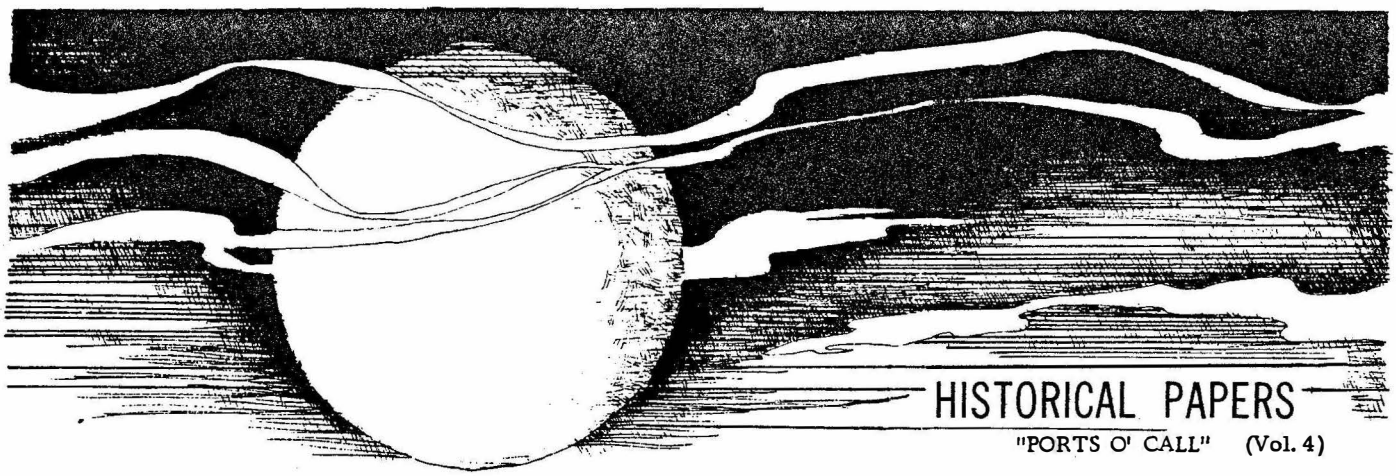
Oh! I mentioned the second alternator. It was from Bolinas, originally sent to Guam and then back to Haiku after WW-II.

See you at Oceanside,

73

Warren

(G. Warren Clark, CAPT USNR RET)

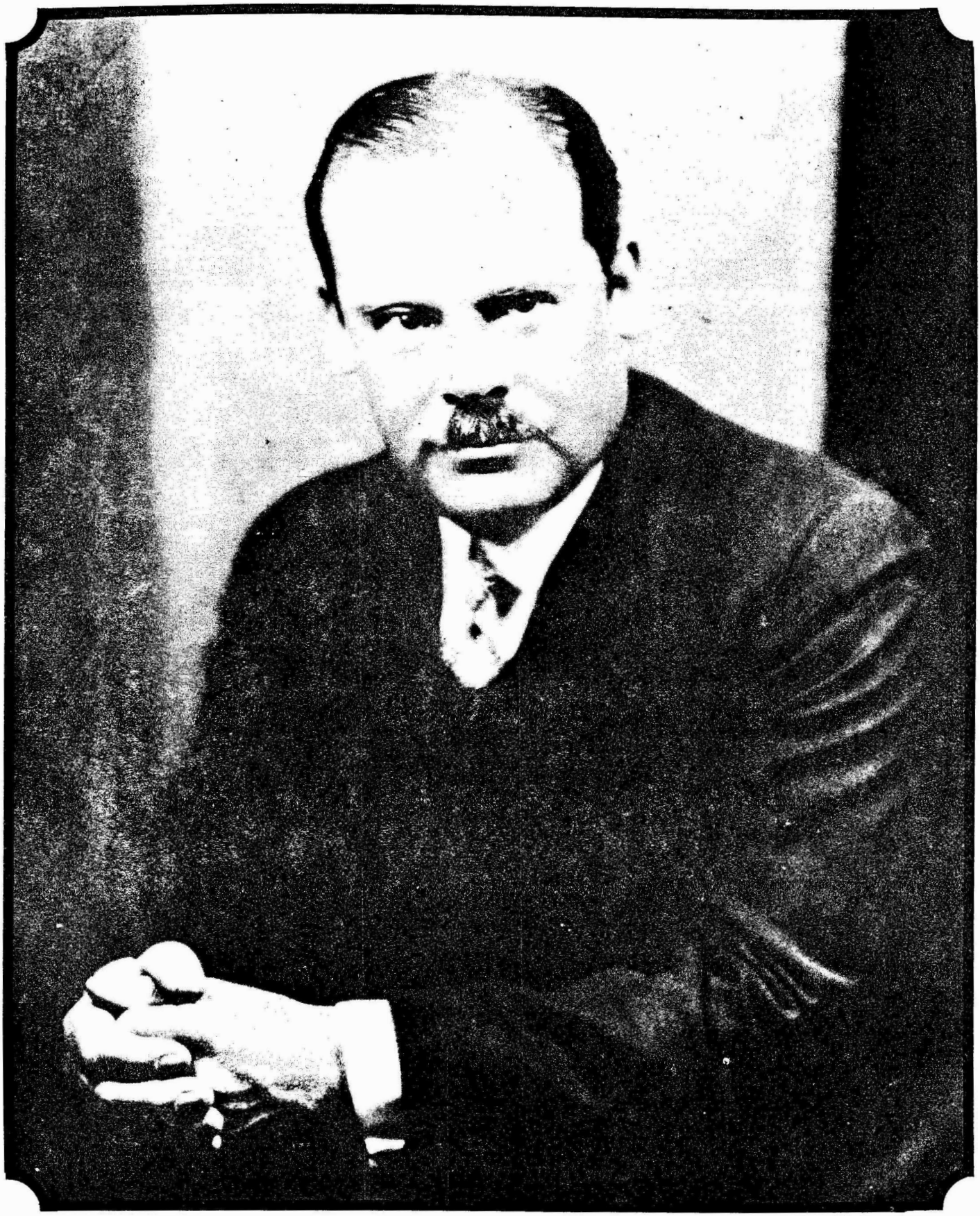


THE ALEXANDERSON 200-KW. HIGH-FREQUENCY ALTERNATOR TRANSMITTERS

BY THORN L. MAYES

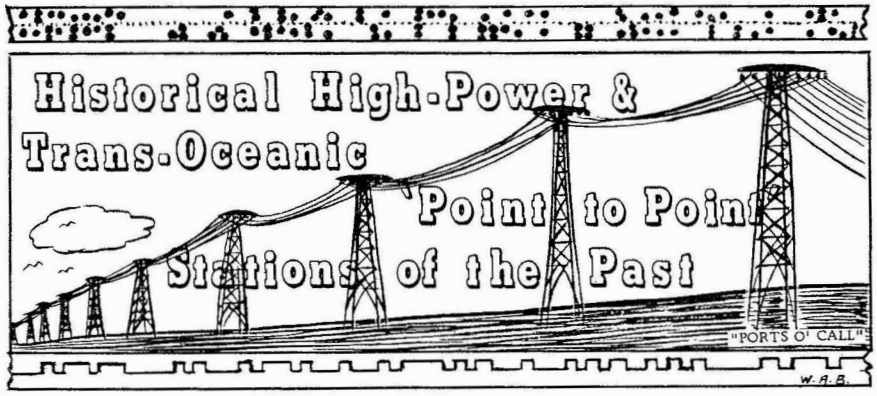
SOCIETY OF WIRELESS PIONEERS

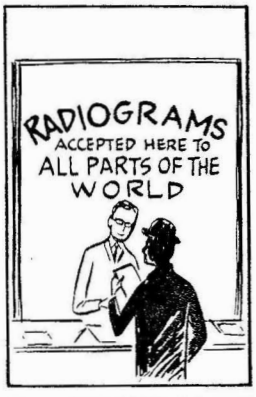
APPENDIX D-11



"PORTS O' CALL"

DOCTOR ERNEST F. W. ALEXANDERSON—1878-1975





THE NEAR PERFECT SYSTEM

ALEXANDERSON ... AND HIS ALTERNATORS

By Thorn L. Mayes

Development of the Alexanderson 200 KW transmitters was a major breakthrough for wireless communication that was responsible for:

- The formation of the first major American controlled wireless communication company, Radio Corporation of America in 1919.
- Dependable day and night wireless contact with our allies in WW-1 through the Navy operated American Marconi station at New Brunswick, N.J.
- Our only reliable contact with Germany during the latter part of WW-1 as England cut the cables connecting the U.S. with Germany early in the War.
- R.C.A. setting up a world-wide communication system that superseded the British Marconi "Imperial Chain" of 300 KW timed spark transmitters.

This development has never received the credit it deserved for it came during a war time period when our main concern was with winning, and the relatively short life of the sets due to the early perfection of the short wave, high power, tube transmitters.

> The purpose of this paper is to review the design and application of these transmitters, show their importance in our building a dependable world-wide wireless system and their contribution to communication in both WW-1 and WW-2.

The Alexanderson 200 KW transmitters were built from 1918 through 1921 and were initially installed by the end of 1923, over 50 years ago, but several of the engineers who installed them are still with us and have supplied much of the information in this paper. A year ago I had an hour's meeting with Dr. Alexanderson who recalled many incidents dealing with the design and operation of these sets. Several days spent in the Schaffer Library of Union College, Schenectady, with Dr. Alexanderson's papers and letter books, furnished the material on early design and tests.

I am also especially indebted to the following who provided essential data on location of stations, performance and later use of the transmitters: Capt. Hedley Morris, retired R.C.A. and Navy executive, who helped install the sets at Kahuku, Hawaii in 1920 and was engineer of the station through 1927. Later while serving with the Navy in WW-2, he selected the VLF site in Haiku Valley, Hawaii. W.W. Brown who was the General Electric engineer in charge of all of the initial installations. G.J. Eshleman, engineer in charge of R.C.A. Tuckerton station until it was closed, then civilian engineer of the Marion station while it was operated by the Air Force. T.M. Linville, General Electric research engineer. Bruce Kelley and Lincoln Cundall of Antique Wireless Association who visited Marion and Tuckerton in 1955 to take pictures and make notes on their operation. And to General Electric and R.C.A. for use of pictures and printed material.

Theory of the high frequency alternator was not new. Dr. J.A. Fleming in his 1906 edition of "The Principles of Electric Wave Telegraphy" says: "Designs for high frequency alternators began to be considered about 1889 or 1890 when attention was being directed to arc lighting by alternating currents. It had been found that most forms of alternating current arc lamps produced a disagreeable hum when actuated by an alternating current of a frequency of the order of 100. The notion therefore arose that if a frequency could be used higher than the highest audible note, the defect would be annulled. Prof. Elihu Thomson and Mr. Tesla were probably the first to construct such alternators, and Tesla, finding that he had in his machine a source of electric current capable of exhibiting many interesting electrical effects, pursued the subject and devised several forms of alternator capable of producing alternating currents of a strength of 10 amperes or so, having a frequency as high as 12,000 complete periods per second."

> Dr. Fleming concludes: "The great defects of all extra high frequency alternators so far produced are their small output, and the extremely high speed they have to run. High speeds may be practical for small machines, but would be dangerous if the revolving parts were at all heavy. On the whole, the prospect of being able to generate by purely mechanical means, high frequency currents of 100,000. and upwards with large power output is not very great."

Fleming lists the 1KW-5,000. Hz alternators built by both Thomson and Tesla in 1889 with a 1 KW-10,000. Hz machine by Steinmetz in 1903. This latter machine was used by Fessenden in experiments with wireless telephony who in 1904 ordered from General Electric Co. a unit to generate A.C. at a frequency of 100 KHz. This order was given to E.F.W. Alexanderson to design as he came with G.E. in 1902 and was in their A.C. Engineering Department.

Alexanderson made tests on special Swedish iron strips 1½ mills thick in strong magnetic fields at high frequencies and found the iron would operate satisfactorily at frequencies of 100 KHz so designed the alternator with an iron core.

Fessenden rejected the design, #1fn, insisting that the machine be built with a wooden core as he was sure iron would be melted in a strong field at such high frequency.

General Electric built a machine by mid 1906 with wooden core, that generated 1 KW at 50 KHz frequency, which Fessenden used for his famous tests made at Brant Rock, Mass., Christmas Eve of 1906 when he broadcast voice and music, heard as far as Norfolk, Virginia. #2fn.

Alexanderson in a memo dated March 13, 1924, #3fn, states, "In the meantime I did not give up the idea of a high frequency alternator with an iron armature. I believed it was a mistaken assumption of Fessenden's that iron could not be used, and I expected a higher efficiency with an iron armature. I therefore obtained an appropriation from General Electric to build a model alternator in accordance with my own ideas. When Fessenden made a visit to Schenectady, I showed him this machine and convinced him of its merits and he placed orders for two 100 KHz alternators of this type.

Fessenden about this time severed his relations with National Electric Signaling Company but his work was carried on by the management of the company and orders were placed for two 100 KHz and one 200 KHz alternators which we built and delivered. Two 100 KHz units were also built for Mr. John Hays Hammond."

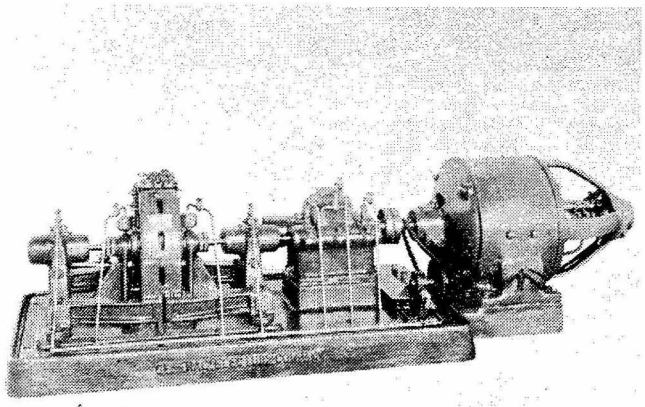


Figure 1 is of one of the 2 KVA-100 KHz machines with iron core driven by a 2,000. RPM direct current motor through a 10 : 1 increasing gear box.

Dr. A.N. Goldsmith in his book "Radio Telephony", page 118, makes these comments on these machines: "Since the speed of the rotor is 20,000. RPM or over 330 revolutions per second, the actual speed at the rim is nearly 12 miles per minute!! Such a machine must, accordingly, be considered a masterpiece of engineering design."

Dr. Alexanderson's memo continues: "Through Mr. John Hays Hammond, I became acquainted with the DeForest audion which is a three-electrode tube, and I saw in this device a possible realization of my ideas for telephonic modulation of the output of the high frequency alternator.

I bought a sample audion from Mr. Hammond, gave it to Dr. Langmuir explaining my intentions of developing it as a power modulator. Dr. Langmuir developed successfully the power tubes which we used for modulating the output of the high frequency alternators in our first radio telephone tests between Schenectady and Pittsfield, Massachusetts."

Based on these tests, a 50 KW-50 KHz experimental alternator was completed in 1915 and tested in Schenectady until Feb. 1917 when it was installed in the American Marconi station, New Brunswick, N.J. During these tests, Dr. Alexanderson and other specialists, perfected the magnetic amplifier with vacuum tube control for modulating with voice, and the design of the multiple tuned antenna.

Dr. Alexanderson continues, #4fn: "The 50 KW equipments were ready to test in the Marconi station the spring of 1917 at the time when America entered the great War. All radio stations including the New Brunswick station were taken over by the Government and it looked at first as if it would not be possible to carry out the tests of the 50 KW alternator. However we succeeded to convince the Navy that our experimental installation might be useful for military purposes and the station was placed at our disposal for experimental tests under the control of the Navy. The tests we made on both telegraphy and telephony proved very successful and the improvement in efficiency of radiation which we had expected from the use of the multiple tuned antenna proved to be correct. The signal reaching Europe from our experimental equipment proved to be better than any other American station.

Our tests of radio telephony and improvement of radiation efficiency were carried on during the summer of 1917 until the Naval Communications Department decided to take over the equipment for much needed communication with France. While the 50 KW alternator was thus used, work was in progress of installing a 200 KW alternator which in the meantime had been built in Schenectady. The 200 KW alternator was placed in service, superseding the 50 KW machine in the summer of 1918. Through the reliability and clearness of the signals sent out by the 200 KW set, the New Brunswick station became quite well known all over the world, and the press messages sent out by the station were copied by all the belligerant countries in Europe."

Because of its greater power, the 200 KW set was used by the Navy for communication as soon as it was installed in mid 1918 but it was released occasionally for short periods for testing. Dr. Alexanderson told me Oct. 2, 1974, that he and the installation engineer W.W. Brown were making some tests Oct. 20, 1918, when a Naval representative came in and said the Navy wanted to use the transmitter at once.

NFF, the call letters of New Brunswick under Naval control, immediately called POZ, the largest German station, and demanded the abduction of the Kaiser as a preliminary to Armistice negotiations. This was our first contact with the German radio since the War started, and NFF was used exclusively for the Armistice negotiations. Dr. Alexanderson said that because of the strong signals sent out by NFF, that all countries allied with Germany could easily hear our proposals and the German replies as all negotiations were carried out in English with no coded messages for our Government wanted all of Germany's allies to have the true story of the negotiations.

It is claimed, #5fn, that because of the power and coverage of station NFF that President Wilson's fourteen points and other pleas for termination of the War became known in spite of the censorship through all the countries of the Central Powers.

DESIGN

Four major elements contributed to the success of the Alexanderson transmitter, all four had to be developed and each required designs well ahead of current performances. They were:

1. Producing an alternating current generator that would generate sufficient power at radio frequencies.

2. An extremely precise speed control system.

3. A modulation system that would control the full power of the generator, and

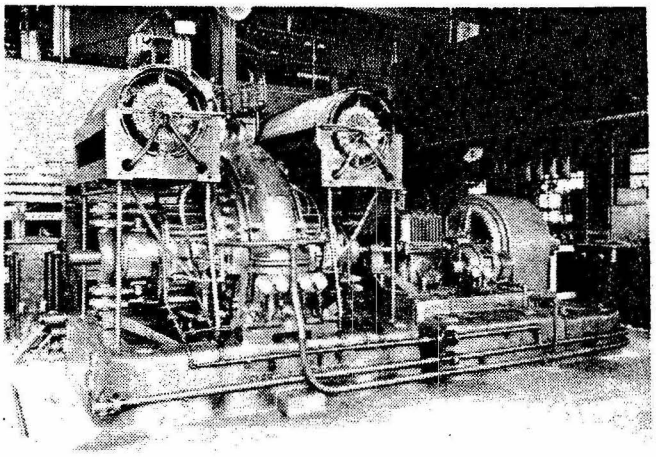
4. A multiple tuned antenna system that would result in a signal gain of 500% to 600% over the conventional flat top antenna.

Footnotes - 1fn, Etc.

The author's footnotes - numbered from No. 1 to 17 are indicated in the text as... #1fn, #2fn, #3fn, etc. Explanatory notes will be found in keyed table at end of this paper.

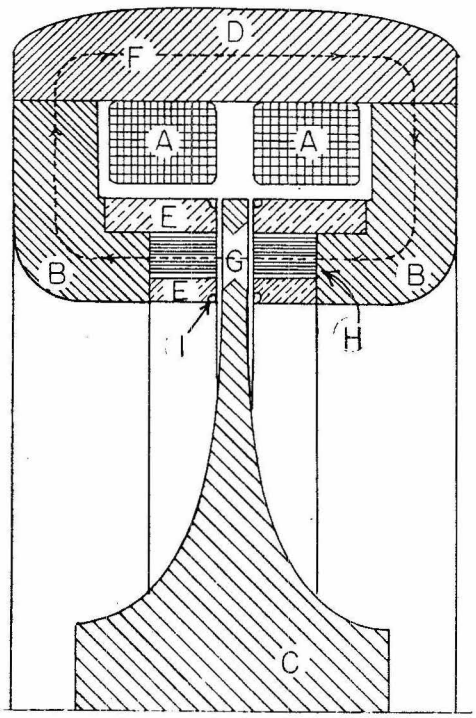
APPENDIX D-14

'W I I' Transmitter New Brunswick



ALTERNATOR

This is the first 200 KW set built, which was installed in the New Brunswick, N.J. station, June 1918. It consists of the 600 horse power driving motor on the right, connected to a 1 to 2.97 speed increaser which could give a maximum alternator speed of 2700 RPM. The alternator is on the left with the two R.F. open core transformers mounted on each side. These transformers boost the generated voltage of 128 to 2000 volts.



Schematic Section of Inductor Alternator

FIGURE 3 - Legend

A - Field Coils	D - Frame	G - Rotor Slot
B - Armatures	E - Support Rings	H - Sheet Iron Core
C - Rotor	F - Magnetic Flux	I - R.F. Winding

The alternator is of the inductor type with stationary armature and field coils. It consists of a steel disc C with thin rim which is slotted at G, the slots filled with non-magnetic metal. Windings A-A located inside the frame, generate a strong magnetic field F which passes through frame D, the armatures B-B, thin sheet iron cores H-H, the air gaps and the steel disc. The cores H-H are supported by non-magnetic rings E-E and the slots are milled in them to support the radio frequency windings I-I.

As the disc "C" rotates, the alternate steel and non-magnetic poles cause the flux to pulsate in cores H-H thus inducing a radio frequency voltage in Windings I-I.

Rotor C is a steel forging 64 inches diameter, 3 inches thick at the rim. To generate the required frequency of 25.8 KHz in the Marion, Mass. alternator, a rotor speed of 2538 RPM is necessary. At this speed, the rim of the rotor is moving at 8.3 miles per minute or just under 500 miles per hour.

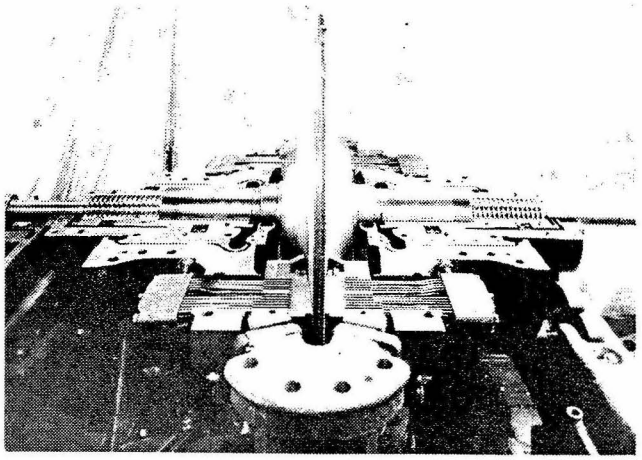


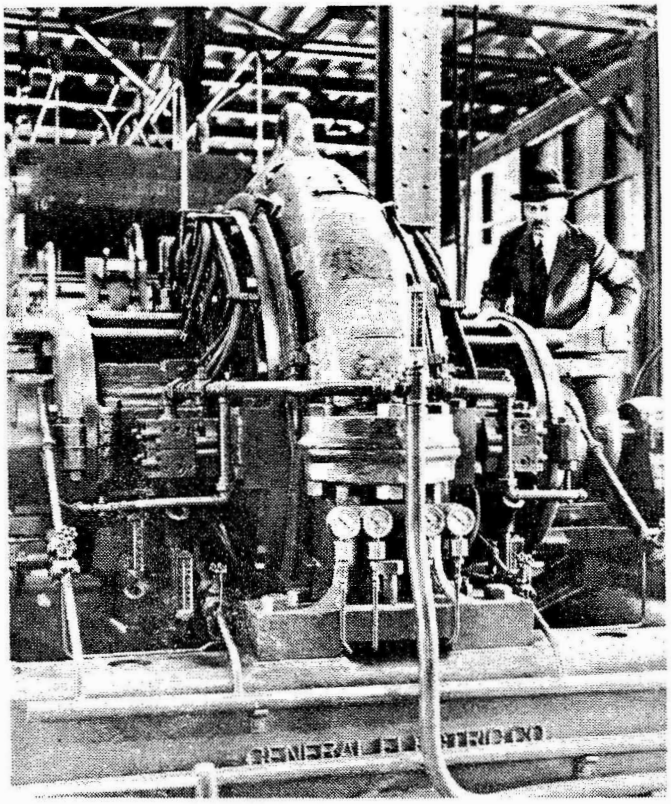
Figure #4. 200 Kilo-Watt Alternator, Top Half Removed.

Here is the 200 KW alternator with top half of stator removed but with rotor in place. Note leads on each side leading to radio frequency winding.

Dr. Alexanderson decided that a 200 KW size would be ideal for a high power transmitter. This meant 200 KW into the antenna whereas the spark and arc stations were rated in power input which with a 50% efficiency would mean only half the rated power to the antenna.

The sets were built to operate at wave lengths of 10,500 to 24,000 meters (28.57 to 12.5 KHz). This was accomplished by three design variables. The alternators were built with 1220 or 976 or 772 poles. Three gear boxes were available with ratios of 2.675- 2.973 and 3.324 and the 900 RPM driving motor was operated at slips of 4% to 20%, giving speeds of 864 to 720 RPM. Transmitters installed in Europe, operating on 50 cycle power, had a wavelength range of 12,500 to 28,800 meters because of the lower speed of the driving motor.

The Alexanderson Alternator Transmitters



Dr. Alexanderson watching his invention at Radio Central May 26, 1922

This picture, Fig. 5, shows Dr. Alexanderson with one of the 200 KW alternators installed at Radio Central, which gives an idea of its size. They were always installed in pairs and the base foundation for the two sets were 43 feet long by 11 feet wide. The main frame steel casting was 7½ feet in diameter by 19¼ inches wide.

Weights of one set were as follows:

One alternator with base	30.0 tons
600 horse-power driving motor	5.4 tons
Auxiliaries	11.6 tons
Detailed parts	3.5 tons
Total weight, one set	50.5 tons

In a letter to Roy Weagant, chief Engr. of American Marconi dated Nov. 12, 1919, Dr. Alexanderson gives the following power requirements:

Alternator delivering 200 KW, key down	385 KW
Average load telegraphing at 200 KW	307 KW
Key up, alternator excited	116 KW
Running full speed, no field excitation	82 KW
Auxiliaries (estimated)	40 KW

SPEED CONTROL

The antenna system was closely tuned to the alternator frequency and if that frequency changed as much as ¼ of one percent the antenna current would be reduced by fifty percent. A system of speed control had to be devised that would hold the speed of the 900 RPM driving motor to a change of less than one RPM from no-load to full-load.

Dr. Alexanderson told me that in 1920 he gave the Japanese a full set of alternator drawings. They built one but were never able to devise the necessary speed control so it was never put into commercial service.

Jack Napier who was engineer in charge of the Bolinas station 1930 through 1955 wrote, "Because the Bolinas antenna was small for VLF (about 2700 feet long) the voltage was rather high, running about 120 KV. If a southwest wind blew it would raise the antenna and change the antenna to ground capacity, which was considerable, and detune things and the insulators would flash over with a crack like a fifty caliber machine gun. At each support point there were two insulators in series, each being about five feet long with rain shields and corona rings."

MODULATION

Dr. Alexanderson was very familiar with the difficulties experienced by Fessenden and others who attempted to modulate the carrier of their radiophone transmitters, and knew it would not be practical to build a modulator that would carry the full current of a 200 KW machine.

He developed a magnetic amplifier that included a variable impedance in shunt with the external circuit of the alternator. By detuning this circuit, the antenna current could be reduced by ninety percent with a small control current. This construction worked satisfactorily up to code speeds of 500 words per minute.

As the antenna current varied directly with control current, this small control current could be easily modulated with a vacuum-tube amplifier for radio telephony.

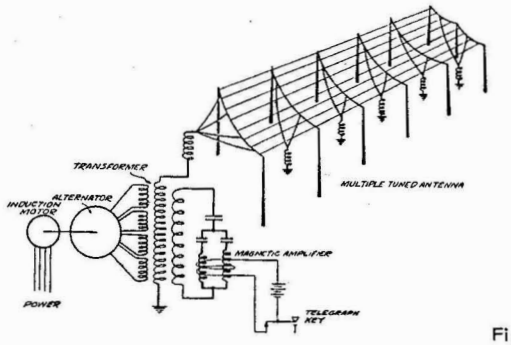


Figure 6

Alexanderson System Schematic

The Magnetic amplifier connected for telegraphy is here shown, Fig. 6, inductively coupled to the alternator.

MULTIPLE TUNED ANTENNA

This picture also shows the schematic diagram of the whole system feeding a multiple tuned antenna.

The objective of the multiple tuned design is to reduce antenna resistance which means reduction in loss. The New Brunswick antenna for example, which had a flat top over a mile long, had a resistance of 3.7 ohms. By multiple tuning this was reduced to 0.5 ohms. This was accomplished by connecting the antenna at six equally spaced locations, along the flat top, to ground through large inductances tuned to the required frequency.

The major loss in an antenna is equal to the current squared times the resistance. To maintain an antenna current of 600 amperes in the multiple tuned antenna requires 600 squared times 0.5 or 180 KW of power. To maintain the same current in the flat top design would require 600 squared tirnes 3.7 ohms or 1330 KW, over seven times the power, and tests have shown that the signal strength was the same under both conditions.

For a detailed description of the design and operation of the 200 KW system, refer to Dr. Alexanderson's paper in the Proceedings of the AIEE for October, 1919, pages 1077 to 1094 or to E. E. Bucher's article in Wireless Age, July 1920, pages 10-17 and August 1920, pages 13-23.

THE FORMATION OF THE RADIO CORPORATION OF AMERICA

The War clearly demonstrated the importance of wireless communication to our nation. During the War, all commercial stations were operated by the Navy under Admiral Bullard. He realized an industry as important as wireless would soon be in the U.S. should be controlled by an American company, not the British dominated American Marconi Company. He knew from the performance of station NFF that whoever controlled the Alexanderson system would dominate world-wide communications. He knew that General Electric had paid for the development of the alternator and the various accessories and that the only company that could afford to buy the equipment was the British Marconi Company. He also knew that early in 1919 Marconi had offered General Electric an order amounting to five million dollars for Alexanderson transmitters.

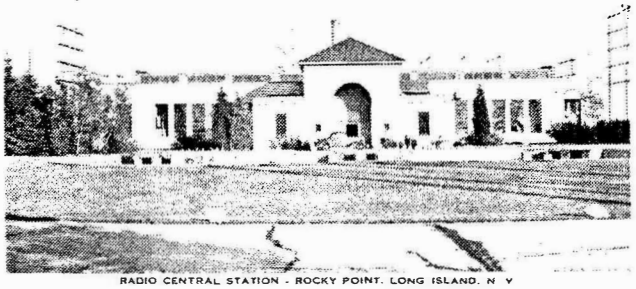
This story is told in the February 1921 Wireless Age in an interview with Admiral Bullard, who tells how he called a meeting of General Electric top management and asked them not to sell the sets and patents to Marconi on an exclusive basis as wanted. He then suggested that General Electric get into the wireless business by forming a separate company that would purchase control of the American Marconi Company, that could use the Alexanderson transmitters to set up a world-wide wireless communication system. (See Footnote fn-18)

General Electric did purchase the stock of American Marconi owned by the British Marconi Company, and turned down the Marconi order for transmitters. RCA was formed in October 1919 and in November the entire General Electric holding of American Marconi stock was taken over by RCA.

March 1, 1920, all stations were released by the Navy and RCA took over operation of the high power stations on both coasts. By this time preliminary plans had been made for installing Alexanderson sets in their main stations and setting up a Radio Central on Long Island for world-wide operation.

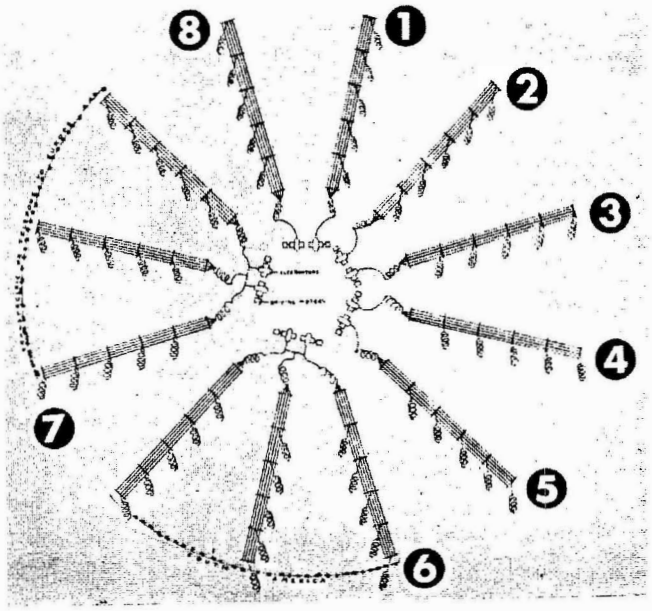
The original plan for Radio Central, #6fn, included central transmitter houses containing ten Alexanderson transmitters with twelve VLF antennas radiating out from the transmitters as shown in Fig. 7.

Work started at this Long Island site July 1920 and the formal opening of the station was held November 5, 1921, #7fn, when two antennas had been completed and two transmitters installed.



RADIO CENTRAL STATION - ROCKY POINT, LONG ISLAND, N. Y.

Photo from collection of SOWP Member Arthur R. Anderson - 851-P



Following is the original plan for usage of each antenna or those coupled as noted in No. 6 and No. 7:

1. Denmark
2. Sweden
3. Germany
4. France
6. South America
7. Trans-Pacific or telephone to Europe.
8. Poland

(Fig.7)

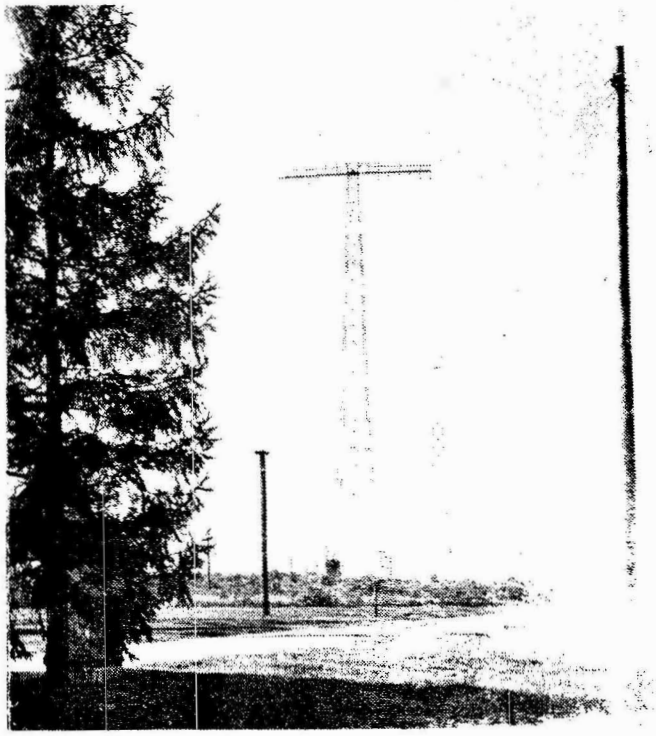


Figure 8.

Antennas at Rocky Point, Radio Central, 1959

Photo by Maurey Garber for RCA "Relay"

Because of the high speed transmission possible with these sets, initially over 100 words per minute, and the low down time for maintenance, the eight additional transmitters and ten VLF antennas were never added.

The towers supporting the VLF antennas were 400 feet high and the cross arms 150 feet long. Six towers spaced 1250 feet apart were needed for each antenna, a length of over one and one-third miles, Fig. 8.

Sites of former high power spark stations were selected for many alternator installations as they were in strategic locations and the costly masts could be used to support the multiple tuned antennas.

Marion, Mass. on Cape Cod had been a 300 KW timed spark station. Two alternator sets were installed there in 1921.

A second set was put in the New Brunswick station in 1921.

RCA took over the former German owned Tuckerton, N.J. station soon after the Navy released it in 1920, #8fn.

This picture of the Tuckerton mast, Fig. 9, 820 feet high, was taken by Hedley Morris in 1929. The guy wires show clearly, also the main antenna insulators above the guy wires. This antenna was converted to multiple tuned design and two alternator sets were installed in the station in 1921 and 1922.

The old timed spark sets at Bolinas, California, were scrapped in 1920 and two alternator sets installed in 1921, #9fn.

The station at Kahuku, #10fn, Hawaii had been a relay station to Japan and the Orient. Two alternator sets were installed there in 1920 and 1921.

To complete the world-wide network, the following sets were installed abroad:

Carnarvon, Wales, in April 1921, #11fn.
Warsaw, Poland, in 1923, #12fn.
Varberg, Sweden, in 1924, #13fn.

In 1924 two transmitters were shipped to Pernambuco, Brazil, but it took two years to find a contractor who could build the antenna towers and buildings and by that time, high frequency tube sets were available so the alternators were shipped back to Radio Central warehouse for storage, #14fn.

It was a tremendous task for the General Electric Turbine Dept. to build and test twenty of these transmitters in 1920 and 1921.

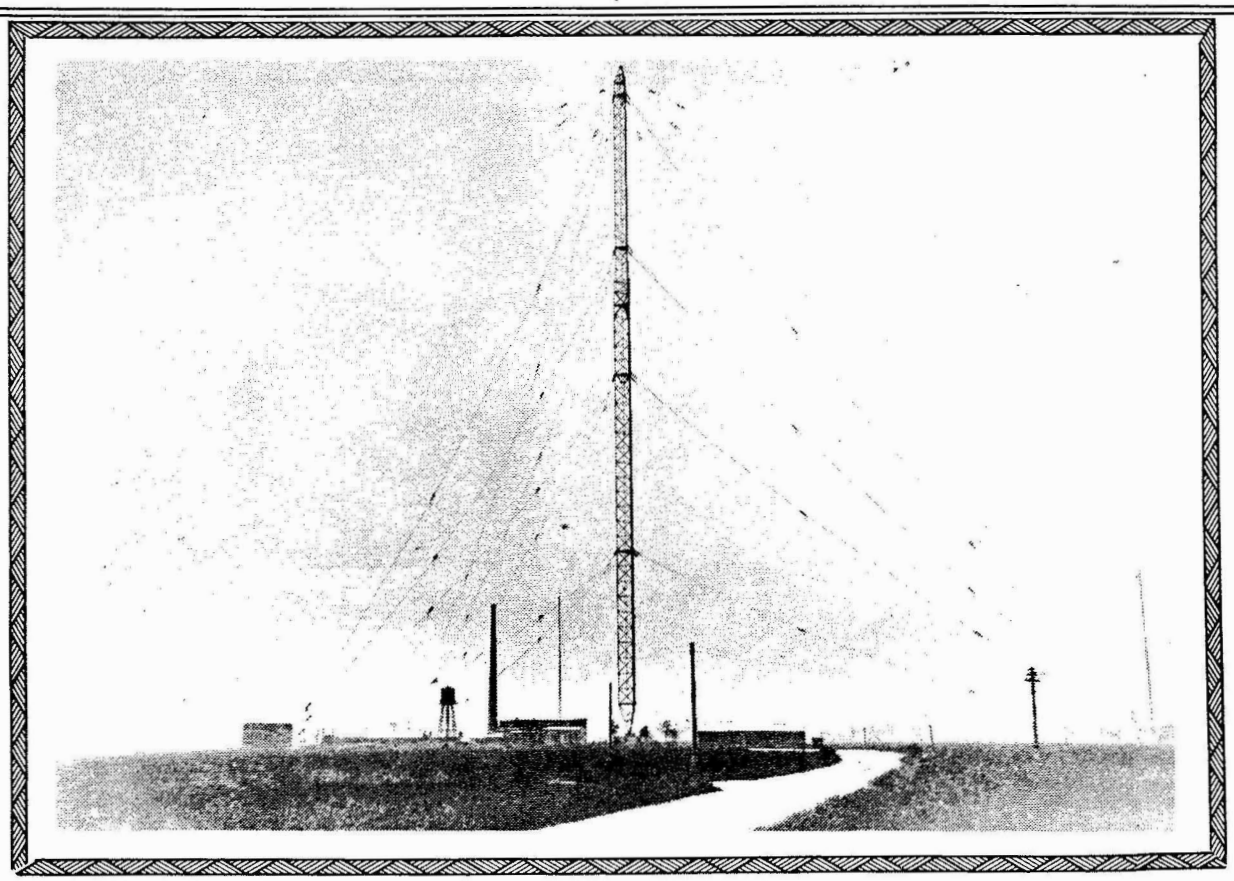
Fig. 10 is a picture of the radio test area during that period when four of the sets were in progress.

Performance of these eighteen VLF stations over the next ten years gave RCA an outstanding reputation for dependable, efficient, rapid handling of traffic. Regardless of weather conditions, or time of day, their signals came through on schedule.

High Frequency Tube Transmitters

An article by Irving Langmuir of the General Electric Research Lab. in September 1922 issue of Wireless Age, gives an indication of things to come. The title was "20 KW Transmitting Radiotrons," the most powerful tube ever made for use in radio communication.

Figure 9 below



Tuckerton Tower

Photo by Hedley B. Morris (195-P) while acting EiC circa 1929 for Gerald G. Eschelman. The 'umbrella' antenna of this Ex-German station was redesigned for the Alexanderson multiplex tuner.

Dr. Langmuir in this article states that by locating the large copper anode on the outside of the glass enclosure, rather than in the evacuated section, that it can be more easily water cooled which solves the problem of heat dissipation. They can be connected in parallel for generating high power. Ten of them will develop the same R.F. power as a 200 KW Alexanderson alternator, and in time they will probably replace the alternators as they are less costly, smaller in size, quiet in operation with lower operating cost. In addition the high frequency transmitter uses an antenna a fraction of the cost of the VLF antenna.

Radio News of August 1928 carries an article by Robert Hertzberg, "A Visit to Radio Central," which includes the picture of an Alexanderson alternator with its massive antenna almost a mile and a half long, and its long switchboard compared to a compact 20 KW tube transmitter with its low short antenna.

He comments: "Although great progress has been made in long distance communication on short waves with low power, the Alexanderson alternators, operating on wavelengths above 16,000. meters with an output of 200 KW each represent the backbone of transoceanic message service. The long waves are required for uninterrupted communication from daylight to darkness, for uniform and reliable transmission 24 hours a day regardless of weather. A single short wave transmitter working on one fixed wavelength cannot supply the same class of service; engineers are now conceding the necessity for a group of different transmitters which can be shifted at will to meet the peculiar effects of daylight and darkness on the carrying powers of their respective wavelengths. Marked economies are effected many times with the use of short waves instead of the longer ones, for less power is required and the transmitting speeds can be greatly increased.

At Radio Central short wave transmitters are handling more and more traffic to Europe and Latin America and are being used experimentally for directive transmission to selected countries.

Such have been the developments of a very few years; six since the inauguration of Radio Central, and twenty since the first commercial radio service was put in effect across the Atlantic between Clifden, Ireland, and Glace Bay, Nova Scotia."

By 1935 the bulk of all traffic had been taken over by tube sets and by 1940 the alternators were merely on standby. The sets at Kahuku, Hawaii, and Carnarvon, Wales, were scrapped before 1940 and the day of the VLF transmitters was thought to be over.

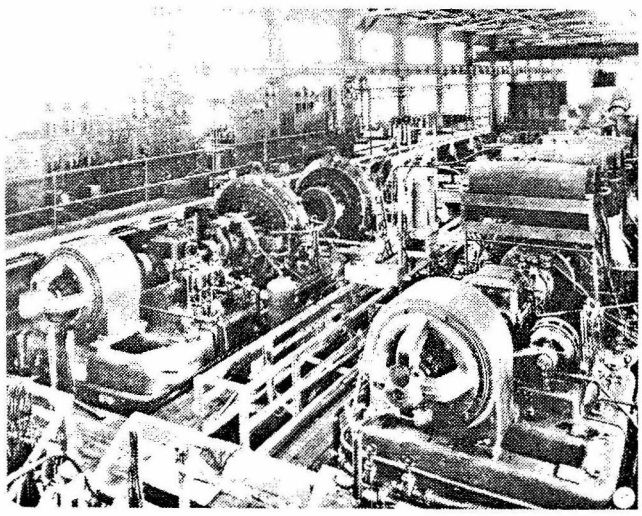


Figure # 10.
Radio Test at General Electric's Schenectady Works on Alexanderson Alternators circa 1920.

200 KW ALEXANDERSON ALTERNATOR TRANSMITTERS

(F-11)

No.	Location	Call	Wave Length	In-stalled	Idled	*Scrapped
1	New Brunswick, N.J.	WII	13,761	6-1918	1948	1953
2	New Brunswick, N.J.	WRT	13,274	2-1920	1948	1953
3	Marion, Ma.	WQR	13,423	4-1920	1932	
4	Marion, Ma.	WSO	11,628	7-1922	1932	To Haiku 1942
5	Bolinas, Ca.	KET	13,100	10-1920	1930	1946
6	Bolinas, Ca.	KET	15,600	1921	1930	To Haiku 1942
7	Radio Central	WQK	16,484	11-1921	1948	1951
8	Radio Central	WSS	15,957	1921	1948	To Marion 1949
9	Kahuku, Hi.	KGI	16,120	1920	1930	1938
10	Kahuku, Hi.	KIE	16,667	1921	1930	1938
11	Tuckerton, N.J.	WCI	16,304	3-1921	1948	1955
12	Tuckerton, N.J.	WGG	13,575	1922	1948	1955
13	Carnarvon, Wales	MUU	14,111	4-1921		1939
14	Carnarvon, Wales	GLC	9,592	1921		1939
15	Varberg, Swed.	SAQ	17,442	1924		
16	Varberg, Swed.			1924		
17	Warsaw, Poland	AXO	21,127	12-1923		
18	Warsaw, Poland	AXL	18,293	1923		
19	Shipped to Pernambuco, Brazil in 1924 then to					1927
20	Rocky Point warehouse in 1926.					

(*) disposition of each unit be scrapping or other action from records researched. *Scrapped or Disposition

Call letters and wave lengths in meters from RCA listing Long Wave Stations, Dec. 5, 1928.

The table Fig. 11 gives the story of commercial operation of the twenty transmitters that were built. All domestic units had been scrapped by 1953 except the ones that were used by the Military in WW-II.

World War II

During time of war, vessels of beligerants operate under "radio silence" to guard against their location by enemy radio direction finders. Routing Orders and other combat operational information must be given to silenced vessels by transmission from shore, receipt of which obviously cannot be acknowledged. Transmissions of utmost reliability must, therefore, be used, and VLF transmission at high power, not subject to fading and periodic dropouts are used to supplement simultaneous transmissions by high frequencies which are less subject to interference by noise. VLF is also by far the best means of communicating with our submarines when they are submerged.

Soon after the start of WW-II it became evident to the Navy that their high power VLF tube set in Hawaii was inadequate to carry the communications load in the Pacific and there was not time to build new transmitters and VLF antenna towers.

Hedley Morris was on active WW-II duty with the Navy in Hawaii and was given the assignment of finding in Hawaii, a suitable VLF station location. He selected Haiku, a narrow

U shaped valley approximately two miles east of Kaneohe, on the north side of the island of Oahu, that had cliffs on three sides that were 2500 feet high. Four copper-clad steel cables were stretched across the valley approximately 4000 feet long, making the antenna, and a bomb-proof concrete transmitter house was built in the center of the valley to house two Alexanderson transmitters. Both sets at Kahuku had been scrapped so one set was shipped from Bolinas and one from Marion to power the Haiku station. This VLF installation provided the contact with our fleet and submarines in the South Pacific during the War, #15fn.

The Navy took over operations of the alternators at Marion and Tuckerton to provide VLF communications in the Atlantic thru 1948. Tuckerton was closed in 1949 and sets scrapped in 1955.

Marion was purchased by the Air Force in 1949 and an alternator set was obtained from Radio Central to replace the one shipped to Haiku in 1942.

Mr. G. J. Eshleman was for many years engineer in charge of the Tuckerton station, transferred to Marion as civilian engineer for the Air Force operation 1949 to 1957. He installed the set from Radio Central and changed the controls so the sets could be keyed by teletype as the receiving stations were equipped for teletype reception. In a letter he stated that the station was used to transmit international weather and other material to Air Force stations at Tule, Greenland, Labrador, Iceland and on ice islands in the Arctic region where reception of short waves was very erratic, #16fn.

Marion station was sold in 1961, one alternator was scrapped and one went to the Bureau of Standards. Some of the tuning gear from this set was used at Boulder, Colorado, for building the WWV-VLF transmitter.

The Navy operated the single VLF transmitter left at Bolinas, California, 1942 to 1946, for communication in the Pacific. When the set went on the air it put out of commission a large radar station on Mt. Tamalpais six miles away. The trouble was soon located and Jack Napier the Bolinas engineer in charge made this comment: "A poor connection between an insulator metal end-cap and a rain shield caused a spark between the two, and the rain shield acted like a 100 MHz doublet and jammed the radar station on Mt. Tamalpais on 105 MHz. How is that for a 105 MHz spark set?, #17fn.

The Bolinas transmitter was scrapped late 1946. Here is its name-plate, Fig. 12.

Table 13 shows the WW-II service of the Alexanderson transmitters and gives their final disposition.

In conclusion, I quote an appropriate article that appeared in the RCA Relay of December 1946 by L. E. Smith, one of the VLF engineers.

"Our Bolinas staff cheered lustily when the Navy decided to shut the alternators down, and from actual experience they had good reason to cheer.

No more jumping on your car with both feet to avoid an unexpected jolt. No more avoiding wire fences and company-cottage clothes lines which snapped at you on occasions. No more corona discharge from the horns of local cattle, or metallic collar-buttons that would keep biting you in the back of the neck as you walked between the buildings. No more hot seats for the riggers while aloft in bosns chair. When the antenna system came down we cleared the atmosphere of the tremendous potential which prevailed when the alternator was in operation.

Who, having worked with an alternator, will ever forget the sound of the machine coming up to speed; listening to the gear-box noise; the pounding of the compensating contactors as they follow the keying under full load, or the sudden, comparative silence that accompanied a traffic lull? Then there was the warmth and peculiar fragrance--that's right, fragrance--that exuded from the whole contraption. The thing smelled good! And how many old timers have spent cold nights leaning against, or curled up alongside, the driving motor?

Yes, the Alexanderson's are through at Bolinas, and the masts are down. There is little possibility of the antenna ever being erected again. A period of radio history--some feel one of its greatest and most romantic--is gone.

Though the alternators are now classified as obsolete, those of us who have always had an inherent fondness for the massive contraptions will never admit it. For as late as 1945, in the age of VHF, UHF, and television, the Alexanderson Alternators put a steady signal through where nothing else would. They did it steadily, free of skip, fading, and most outage causing trouble, twenty-four hours a day.

Dr. Alexanderson's brainchild bows out with its head high. Science marches on!"

--T. L. Mayes

"PORTS O' CALL" (Vol. 4)

APPENDIX

INSTALLATION SITES—WW—II & LATER

200 KW ALEXANDERSON ALTERNATOR TRANSMITTERS
USE IN WW-II AND LATER (Fig. 13)

LOCATION	ORIGINAL LOCATION	NAVY OPERATION	AIR FORCE OPERATION	SCRAPPED
Haiku, Hi	Marion, Mass.	1942-1946		
Haiku, Hi	Bolinas, Calif.	1942-1946		
Marion, Ma	Marion, Ma	1942-1948	1949-1957	1961
Marion, Ma	Radio Cent.		1949-1957	To Bu Stds.
Tuckerton, N.J.	Tuckerton, N.J.	1942-1948		1955
Bolinas, Calif.	Bolinas, Calif.	1942-1946		1946

NUMBERED FOOTNOTES

FOOTNOTES FOR WIRELESS PIONEER ARTICLE

1. Letter June 29, 1915. E.F.W. Alexanderson to A.G. Davis, General Electric Patent Dept., Schaffer Library.
2. History of Radio to 1926, by Gleason Archer, page 86.
3. Memo by E.F.W. Alexanderson, March 13, 1924. Our Radio Activities before 1920, Schaffer Library.
4. Same Page 2.
5. Same page 3.
6. Wireless Age, August 1920, page 10-11.
7. Wireless Age, December 1921, page 18-22.
8. Wireless Age, March 1920, page 10.

FOOTNOTES, CONTINUED FROM PAGE 38

9. Wireless Age, December 1920, page 7.
10. Wireless Age, September 1923, page 36-38.
11. Letter from Marconi Company Ltd. to T. L. Mayes, Feb. 19, 1975.
12. Wireless Age, October 1922, page 57-61.
13. Wireless Age, June 1921, page 11-12 and March 1923, page 39-40.
14. Letter December 16, 1974, A.W. Aird to Hedley Morris.
15. Letter May 23, 1974, Hedley Morris to T.L. Mayes.
16. Letter June 24, 1975, G.J. Eshleman to T.L. Mayes.
17. Letter July 8, 1974, C.J. Napier to T.L. Mayes.
18. (Page 35) Re: license situation and cross-licensing following World War 1. (Quoted from records).

At this time, the Alexanderson Alternator and the Poulsen Arc were the only types of high powered, efficient transmitting apparatus, except for a French system. Without one or the other of these transmitting devices, the British Marconi stations were at a great disadvantage in a competitive market.

Of all the problems existent at this time, the patent situation was by far the worst. As an example, the vacuum tube involved patents issued to Fleming, DeForest, Arnold, Langmuir, and several others. The British Marconi Co. had purchased some rights of some inventors; the G.E. Co. held some most important patents, not the least of which was the Alexanderson Alternator patents; the Westinghouse Electric and Manufacturing Co. possessed the heterodyne device of Professor Fessenden and also the Armstrong feedback patents. The United Fruit Co. with its crystal detector patents controlled that field.

Interestingly, the Westinghouse, A.T. & T., United Fruit Co., and G.E. Co., all had patents, but not a one of them had in its control a complete system!

Concerned about the formation of RCA by the G.E. Co., the Westinghouse Co. bought outright the International Radio Telegraph Co. which previously was the National Electric Signaling Co. The International Co. owned some very useful patent rights for Westinghouse to acquire. These were the rights to the heterodyne method of reception and the rotary spark gap.

In addition to the above, the Westinghouse Co. obtained from Major Armstrong and from Professor Pupin the rights to four patents and to 16 patent applications relating to radio. The Armstrong Feedback cct. was one of these. However, at this time it was in litigation with the De Forest interests.

These rights, the rights to the Armstrong, Pupin patents greatly strengthened the International Company's position. By now, the Westinghouse officials felt that they were in a very advantageous position. The result was they directed the International Radio Telegraph Co. to see, if by making overtures to RCA, the Westinghouse Co. could make some agreements with RCA. The result was that in June of 1921 the Westinghouse Co. joined company with the RCA, The International Co. was bought out by RCA and a cross-licensing agreement was consummated between Westinghouse and RCA. Additional cross-licensing agreements were agreed upon between Westinghouse and the Telephone Co. and with the manufacturing part of the telephone company, the Western Electric Co.

The General Electric Co. acquired one half of the stock of the Wireless Specialty Apparatus Co. from the United Fruit Co. in Feb. 1921. The result of this manuever resulted in cross-licensing which resulted in control by RCA of all the patents of the Wireless Specialty Apparatus Co. including the important patents of Pickard.

It was some years, however, before many of these companies with their cross-licensing, acting cannibalistically against competitors finally settled down. After a period of time the 'in-fighting' ceased and the industry finally rested on an even keel. By this time, many basic patents began to expire one after the other. As these began to expire, cross-licensing began to have less and less significance. This resulted finally in the field being pretty well opened up. Much of it by this time became available to anyone.

FIGURES—INCLUDES PICTURES, CHARTS, ETC.

0. Dr. E.F.W. Alexanderson
1. 2 Kilo-watt 100 kilo-Hertz alternator
2. First 200 kilo-watt set at New Brunswick station.
3. Schematic section of inductor alternator.
4. 200 kilo-watt alternator, top half removed.
5. Dr. Alexanderson with 200 kilo-watt set at Radio Central.
6. Schematic diagram of multiple tuned antenna.
7. Original plan for Radio Central.
8. Radio Central antenna support tower.
9. Tuckerton tower.
10. Radio test, Schenectady Works, 1920.
11. Original transmitter locations.
12. Nameplate from last Bolinas alternator.
13. Transmitter locations for WW-II.

DR. ERNST FREDERIK WERNER ALEXANDERSON

1878——1975

Dr. Alexanderson was born on Jan. 15, 1878 at Upsala, Sweden the son of Prof. A.M. Alexanderson, then on the faculty of Upsala University. Early interest was expressed in Electrical Engineering, stimulated by a year of technical work at the Univ. of Lund in 1896. He was graduated in 1900 as an Electrical-Mechanical Engineer from the Royal Inst. of Technology in Stockholm followed by a year of postgraduate schooling at the Technical Univ. in Berlin, Germany.

Dr. Alexanderson's high-frequency alternator which he initially developed for Prof. Fessenden after two years of work at the General Electric plant, was installed at Brant Rock and made possible the first voice and music broadcast which occurred on Christmas Eve 1906.

Encouraged by his father who was a Professor of languages, Dr. Alexanderson learned English, German, French and Latin in addition to his native Swedish. Thus, he was able to read a copy of Dr. Charles P. Steinmetz's paper on Alternating Current Phenomena while attending the Technical University in Berlin.

He was so impressed that he decided to move to America and seek work with Dr. Steinmetz which he was able to do in 1902. His first work was on the drafting table but after passing the GE Test Engineering course he became a member of the engineering staff, designing generators in 1904 under Dr. Steinmetz. It was in this year that Professor Reginald A. Fessenden (who was also a pioneer in wireless transmission experimentation) asked the G.E. Company to design and build a high-frequency machine that would operate at high speeds and provide continuous wave transmission/s. The project was turned over to Alexanderson. This was a two-kilowatt, 100,000 cycle machine.

News of the success of the Alexanderson alternator (with many improvements to Prof. Fessenden's original concept) reached the ears of Guglielmo Marconi in England so he visited the G.E. plant in 1915 and after a talk with Alexanderson, arranged for a 50-Kilowatt installation to be made at the New Brunswick, N.Y. Marconi Trans-Atlantic Station.

Not content with his development, he further perfected the unit to provide 200-KW of power. This powerful transmitter was also installed at New Brunswick and was used by President Wilson in the transmittal of messages to the war theatres of Europe since the cables had been cut. The historical test came on Oct. 20, 1918, when President Wilson used this station and its transmitter to send the Peace Ultimatum which brought the war to a close.

CONTINUED ON PAGE - 40

DR. ERNEST FREDERIK WERNER ALEXANDERSON

(CONTINUED FROM PAGE 39)

During 1923, Marconi tried to buy the exclusive world rights to the Alexanderson alternator and its improvements but President Wilson had a deep desire to keep the inventions 'American'. The end result was the formation of the R.C.A. which became the progenitor of what is now R.C.A. Inc.

Dr. Alexanderson was a prolific inventor as his inventive genius touched many fields. Some of his inventions in communications included the Magnetic Amplifier, the Electronic Amplifier, the Multiple Tuned Antenna, the Anti-Static Receiving Antenna, the Directional Antenna, Radio Altimeters. His inventive genius touched many other fields including TV (1928), First Facsimile used Trans-Atlantic on June 5, 1924. He sent a 'hand-written' greeting to his father in Sweden via Fax.

In other fields such as Power & Control, he designed single-phase motors for railway electrification (used on Pennsy R.R. System); worked out a system for regenerative braking by D-C series motors (used on CM&SP Railway locomotives); the Amplidyne and Thyratron motors were among some of the more than 320 patents issued during his 46-years with G.E., (one for every month, give or take a few days).

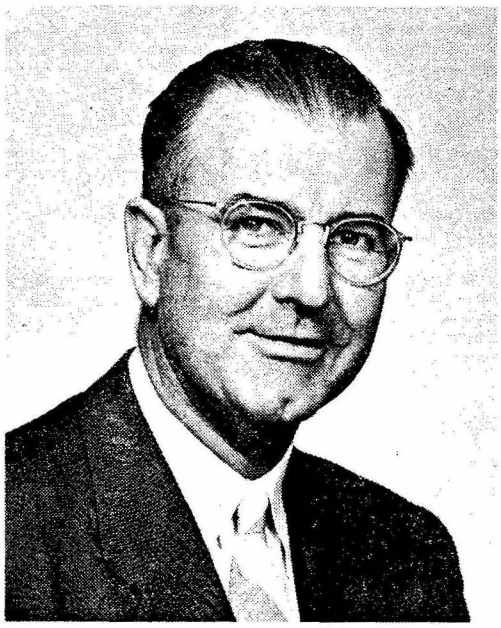
Dr. Alexanderson retired in 1948 but continued as consultant for another year. He was 97 when he died on May 14, 1975, at his home in Schenectady, N.Y. Dr. Alexanderson was widowed twice, is survived by his third wife Thyra and son Verner; also three daughters and nine grandchildren.

The honors and awards bestowed on Dr. Alexanderson were so many it would take quite a lengthy column to list them all.

Our Technical Editor, Thorn L. Mayes, was indeed fortunate in having been associated with this great man through various assignments with the General Electric Company. He has had a number of interviews with Dr. Alexanderson about the early days of the alternator and his experiences, therefore, able to bring a 'first-hand' report on many phases of the communication/s art including the alternators developed by him. Dr. Alexanderson indeed stands tall among those in the field of invention and as a benefactor to all mankind--resulting from his brilliant ideas and his ability to translate them into practical use.

--W.A.B.

SOCIETY OF WIRELESS PIONEERS
P. O. BOX 530
SANTA ROSA, CALIFORNIA 95402



Thorn L. Mayes

It is unfortunate that our Technical Editor and Technical Consultant was so preoccupied in his early days with the 'learning process' that he did not have the time or opportunity to 'pound-brass' professionally, so he could qualify as a regular member of SOWP.

He did manage to take time out to receive his amateur call (6AX) back in 1921 and during his high-school days in Oakland bought or made equipment to commission station 6JR (1-KW spark transmitter and single audiotron regenerative receiver) which he operated until graduation in 1923. Thorn graduated from the University of California with a degree in Elec. Engineering in 1927.

Thorn has maintained an over-riding interest in communications all of his life and since retirement from the General Electric Company where he spent most of his professional years, he has devoted his time and attention to compiling a history of early day wireless and radio - especially the organizations involved in the field, tracing the fortunes of these organizations over the years--as has already been brought to the members in past issues of "SPARKS" and other Society releases.

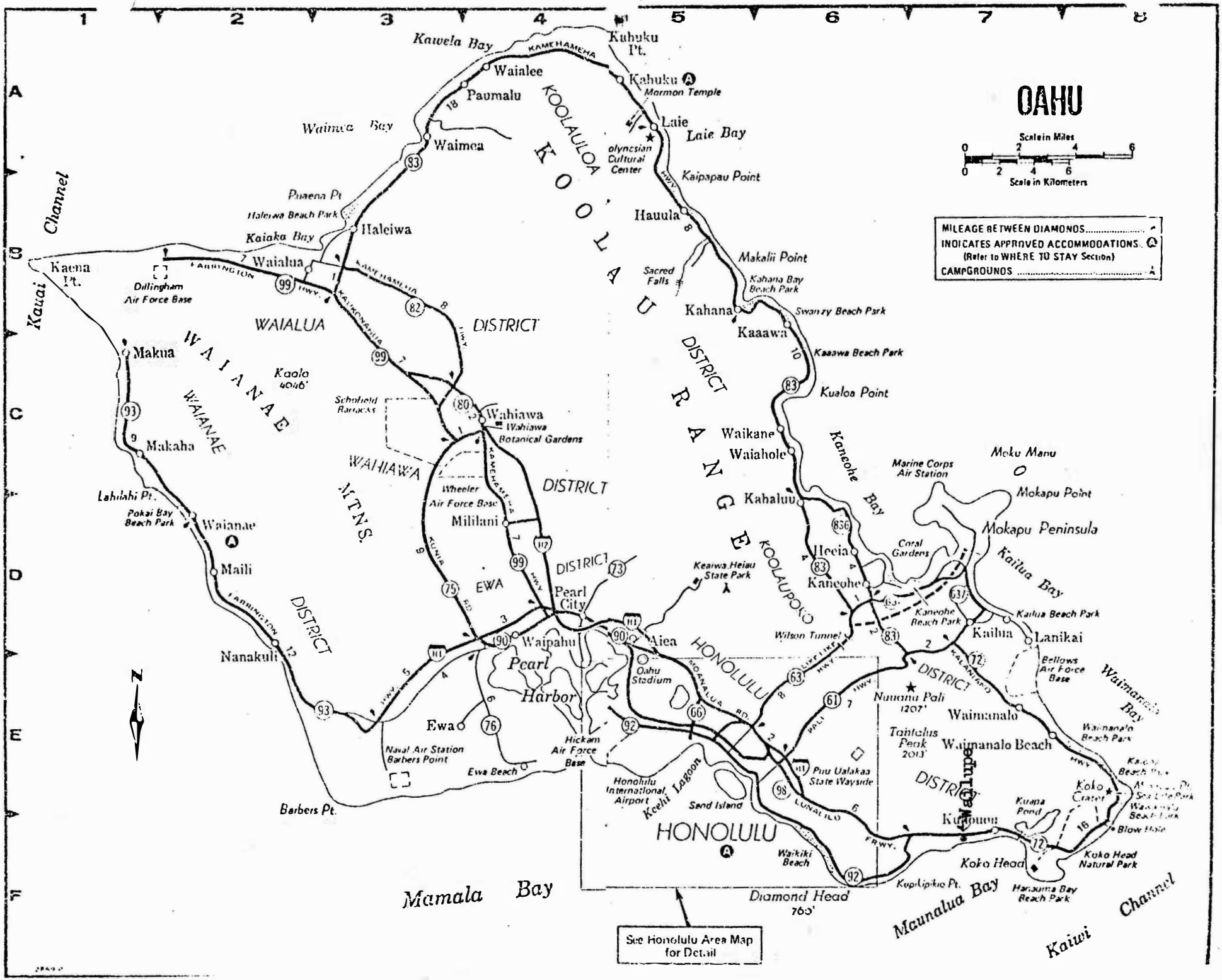
"Thorn" has held some very important assignments with G.E. over the years, including that of Manager of Engineering in the motor plant at Lynn, Mass. and in 1952-58 at Fort Wayne, Ind. where first he was in charge of the building and equipment where induction motors (1-5HP) were built and then as General Manager of the plant. When this plant was combined, he moved to Shelbyville, Ind. as Manager of Engineering of the GE Industrial Heating Plant at that location.

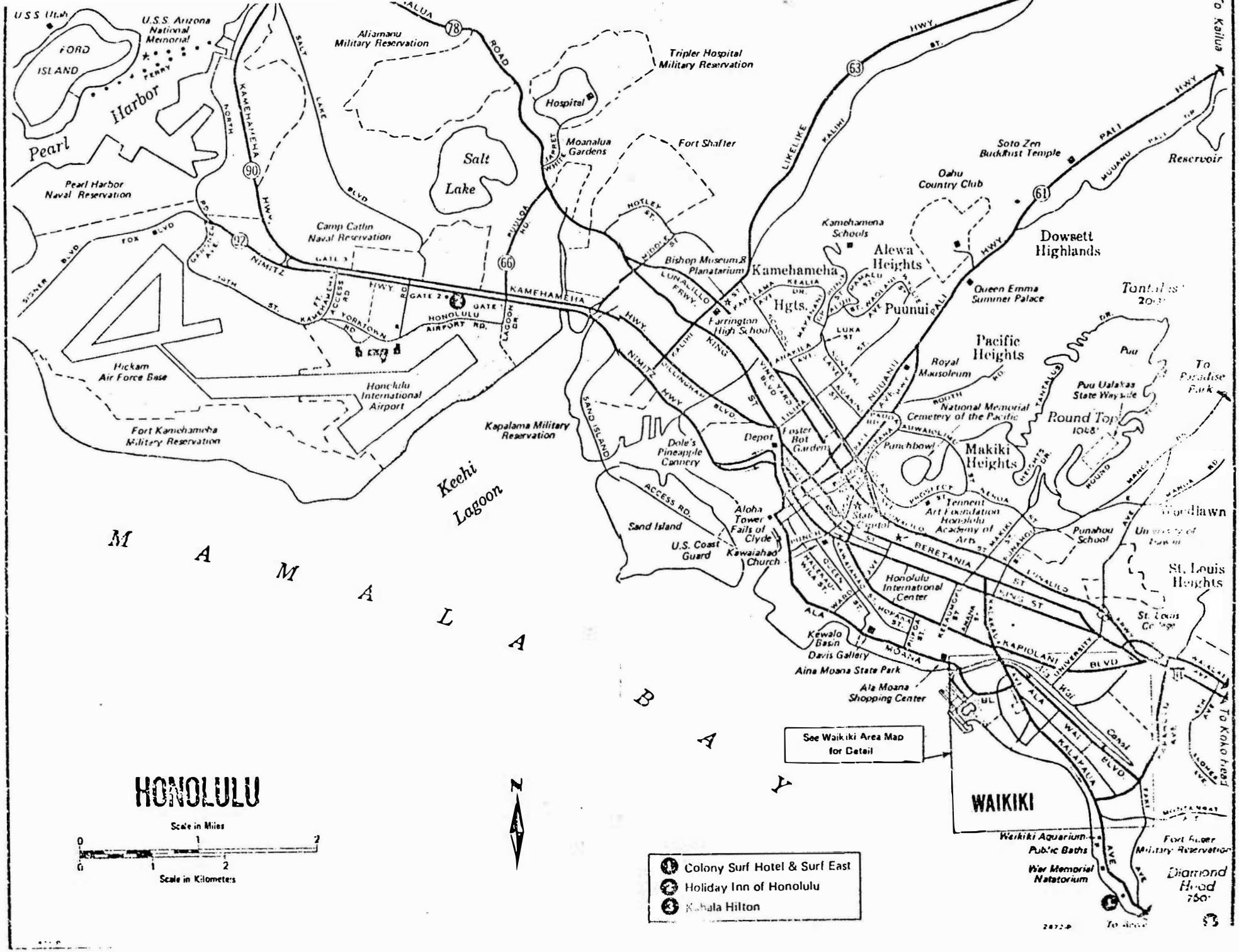
His interest in radio and amateur radio never waned. He held call W2CE in Schenectady, then W1CX at his home in Marblehead, Mass. This was followed by W9AX at Fort Wayne and after his return to California, found his old call 6 AX vacant so now holds W6AX. He has received his 50-year award by QCWA and was a Director of OOTC. He was one of the Charter members of A.W.A. and has presented a number of papers at their annual meetings.

Thorn is also a collector of early communication/s artifacts. He has been most charitable with his time and has on many occasions brought some of his choice receivers and other pieces of early equipment for Society of Wireless Pioneer members to inspect - bringing back nostalgic memories of bygone days.

Mr. Mayes with his wife Lygia lives in Saratoga, California. He is an active member of the Space Science Center Advisory Committee of the De Anza & Foothill Community College and Vice President of the Perham Foundation of the Foothill College Electronics Museum.

The Mayes have a son living in Phoenix who has been an amateur since 1946. Their daughter, married to an Orthopedic Surgeon, also has held an amateur license for many years, hence the Mayes hold family reunions via the air-waves several times weekly - a wonderful way to keep in touch.


OAHU
Scale in Miles
Scale in Kilometers
MILEAGE BETWEEN DIAMONDS
INDICATES APPROVED ACCOMMODATIONS
(Refer to WHERE TO STAY Section)
CAMPGROUNDS
Kawela Bay
Kahuku Pt.
Kahuku
Mormon Temple
Laie
Laie Bay
Polynesian Cultural Center
Kaipapau Point
Waialee
Paumalu
Waimea Bay
Waimea
Punaena Pt
Haleiwa Beach Park
Haleiwa
Kaiaka Bay
Hauula
Makalii Point
Sacred Falls
Kahana Bay Beach Park
Kahana
Swanzy Beach Park
Kaaawa
Kaaawa Beach Park
Kualoa Point
Waikane
Waiahole
Kaneohe Bay
Marine Corps Air Station
Moku Manu
Mokapu Point
Mokapu Peninsula
Kailua Bay
Kailua Beach Park
Kailua
Lanikai
Bellows Air Force Base
Waimanalo Bay
Waimanalo
Waimanalo Beach Park
Waimanalo Beach
Kaiona Beach Park
Sea Life Park
Waimanalo Beach Park
Kaena Pt.
Dillingham Air Force Base
Waialua
Kaukonahua
Makua
Kaala 4046'
Waianae
Waianae Mtns.
Makaha
Lahilahi Pt.
Pokai Bay Beach Park
Waianae
Maili
Nanakuli
Schofield Barracks
Wahiawa
Wahiawa Botanical Gardens
Wheeler Air Force Base
Mililani
Kunia Rd.
Ewa
Pearl City
Waipahu
Aiea
Keaiwa Heiau State Park
Oahu Stadium
Pearl Harbor
Hickam Air Force Base
Naval Air Station Barbers Point
Ewa Beach
Barbers Pt.
Honolulu International Airport
Keehi Lagoon
Sand Island
Mamala Bay
Waikiki Beach
Diamond Head 765'
Kapiolani Blvd.
Nuuanu Pali 1207'
Tantalus Peak 2013'
Pali Hwy.
Wilson Tunnel
Kaneohe
Heeia
Kahaluu
Koolau Range
Koolauloa District
Koolaupoko District
Ewa District
Waialua District
Waianae District
Wahiawa District
Honolulu District
Koko Crater
Koko Head
Koko Head Natural Park
Kuapa Pond
Blow Hole
Hanauma Bay Beach Park
Kupikipiki Pt.
Maunalua Bay
Kaiwi Channel
Kauai Channel
See Honolulu Area Map for Detail


HONOLULU
Scale in Miles
0 1 2
0 1 2
Scale in Kilometers
N
See Waikiki Area Map for Detail
1 Colony Surf Hotel & Surf East
2 Holiday Inn of Honolulu
3 Kahala Hilton
M A M A L A B A Y
Keehi Lagoon
Pearl Harbor
Salt Lake
WAIKIKI
Diamond Head
Pacific Heights
Makiki Heights
Round Top
Punchbowl
Kamehameha Hgts.
Alewa Heights
Dowsett Highlands
Puunui
Moanalua Gardens
Fort Shafter
Tripler Hospital Military Reservation
Aliamanu Military Reservation
Camp Catlin Naval Reservation
Pearl Harbor Naval Reservation
Hickam Air Force Base
Honolulu International Airport
Fort Kamehameha Military Reservation
Kapalama Military Reservation
Sand Island
Dole's Pineapple Cannery
Foster Bot Garden
Royal Mausoleum
National Memorial Cemetery of the Pacific
Tennent Art Foundation Honolulu Academy of Arts
Honolulu International Center
Aloha Tower
Fall's of Clyde
Kawaiahao Church
U.S. Coast Guard
Kewalo Basin
Davis Gallery
Aina Moana State Park
Ala Moana Shopping Center
Waikiki Aquarium
Public Baths
War Memorial Natatorium
Fort Ruger Military Reservation
Queen Emma Summer Palace
Soto Zen Buddhist Temple
Oahu Country Club
Kamehameha Schools
Bishop Museum & Planetarium
Farrington High School
Punahou School
St. Louis Heights
Manoa
Puu Ualakaa State Wayside
To Paradise Park
To Kailua
To Koko Head
Reservoir

CODES USED: WESTERN UNION, A. B. C., LIEBER'S

CABLE ADDRESS: "WIRELESS"

TELEPHONE EXCH. 4
P. O. BOX 628

Aug 25/08

Wireless Telegraph Company

OPERATING A SYSTEM OF WIRELESS TELEGRAPHY
BETWEEN THE ISLANDS OF KAUAI, OAHU, MOLOKAI,
MAUI AND HAWAII

Honolulu, Hawaii, Aug. 25, 1908.

Hon. W. F. Frear,

Honolulu.

Sir:

In reply to yours of August 21st, asking for a brief statement regarding the Wireless Telegraph System of these Islands, would say:

INTER-ISLAND WIRELESS STATIONS

Name	Island	Call	Power
Barbers Point	Oahu	B. P.	1 K.W.
Nawiliwili	Kauai	N. W.	1/2 K.W.
Lahaina	Maui	L. H.	1 K. W.
Puako	Hawaii	K. A.	1 K. W.
Kamalo	Molokai	* A. M.	1/2 K. W.

(Molokai station not in operation.)

HIGH POWER SHIP STATION

Kahuku	Oahu	H. U.	15 K. W.

TELEGRAPH OFFICES

Honolulu Office is connected with Barbers Point Station this Island with a telegraph line 25 miles in length. Arrangements are now being made to connect the Honolulu Office with the Kahuku Station with both telegraph and telephone service.

DELIVERY OF MESSAGES.

On the islands of Kauai and Maui, messages are telephoned direct to addressee from the Wireless Station. If the addressee has not a telephone, our operator manages to send someone to call party to public 'phone. On the Island of Hawaii, four

Telephone Companies, - the Hamakua & South Kohala Telephone Co., Kohala Telephone Co. and Kona-Kau Telephone Co. and Hilo Telephone Co. act as Agents of the Wireless Company. Messages for this island are telephoned direct from the Puako Wireless Station to centrals of the various Telephone Companies, and they in turn see that same are promptly delivered. In the same manner messages are sent from Outer-Island points to Honolulu or other Islands.

Honolulu: Messages are delivered by messenger in the city of Honolulu. Messages from outside Oahu points are telephoned.

List of places reached by system: All towns and cities in Hawaiian Islands are in touch, also all private residences having a telephone installed.

HOURS OF OPERATION

Inter-Island Wireless Stations: These stations are open for business at 7 a.m. and close at 5:30.pm daily except Sunday.

Kahuku Ship Station: This station is open day and night, Sundays included.

R A T E S

Enclosed find new schedule of ship and inter-island rates to go into effect October 1, 1908.

Respectfully submitted,

J. A. Balch

JAB MANAGER, WIRELESS TELEGRAPH CO. LTD.

APPENDIX F-2 (from H. L. Chadbourne collection)

POST OFFICE BOX 400
CABLE ADDRESS
"MUTELCO"

Mutual Telephone Co., Ltd.

TELEPHONE, RADIO, FIRE ALARM AND TIME SERVICE

Honolulu, T. H., December 4th, 1923

Mr. George R. Clark,
Secretary to the Governor,
Executive Chamber,
Honolulu, Hawaii.

Dear Sir:

Replying to your letter of December 3rd, asking for information regarding telegraph statistics for the Territory of Hawaii, would say, that there are no regular telegraph systems in this Territory.

The Mutual Telephone Company is, at present, leasing the following miles of telegraph wire to private firms on this island.

Marconi Wireless Telegraph Company of America:
From Honolulu to Koko Head and Honolulu to Kahuku (Oahu) for private communication between these two wireless stations; miles of wire..... 200

Federal Telegraph Company:
Connecting their Honolulu office with their Heeia (Oahu) Wireless Station; miles of wire..... 25

Mutual Telephone Company, Wireless Dept.:
Connecting their Honolulu office with their Kahuku (Oahu) Wireless Station; miles of wire..... 100

U. S. Government:
Connecting Department Headquarters (Honolulu) with Fort Shafter and Schofield Barracks (Oahu); miles of wire..... 56

APPENDIX F-3 (from H. L. Chadbourne collection)

ISLAND OF HAWAII.

Wire leased by the Mutual Telephone Company, Wireless Department, from the Hawaii Telephone Company, connecting the wireless station at Kawaihae (Hawaii) with Hilo, Hawaii: miles of wire..... 120

I beg to state that these are all of the telegraph lines in the Territory of Hawaii, at the present writing.

Hoping this information will be what you require, I beg to remain,

Yours very truly,

J. A Balch

Treasurer, Mutual Telephone Co., Ltd.

Mutual Telephone Company, Ltd.

WIRELESS DEPARTMENT REPORT.

Honolulu, T. H., February 25th, 1915.

Mr. F. G. Hummel,
Manager, Mutual Telephone Company, Limited,
Honolulu, T. H.

Dear Sir:—I beg to submit herewith the following report of the Wireless Department for the year ending December 31st, 1914.

All of the wireless stations of the company have received the necessary repairs to buildings, masts, guys, and wireless apparatus, and are in excellent condition; and for the year 1915 I do not know of a single dollar that need be expended on anything other than the operating expenses and general maintenance.

On March 3rd last, our new Inter-Island and Ship Wireless station was completed and placed in operation at Wahiawa, this island, thereby superseding our old Kahuku station in handling the ship and inter-island business of the Island of Oahu.

The removal of this station was necessitated by the erection of the large Marconi trans-Pacific wireless station within 1½ miles of our old Kahuku site, thereby compelling our removal in order to escape from the interference zone created by this immense 250 kilowatt plant. Practically all of the costs incidental to the removal of our station to Wahiawa were borne by the Marconi Wireless Telegraph Company of America, and is an example of the honorable business methods of this company under whose patent rights the Wireless Department, as lessee, is conducting the inter-island and ship wireless business of the Territory.

During October 1914, in addition to our usual rush and double rush service, a night lettergram was added to our inter-island service, making it now possible to file, at any point in the Territory for delivery the following morning, 25 words for $1.50 with an additional charge of 5 cents per word for each word over the 25-word minimum.

MESSAGES SENT AND RECEIVED.

	Year 1912	Year 1913	Year 1914
Number of Ship messages sent and received	4,269	5,495	5,526
Number of Inter-Island messages sent and received	17,069	13,826	13,638

By this you will see that our inter-island business fell off during 1914 as compared with 1913 by 188 messages and from the 1912 record by 3,431 messages; this large decrease of inter-island business being only accounted for by the general slackening of business for the past two years as well as by the general improved mail service between the islands of the territory.

The ship messages, on the contrary, show a slight increase over 1913 by 31 messages and over 1912 by 1,257 messages, this being accounted for by the increased number of ships equipped with wireless installations.

In conclusion, I might add the removal of our Kahuku station to Wahiawa to avoid interference from the large Marconi station has proved successful, and although only 15 miles separate the two plants, both stations are now able to tranact business simultaneously without interference.

Following is a list of the stations of the Mutual Telephone Wireless Department:

INTER-ISLAND STATIONS OF MUTUAL TELEPHONE COMPANY, LIMITED.

Station	Island	Call	Power
Wahiawa	Oahu	K.H.K.	2 Kw.
Lihue	Kauai	K.H.M.	2 Kw.
Lahaina	Maui	K.H.L.	2 Kw.
Kaunakakai	Molokai	K.H.O.	½ Kw.
Kawaihae	Hawaii	K.H.N.	2 Kw.

Stations open 7 a. m., close 5:30 p. m.

LONG DISTANCE SHIP STATION.

Station	Island	Call	Power
Wahiawa	Oahu	K.H.K.	10 Kw.

Open day and night.

Respectfully submitted,

(Signed) J. A. BALCH,
Superintendent.

Mutual Telephone Company, Ltd.

TREASURER'S REPORT.

Honolulu, T. H., February 25th, 1915.

To the Stockholders of the
Mutual Telephone Company, Limited.

Herewith are submitted the following financial exhibits the Company's business for the year ending December 3 1914:

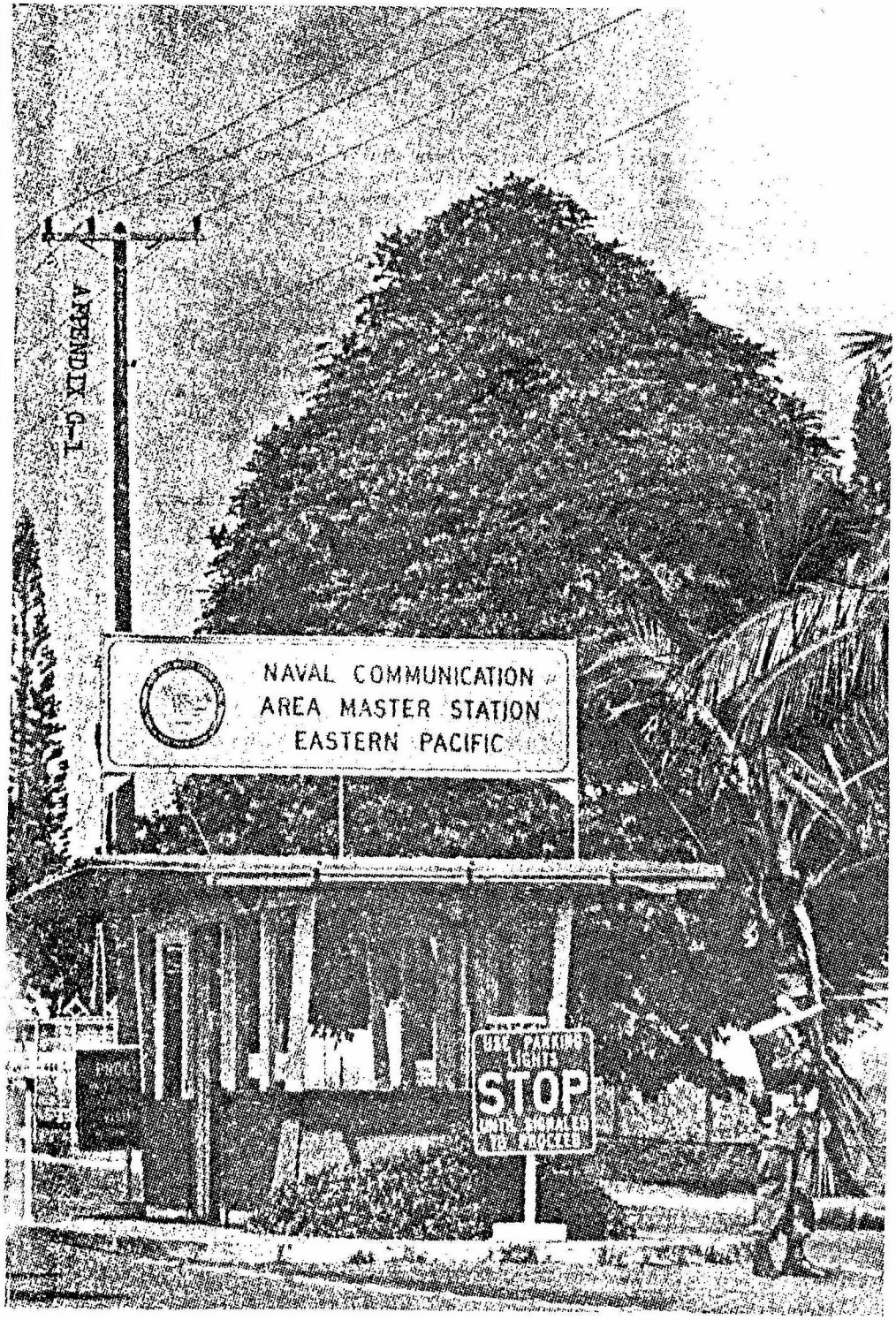
Balance Sheet as at December 31, 1914.

Auditor's Certificate.

Statement of Profit and Loss Account for the year.

Respectfully submitted,

J. A. BALCH,
Treasurer, Mutual Telephone Company, Limite



APPENDIX G-1

NAVAL COMMUNICATION AREA MASTER STATION
EASTPAC, HONOLULU

HISTORY

At the close of the 19th century, King Kalakaua of the Hawaiian Islands gave to the U. S. Government the exclusive rights to enter and develop Pearl Harbor. It was in May, 1898 that the U. S. established a coaling station in the harbor to service the vessels of the Pacific Fleet.

Early in 1906 Congress approved plans to build a U. S. Naval Radio Station in the Pearl Harbor area. On October 1 of that year the station was placed in operation. This was the first government station in the islands and it continued in operation until deactivated in 1917.

The annual report of the Secretary of the Navy for 1911 discussed a proposed network of high-power, long-distance radio stations similar to the one being constructed at that time in Washington, D. C. On March 3, 1915 Congress passed an Appropriations Act, which authorized $400,000 for construction of a high-powered station at Pearl Harbor.

In 1916 the new station--NPM—was put into operation at Hospital Point, Pearl Harbor. Messages were exchanged with Naval Radio Station, Long Beach, California on the morning of September 20, 1916. At 0230, the Pearl Harbor transmitter sent:

"SECRETARY OF THE NAVY, WASHINGTON, D.C.
I HAVE THE HONOR TO SEND YOU THE FIRST THROUGH
MESSAGE TO WASHINGTON, D.C. FROM PEARL HARBOR,
HAWAII RADIO STATION AND CAN REPORT SATISFACTORY
PROGRESS OF THE PLANT. GEORGE R. CLARK SENDS"

Captain Clark was the first Commandant of the 14th Naval District. A congratulatory reply was received from the Secretary of the Navy 33 minutes later.

Based on subsequent tests it was decided that moderate, rather than high power, would suffice for the proposed stations in Guam and the Philippines since Pearl could communicate directly with Cavite, Philippines without the necessity of relay. This decision resulted in Naval Radio Station Pearl becoming the center of communications for the U. S. Navy in the Pacific, a position which is still held today.

In 1917, in compliance with an Executive Order from Washington, all radio facilities in the Hawaiian Islands were seized

by the U. S. Government. At the close of WWI, the Federal Telegraph Company's radio station at Heeia was purchased and became an integral part of the communications system.

Period of Expansion

Plans were drawn up in 1919 for a receiving station at Wailupe. When the buildings were completed in late 1920 this station was considered one of the largest receiving stations in the world. Two 47-foot antennas were located at each end of the operations building, which was built out over the ocean, and four shorter poles were planted along each side to position loops for receiving from San Diego, San Francisco, Guam, Japan, and Manila. Initial facilities were arranged so that six messages could be sent and received simultaneously. Various local circuits connected Wailupe with commands throughout the Hawaiian Islands.

During the following years naval activities continued to expand in the Pearl Harbor area. It soon became obvious that future expansion of the radio station facilities in this area would be impractical. So, a tract of land at Lualualei was purchased in 1931 for $227,127. At this new site seven self-supporting steel towers were erected to a height of 610 feet. This antenna system was especially designed for long wave radio transmitting. The transmitter site was activated in 1936. Twelve transmitters were in operation by 1941.

Additional responsibilities were assumed by the command during this period. A Security Group Detachment was established at Heeia. Also, a Registered Publications Issuing Office was located in the Admin Building, Pearl Harbor. From a small beginning this office has come to be considered the main distribution point for the Pacific area. Another responsibility given to the command was the Fleet Post Office.

When the major fleet units of the U. S. Pacific Fleet began to arrive at Pearl in 1939, it became increasingly clear that a new receiver and control station was vitally needed. A secluded spot at Wahiawa, some 20 miles north of Pearl Harbor, was chosen and purchased by the Navy for approximately one million dollars. In 1940 construction began on the 696.2 acres of land. This station was scheduled for completion in 1942 and was considered the most important of a number of Naval Radio and Air Stations being constructed as part of a general expansion program.

World War II

A few minutes before 0800 on December 7, 1941 several squadrons of Japanese aircraft passed over the Lualualei Transmitter Site on their way to bomb Pearl Harbor. Each major Naval Radio Station was strafed as the planes passed overhead, but casualties among communications personnel were light. However, the radio stations had proved to be highly vulnerable to attack. Lualualei was only 4,000 yards from the shoreline and its power was received over exposed landlines from the Hawaiian Electric Company, 22 miles away.

Steps were immediately taken to increase auxiliary power, to develop an efficient system of passive defense, to disperse transmitters and to conduct emergency drills as well as to construct bombproof shelters for men and equipment. Wailupe, too, was located on the seacoast and had no bombproof shelters.

On the morning of December 10, it was decided to have all the equipment at Wailupe moved to the new site at Wahiawa. This site was an excellent receiving area and the best protected radio station on the island.

Men worked night and day to transfer operations to Wahiawa and on December 17 the relocation was completed without the slightest interruption in communications service. This location became known as the Naval Radio Station Wahiawa. Shortly thereafter, the Security Group Unit was also moved from Heeia to Wahiawa.

By 1943 six new buildings were erected at Lualualei to accommodate an increase of transmitters from 22 to 55, which greatly heightened the importance of this station.

The Navy was aware of the need for another large transmitting station as a standby for Lualualei and as a part of the general dispersion program. Plans to build such a station in Haiku Valley were drawn up. The mountain valley afforded excellent protection for the station. In December 1943 the antennas were strung between two mountaintops and the station was placed in an operational status. The antennas reached a height of 2,800 feet and had a span of 7,500 feet.

To improve naval communications in the Pacific area, a communications security unit (COMSEC) was established at Wahiawa in 1943 under the management and control of the Chief of Naval Operations. Their purpose was to assist in a program of cryptographic security, traffic control and traffic analysis.

At the end of World War II the command complement had increased to 100 officers and 650 enlisted personnel; compared to five officers and 165 enlisted personnel prior to December 1941.

In 1945 the Naval Teletypewriter Exchange Network was born. This represented a major change in system and procedure to accelerate the delivery of messages, both on-island and to the Mainland. This station became an integral part of the world-wide network, linking those points west of Hawaii with the Mainland.

It became apparent after the war that the naval communication facilities in Hawaii could never revert to their small pre-war status, but would have to continue in the role of "big business." A committee was appointed by CNO to make a survey of these facilities and to make appropriate recommendations. This committee decided that the central point of the radio station should return to Pearl Harbor with Wahiawa relegated to a receiver site. CNO also granted the Coast Guard permission to occupy and operate the Wailupe Station.

At the outbreak of the Korean War in 1950, the communications workload increased measurably. Since the end of the war saw little decline in this workload, new and more sophisticated gear was introduced into the communications system shortly thereafter.

In 1956 it was decided that insufficient space existed in the Pearl Harbor area to permit continued expansion of communication facilities on Oahu. In addition, the various components were scattered throughout the Pearl Harbor complex, which made the operation highly uneconomical and difficult to supervise. Therefore, it was decided to re-relocate the central point back at the Wahiawa site.

In 1957 the Chief of Naval Operations, in order to meet the necessity of rapid communications from the Navy Department to fleet operational commanders, authorized the activation of an additional teletypewriter system, operating parallel to the existing channels, and called "HICOM." Afterwards, the Commander in Chief, U. S. Pacific Fleet, established an additional parallel circuit known as the "Atomic Strike Coordination Circuit."

In 1958 a change in the concept of postal operations resulted in the transfer of the Fleet Post Office from the Communication Station Wahiawa to the Naval Station Pearl Harbor.

In 1959 it was determined that even more rapid communications were necessary. Therefore, a new communications net, known as the "Naval Operational Net," was formed.

At the same time it was decided that the need for the continued operation of the stations at Haiku and Heeia no longer existed. The station at Heeia was turned over to the Marine Corps Air Station at Kaneohe, while the Haiku station was placed in a non-operational atatus.

On January 28, 1960 at 0900 local time, the Navy made its first public demonstration of a new communications system, which used the moon as a passive reflector for the relay of radio signals. This demonstration involved transmiasions between Hawaii and Washington, D. C.

In 1960 the station headquarters, message center, relay and control functions returned to Wahiawa, occupying a large newly constructed communication center.

Construction began in March 1966 on the 2.5 million dollar AUTODIN addition to the main communications building and was completed in October 1966. In July 1966 the transmitter site at Makalapa was deactivated and the responsibilities were assumed by Lualualei.

AUTODIN was activated March 25, 1967. Satellite communications came to Hawaii in July 1967 with the placement of two terminals at Helemano.

Consolidation played a big part in 1967 at NAVCOMMSTA Honolulu. The message centers at Moanalua (Fleet Weather), July 1967; Makalapa (CINCPACFLT), November 1967; and NAS Barbers Point, December 1967 came under the operational and administrative control of NAVCOMMSTA Honolulu. Secure Voice Facilities were placed into operation in November 1967 at Pearl Harbor. In September 1967 the Consolidated Maintenance Division in Pearl Harbor was established. SEVAC became operational in January 1968.

Microwave installations between Wahiawa/Lualualei and Kunia/Makalapa resulted in disestablishing the microwave site at Mauna Kapu in September 1968.

November 1968 marked the deactivation of the final Naval Teletype Exchange Network circuit as AUTODIN assumed the responsibilities of the outdated torn-tape system.

NAVCOMMSTA Honolulu supported the manned space efforts throughout the Mercury, Gemini, and Apollo programs.

The Makalapa Local Digital Message Exchange (LDMX) was activated in March 1973 by Vice Admiral G. C. Talley, Deputy CINCPACFLT. The system's activation marked a significant step forward by improving writer-to-reader speed of service, message formatting, routing indicator assignment and message recall for CINCPACFLT.

Recent Period

The Commanding Officer of NAVCOMMSTA Honolulu transmitted the first message via the LDMX system in a ceremony marking the turnover of CINCPAC Telecommunications Center at Camp Smith, from joint operation to Navy management in September 1973. The completely automated message processing system has dual access to the AUTODIN switches at Hawaii and Guam.

A mini very low frequency high voltage test facility was constructed at the Lualualei Radio Transmitting Facility in August 1974. The test facility meets the Navy's need to evaluate the performance of insulating devices at radio frequency potentials under varying degrees of electric stress and environmental conditions.

In April 1976 Naval Communication Station Honolulu was officially renamed Naval Communication Area Master Station EASTPAC, Honolulu.

On February 18, 1977 the Commanding Officer at NAVCAMS EASTPAC Honolulu officially dedicated the new SHF Satellite Facility here on station. The new Satellite Communications Facility is the largest of its kind in the world, serving the entire Pacific area. The facility supports two AN/FSC-78 satellite communications terminals and an AN/FSC-79 fleet broadcast terminal. Concurrent with the activation of the SHF Satellite Facility, the Navy's Satellite Facility at Helemano was deactivated.

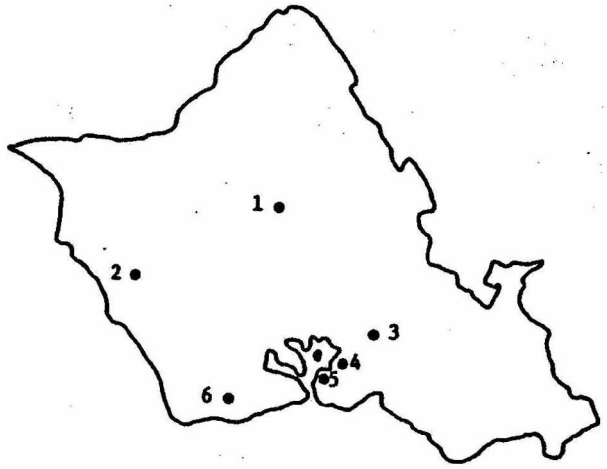
The growth of NAVCAMS EASTPAC HONO is continuing. Some facilities are being considered for consolidation while others are being automated. The 82 officers, 1385 enlisted personnel and 320 civilian personnel of NAVCAMS EASTPAC HONO take great pride in meeting the ever increasing challenge of modern communications at the largest communication station in the world.

COMMAND COMPONENTS

Other components of the command include:

Radio Transmitting Facility, Lualualei
Telecommunications Center, Camp H. M. Smith
Naval Communications Activity Oahu
Naval Telecommunications Center, Makalapa
Naval Telecommunications Center, Barbers Point

The Naval Communication Area Master Station EASTPAC, Honolulu, as the center of communications for the Navy in the Pacific area, is the largest communication station in the world. Its mission is to provide communication service not only to all naval commands ashore and afloat in the Pacific area, but also to a wide variety of Army and Air Force commands in the same area.



1. Naval Communication Area Master Station EASTPAC, Honolulu
2. Radio Transmitting Facility, Lualualei
3. Telecommunications Center, Camp H. M. Smith
4. Naval Telecommunications Center, Makalapa
5. Naval Communications Activity Oahu
6. Naval Telecommunications Center, Barbers Point

K4HON
W. H. COLVIN
Box 536
Clanton, Ala. 35045

November 27, 1972

H. O. Lorenzen, W3BLC
Superintendent, Space Systems Division
Naval Research Laboratory
Washington, D. C. 20390

Dear Mr. Lorenzen:

Re: Your QCWA note, December 1972.

NRL Bellevue and NKF take us back to 1925.

As a Navy Radioman I repeatedly worked NKF from shipboard and later at shore radio station NPM, Honolulu, in the days of crystal controlled transmitter observation. The record as I recall it may or may not be of interest. A blow by blow description would go something like this:

In May of 1925 the old coal burning armored cruiser U.S.S. Seattle, F8Z, Commander in Chief, U.S. Fleet, Admiral Coontz' Flagship Seattle set sail with the fleet on a good will, recreational and training cruise to Australia, first stop at Honolulu. On board the Seattle was believed to the first shipborne experimental crystal controlled transmitter, ever, and built at NRL Bellevue.

On board for the cruise to conduct the tests was W4CF, Lt. Fred H. Schnell, USNR., under the watchful eye of the Fleet Radio Officer, Cdr. S. C. Hooper, who was interested in the new-fangled crystal controlled rigs. Lt. Schnell, having brought his own Ham rig along, worked amateurs daily during the trip using the assigned call letters NRRL, in addition to covering scheduled observation of the NKF transmitter and the NRL transmitter on board.

As a first time around, the two NRL crystal controlled transmitters performed admirably, considering the limited tube types and components available at that time for manufacture. Even power was in short supply. Navy ships of the era had only a d.c. source of power, converters not needed, motor generator sets were the thing. Most, if not all, tubes at that time were filament current hogs.

Before our arrival at Honolulu and while tuning the "band" I heard NKF calling CQ, and with the Bellevue rig warmed up during a check I contacted NKF and exchanged signal strengths. The NKF signal was strong with a pure musical tone of course, and quite in contrast with the a.c. notes of the day.

The Seattle was not able to use the NRL transmitter more than a couple of hours per schedule because the final tubes demanded a heavy filament current from a lead acid battery source of supply. Only one bank of batteries on board. Hi

I was interested in completing the cruise to Australia on board, but since I was also interested in the new transmitters, Cdr. Hooper arranged my transfer to NPM Honolulu for duty, with a note to the District Communication Officer, Lt. Cdr. L. R. Gray at the time, suggesting that I be detailed to cover the NKF/NPM tests and traffic schedules, as well as NPM/F8Z Seattle traffic schedules while the Fleet was enroute and in Australia.

NPM cleared the Seattle of all fleet traffic nightly during the cruise, circuit operation beginning shortly after sundown because the frequency was between 40 and 50 meters, probably in the vicinity of 50. We didn't have a frequency meter. The frequency used by NKF/NPM however was higher, 18 or 20 meters, schedules beginning at 1700 Honolulu time, well before sundown. When the NRL transmitter filament batteries ran down shift

was then made to Lt. Schnell's transmitter to finish off any remaining traffic for the day.

Early in the cruise the Ham 500 cycle note was born when Lt. Schnell's rig suffered a power casualty when a field lead became disconnected which wrecked the motor end of the m.g. plate supply. He then turned to the Seattle storeroom where a discarded 500 cycle spark alternator was available. There and then was born the historic NRRL 500 cycle note. The popularity of this new note was of short duration, the 500 cycle alternators soon being replaced by crystals and VFOs with filtered power supply.

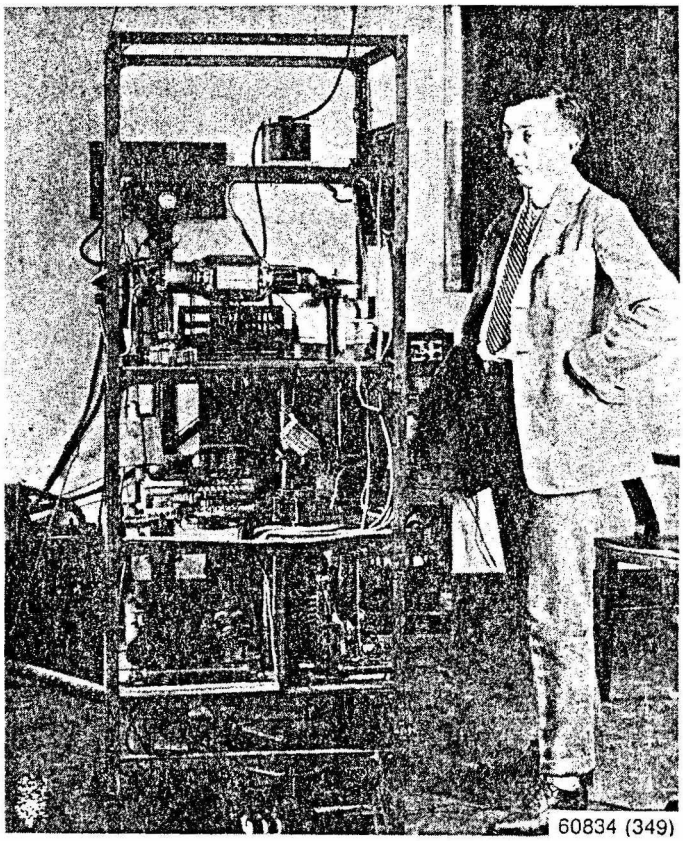
Radio Central NSS Washington in June of 1925, or later, took control of the NKF transmitter during schedules to handle official traffic with NPM, for a period of two weeks. The NPM transmitter, located at Heeia, Oahu, was built by CRE McCutchan who was in charge of Heeia station. McCutchan utilized a 500 cycle spark alternator for the plate supply, as did Lt. Schnell.

Designers and builders of the NKF crystal controlled transmitters should have received merit badges of well done.

My story more in brief, Mr. Lorenzen, is that I worked NKF in the early days. Incidentally, I was a student at RMS, NRL Bellevue, in 1935; and there in the Lab sat the old NKF rig covered with dust, still workable but by this time, having served its purpose, was out of use.

73, and let me be the first to wish you a Merry Christmas.

W. H. Colvin,
CRE., USN., Retired



NRL EXPERIMENTAL HIGH-FREQUENCY
CRYSTAL-CONTROLLED TRANSMITTER

This transmitter was first to communicate with Australia on 15,000 kHz. It handled traffic directly with the U.S. Fleet flagship, USS SEATTLE, during the cruise of the Fleet to Australia in 1925, a demonstration which contributed importantly to the Navy's adoption of high frequencies. L. C. Young, shown here, who developed the equipment, was Associate Superintendent of NRL's Radio Division during the period 1936-1945.

Picture from "Evolution of Naval Radio - Electronics and Contributions of the Naval Research Laboratory, by Louis A. Gebhard, 1979.

NOTES FROM NPM

(Probably written about 1942. Author is not identified but the notes were undoubtedly written by the person named below. See Administrative History of 14th Naval District in WWII)

Clarence "A" Porter (CRM in Charge, Wailupe, 1940-1941)
Chief Radioman, USN (Wahiawa Communication Officer 1942-46)
(Retired 1946 as Lieutenant)

Much has been learned from experience since the Pearl Harbor attack of December 7th, 1941. We, in the Mid-Pacific have had many communication experiences since that date. This little article is written to let our fellow communicators in on the highlights. From our memoirs of trials, tribulations and humorous moments they may be able to gather some information which might, in time to come, prove useful.

Shortly after the attack began communication was established between Guam and Radio Oahu. Unfortunately, this communication was short lived but during the period of time it was in operation, the operators at Guam lived up to the best traditions of Navy Radiomen. Their operation was flawless, their sending good and not betraying in any way the strain under which they must have been working.

Wake stood up for a while after the attack and then suddenly went off the air. For approximately 48 hours, Wake would be called but there weren't any signals to be heard. Then like out of the night here came Wake Island. His NCL sounded like music and it continued to sound like music until within a few minutes of the actual fall of Wake Island. Much has been written about the bravery of those at Wake Island. This we know to be true but, from a communicator's point of view, not enough praise has been directed at Charlie Sargent, J. B. L. Anderson and the others who made up that typically good bunch of men. Their job, that of keeping the communication lines open was admirably performed. Many Japanese stations did their best to disrupt communications but thanks to the fine crew at Wake they were never fully successful. May the day be not far off when once again we may hear tiny Wake with her musical note.

To those of us at this Mid-Pacific outpost the loss of Guam and Wake were bitter pills. At the time of their fall, we were developing a great admiration for those on Corregidor. As the days grew into weeks and the weeks into months, this admiration grew by leaps and bounds. Every resource of this outpost was utilized to its utmost in granting Corregidor's every wish. His wish was our command and we endeavored to govern ourselves accordingly. Some of our brother communicators probably did not think well of us when we would suddenly appear on one of their assigned frequencies and endeavor to reestablish contact with NPO. This sort of procedure paid good dividends because between December 7th and the fall of Corregidor, communications with the Sixteenth Naval District were better than had ever been experienced before. To this end we made frequent but gradual shifts in frequency.

On the humorous side of the happenings on this circuit, there was one operator at Corregidor who would unwittingly cut us in on the fact that they were being bombed since he could not refrain from stopping such transmissions as might be in progress and make some very caustic comment about Japs in general. This he would send by hand and on such a transmission his dots and dashes really dripped with contempt. While this is not exactly in the category of being funny it never failed to sort of lift the tension. Another incident that showed Corregidor's opinion of themselves occurred one day about 0500ZED.

His signal suddenly dropped from five to two. His automatic transmission stopped and he sent by hand: "They just shot my antenna down but don't worry I'll be back." True to his word, he was again very much on the air in just a matter of minutes. This is only one instance. It was paralleled in a hundred different ways during those months of siege.

After the fall of Bataan we knew that stout hearted Corregidor was in for a hot time and finally their fatal day arrived. It all started about 1530ZED and terminated at 0240ZED the following day. During that period we watched them with everything we had. Communications were extremely difficult. We knew that they were being shelled in a most vicious and relentless manner. In spite of their difficulties, which must have been enormous, they still were level headed enough to send us a service message stating that certain numbers of ours were at that time undelivered but that they were still endeavoring to make delivery. This proves they were still on the job in spite of the confusion that undoubtedly reigned around them. Finally at 0240ZED they signed off the air, saying goodbye and good luck. This was signed by Callaghan and McCoy. To us it seemed our very world was crumpling. Operators who were naturally inclined on the tough side were observed to have the veil of a tear over each eye. Very little comment was made, but all that was made was indeed laudatory to our truly great shipmates who had been on Corregidor. When the chapters of History are written about the battling men of Corregidor, the Navy's communicators should rank right up alongside our great heroes of all time.

The Navy, and only the Navy, was able to have and to hold communications with the Philippines area until its capitulation. For this fact the Corregidor communicators were responsible. To them we say, not goodbye, but merely: "CUL CM."

To better serve in our little theater of War, circuits are now in operation to the South and Southwest from this point. Suffice to say we find our British friends a most reasonable group to work with although as a group of operators, they seem to lack the all around speed that is so characteristic of good U. S. Navy operators. They are learning fast and provided the "Demented Axes" can hold out long enough we believe we will have been partially responsible for developing some real speed merchant operators for the British Empire.

Our communications to and from the mainland have been most gratifying. We have encountered our little differences of opinion with both San Francisco and Washington but all in all we have only the best possible thoughts towards those stations. We are well aware that they have ample troubles of their own and we shall do our best to insure that we are not the cause of making them even greater. Communications, particularly on the 7th and 8th of December, were remarkable. San Francisco was cooperative to a point of practically bending over backwards. This was not overlooked on our part. Their good work was and is appreciated. Commendation for their part is due, especially in the early phases of this conflict.

With the Fleet, communications have on the whole been good. We are closely associated with a Fleet Commander. Our work with the communicators of this unit have been most admirable. Communication with various Fleet units have time and again proven that todays crop of Radiomen belong at the head of the class.

Only recently a unit of our Fleet suffered a bombing attack so intensive that the ship was a complete loss but the ship did not sink. In order to put out the necessary information so that at least some rescue of personnel might be made, the Radioman on this unit found himself confronted with a difficult situation. First he came up on the normal Ship-Shore frequencies. The Jap station at Saipan had him completely jammed. He then popped up on a circuit not normally used for Ship-Shore communications and broadcast his message. This message was copied by at least three stations on that circuit, namely NPU, VHC and NPM. The final analysis will undoubtedly prove that plain common sense on the part of this operator made it possible for many of his shipmates to be among the living today. The submarine men likewise have proven time and agin that they have what it takes. They always seem to be cool and in complete control of all their faculties.

Last but not least in our minds is all that has taken place right here. We are now located in the mountains on this Island of Oahu. This has not been an easy task to accomplish. When the attack came we came face to face with the full realization that the position of the Wailupe Control Station was a most precarious one. Immediate steps were taken to rectify this situation. For ten consecutive days the personnel attached to the control station were almost in a one section watch.

On the 17th of December 1941 full control was shifted to our new mountain home. This shift was made almost without the slightest interruption to communications. For this good work, the maintenance men at the Radio Stations at Lualualei and Wahiawa rate a "pat on the back."

In temporarily closing our memoirs of the moment, I would like to say that we are proud to be here, proud to be in a position to serve our shipmates both afloat and ashore. We are aware, fully aware, of the great military significance which is attached to this Island. To protect it, we will strive to remain constantly alert and always striving towards ideas of improvement. To you all, ALOHA.

* * * * * * * * * * * * * * * * *

We are grateful to Richard E. Tutt, RMC USN RET for donating this article to the Old Timer Communicators.

This is a copy of the watch list placed into effect on Sunday, December 7, 1941, immediately after the Japanese attacked Pearl Harbor and Oahu: See Appendix A-25 for a researched list of personnel on this watch list.

* * * * * * * * * * * * * * * * *

U. S. NAVAL RADIO STATION (CONTROL), WAILUPE, OAHU, TERRITORY OF OAHU

WATCH LIST EFFECTIVE IMMEDIATELY

	FIRST SECTION	SECOND SECTION
TRAFFIC CHIEFS	MORRIS - SMITH	NOONER - HAGLUND
SUPERVISORS	CLEMENS - REED	LOBDELL - McGUIRE
NPO	VERNON	OTT
NPG	RUDY	TRACEY
MUX	KEMPTON	STALEY
NPU	BAKER	ALVEY
2838-2902 ETC	CARROLL	TAYLOR
4205	DURFEE	IDLER
30.6	DILL	BOKEE
219	BEAN	TUTT
500	FEATHERS	CLINGAN
4235	FULLER	ALTERMATT
8470	BIGGERSTAFF	SERAFIN
12705	LESH	VERVA
16940	JACOB	SPAULDING
900	CRAMER	FEARS
4265	SCOTT	NELSON
WIRE	JOHNSON	JESSUP
WIREROOM	HILL	ACHESON
TELEPHONES	BOYER	GIVENS
DESK	McBRIDE	MADSEN
DIVERSITY	SNIDER	WALKER
FOX	DAWSON	SPIRO
FOX MONITOR	WILKINSON	DOYLE
450	STEINER	NASH
355	WOODS	LOWTHER

HEEL AND TOE / FIRST SECTION DAY WATCH 7th / EIGHT HOUR WATCHES

POWER HOUSE	WRIGHT	STCLAIR
PHONE DCO QUARTERS	HARLESS	HATCHER
MATERIEL GANG	YETTER - PALKO	HOWARD - PIERCE

GUARD DUTY MARKELOFF, MILBRADT, FITZPATRICK, THORPE, WALDEN, PANIKU, MEDIEROS, WARREN AND WATT

GALLEY GOODEN, KINSFATHER, MORAN AND JUSTIC

SICKBAY McELVEEN

C. A. PORTER, CRM

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Thanks to Richerd E. Tutt, RMC USN RET for donating a copy of this watch list to the OLD TIMER COMMUNICATORS.

Personal recollections of Ernest P. Briggs, LT USN RET

Here are my fond memories of the U. S. Naval Radio Station (T), Lualualai, Oahu, Territory of Hawaii:

In 1935 I received orders to report to the 14th Naval District for assignment. I reported to the High Power Radio Station at Pearl Harbor for further assignment. Eventually about twenty of us were shipped to the Naval Ammunition Depot for temporary quarters awaiting such time when our quarters would be available at Lualualei. We slept in the same barracks with the Marines in folding beds on a big lanai with plenty of room for everyone.

Soon we were joined by another group of radiomen and one machinists mate. Every morning an old Ford truck would pick us up and take us about a mile down the road to what was soon to be our new home, High Power Lualualei. These were depression years and the government had allotted WPA funds for the buildings. The only ones which had been completed were the Very Low Frequency Building, to house the TAW, and the Helix Building. The High Frequency Transmitter Building and the crews quarters were not yet available. The TAW antenna had been in place on the 600 foot towers but the design was wrong as they had fallen on a windy day. So there was much to be done.

We had the manpower but no leaders. Soon CRE McKay and J. T. Manry, our CRM in charge, arrived and work got underway. This part of Oahu apparently had been used only for cattle and was covered with rocks of all sizes and shapes. Every day for sometime the gang was clearing land. I had another gang of civilian workers digging holes for antenna poles and for concrete blocks to anchor the guy wires, etc. Soon our living quarters were completed and the gang moved in. I had a separate room with shower.

Now the High Frequency Building was completed and the High Power Pearl Harbor station started sending transmitters and motor-generators. We had our hands full, trying our best to keep up with the arrival of equipments. I had one excellent assistant in J. Bartko, who not only talked fast, he worked fast. I also had Cecil (Red) Connors, a good man with tools. We managed to get the equipment in fast.

In the meantime a gang worked outside putting up the antennas. Then came the transmission lines. In putting up the antennas, we developed three good climbers, namely Bean, Larson and Kendall. These three radiomen worked daily with their spurs and safety belts atop 80 or 110 foot poles in the blazing sun while I fed them wire or insulators. They did an excellent job. The antennas were laid out using RCA blueprints supplied by our Navy Yard engineer, Mr. Hubbard.

Personal recollections of Ernest P. Briggs, LT USN RET (continued):

Soon our transmitters were on the air. We used our TBC to NPG, the TAL for NPO, the 5 KW TAE for long distance ships at sea plus the usual TAD ship-shore traffic. At this time the TAW was nearing the testing stage and things were settling down to routine operations. Our CRE in charge at the HP Building was Mr. Zimmerman. At the TAW VLF Building, Mr. Reynolds, was the G. E. Engineer. Work was progressing with CRM William Waterous and his gang of radiomen doing most of the non-technical work. As they had many heavy pieces of equipment to handle, riggers from the Pearl Harbor Navy Yard were often brought in to assist. Not to forget our own rigger assigned to Lualualei, who was always on hand for tough jobs.

About this time there remained one little transmitter to be installed. It was a low power job used to communicate with ships of various types stationed at Pearl Harbor. When it was decommissioned and moved to Lualualei, the understanding had been that it would be modified to emit less interference from its own harmonics and poor keying before being returned to service. CRE Zimmerman assigned me as a working party of one to perform this task. I was happy to comply for, indeed, not many CRM's get the opportunity to have a baby of their own on the air. I had a high voltage generator plus four 50 watt triodes to start with. I picked the 4 element tube used in many Navy transmitters, capable of 75 to 100 watts of HF power. These would replace the 4 50 watt tubes used in the old hookup as push-pull oscillators. One little problem had to be solved. To prevent the filament of my tube from burning out due to its proximity to the plate voltage HF. Here I made use of the current issue of QST magazine which usually contains various low power transmitter hookups used by our radio hams. The filament voltage leads of insulated twisted wire were run inside the antenna loading coil and thus assumed the same HF voltage as the plate of the transmitting tube. It worked out OK and we gave birth to another transmitter. We used the screen voltage for keying - a vast improvement over the former plate keying.

Soon after this high in my career, my two years of shore duty expired and it was back to sea duty for me.

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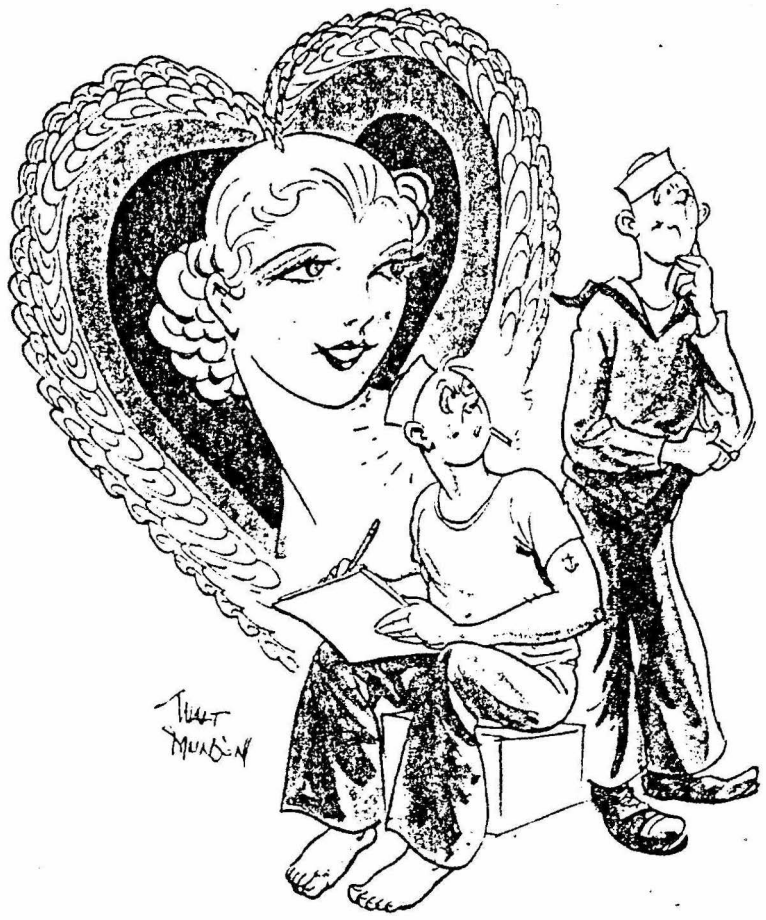


"I used to write to my girl every day ..... then she turned around and married the mailman!"

Lualualei

By JOHN BUNYAN ATKINS

THE Hawaiians tell us that the literal translation of Lualualei is two holes in the ground and a lei. Lua in the Hawaiian language stands for a hole in the ground and, as most sailormen know, lei is a wreath of flowers. Because of the difficulty of putting the e and the i in the proper place, navy men have followed the government's practice of abbreviating and have cut the name to three L's.

We have no leis at the future high power radio station, but we have plenty of holes, or luas. And radiomen are digging these luas while they make their home in the recently constructed million dollar barracks, situated in what was a cane field, thirty-five miles from Honolulu.

If anyone believes that radiomen are not jacks of all trades, he should pay a visit to Lualualei. Someone rushed out and built the barracks, housing for the transmitters that are to come, a house for the leading chief radioman and a house for the officer in charge; then the contractor packed his tool kit and went home. Radiomen were then transferred to their new station and told to make the best of it. Several men homeward bound from China were exiled on this Paradise of the Pacific and told to follow their noses to Lualualei.

The boys began first digging a hole for a swimming pool. They dug so well that the swimming pool was abandoned for the time being and the radiomen were put to digging holes for the poles which are to support the wires for the antenna system. Anyone who is not familiar with high power radio stations could not imagine that it would take so many poles to support the wires for the antenna.

The men are divided into gangs. One gang measures off the distance and marks the spot where the poles are to sit; another gang digs the holes. A radioman, sitting on a tractor, snakes the poles to the proper position. A Chief Machinist's Mate operates a crane to hoist the poles in place. It is simply marvelous the way an eighty-foot pole can be made to stand at attention, almost as quickly as one can say Jack Robinson.

There is another gang for the cement mixer, which is towed around the field by the tractor. One gang in a huge GMC truck keeps the cementers supplied with the stuff of which concrete is made, sand and cement. And, of course, the men must do the plumbing for the water to reach the concrete mixer.

Sans shirts and hats and with skins as brown as natives, the boys turn out at seven-thirty in the morning and labor until eleven-thirty when they rush to the barracks to consume much food. There are two cooks and they are good ones, which is one of the reasons that all men at Lualualei are contented and happy. The day ends at three-thirty and the fellows rush for the shower.

The officer in charge, Chief Radio Electrician Harold Osborne, and the leading chief radioman, John T. Manry, travel about the field in automobiles. A small truck is used to carry messages and supplies about the field and to carry water to the working men. There are no idlers. Even obese chief radiomen are reducing and becoming as nimble as boots at a training station.

The Naval Ammunition Depot, about a mile distant, makes the radio station a better place to live. We go there to the movies, barber shop and canteen. We also buy gasoline at cost for our private cars at the Ammunition Depot.

Married men stand in dread of this place, but the ones of us who are married have managed to find shacks within a decent distance of the station and, so far, there have been no requests for transfer. Rents are from twelve to twenty dollars a month for unfurnished houses, the only kind to be had. There is electricity but no gas. Kerosene oil stoves predominate for cooking, but one may have an electric stove if he wishes.

Schools for children are something else again. There is a grammar school, but no high school. Children of high school age must go all the thirty-five miles to Honolulu. Government conveyance is used for school children residing on the reservation.

Groceries are high in the local stores; so most of us do our shopping in Honolulu or at the Commissary in the Navy Yard. Milk and newspapers are delivered to our door. We observe Navy Yard schedule for work, leaving Saturday for going to the city. Those who do not have cars may go in the station truck.

Ex-farmers are exceptionally well satisfied here. They are reminded of home. The only difference between us and the early Americans, who pushed westward, is that we do not have to clear the ground. It is a real adventure into the wilderness. A couple of years hence we can sit back and take it easy and admire a job well done. Perhaps in that time another brain storm will have developed and another radio station will be planned. The men who have built this one will be well qualified to do the work and will probably prefer it to a battleship.

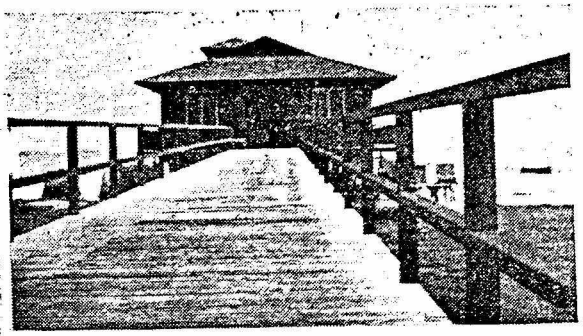
Naval Race Sure, Says Japanese Expert

Predicting battleships of 50,000 or even 60,000 tons with 18-inch guns Masahori Ito, Japanese Naval Expert, recently stated that a big naval race is inevitable, now that Japan has seen fit to withdraw from the London Conference and renounce existing naval treaties.

Mr. Ito, reiterating the Japanese demand for parity, lays the blame for disruption of treaties upon other signatory powers who refused to admit Japan's need for a Navy equally as strong as the naval establishments of Great Britain and the United States.

Meanwhile the British have announced a new building program calling for an immediate start on the construction of 11 super dreadnoughts, 36 cruisers, 120 destroyers, 30 submarines, and 3 aircraft carriers. 2,000 military airplanes will be

The Wailupe Warbler SES



OPERATING BUILDING, WAILUPE

"Before"

SOME HIGH PRICED HELP TURNING TO

Left to right: Shryack, MacDole, Baldy, Cameron, Mr. Bradley and an unidentified worker.

"After"

These photos pinpoint the year in which the "bridge over the water" to the operating building at Wailupe was dismantled and replaced with a concrete sidewalk.

H. O. (Tommy) Thompson, then a radioman at Wailupe, wrote a column, "The Wailupe Warbler Ses," for the Army and Navy Review from June 1933 to February 1934. Here is a quote from a portion of one of his columns:

"The board walk from the road to the radio operating building was getting old, so we tore it down, filled in with rocks, (big ones they were) and laid a cement sidewalk. The fill-in was about eight feet wide and two or three feet high. We hope it will withstand the assaults of high tides in the future. Just about all hands have done their share. The regular watch standers came in for a three hour working party in the morning of their 4 to midnight watches. Mr. Bradley and Kiepler, the "straw bosses," even had such high priced help turning-to on the job as Shryack, radioman first, MacDole, machinist's mate first, and Kahn, electrician's mate first. We didn't believe it, but Cameron, radioman first, was out there too. The picture by Johnson proves it."

From Tommy's column in August 1933 we learn the date when Heeia first went off the air:

"On June 24th the personnel at Heeia threw a luau to commemorate the decommissioning of that station. Ye Warbler was unlucky enough to have had the 4 to 12 watch and was unable to attend."

Personal recollections of Roy E. Brown, LT USN RET:

I received orders in 1931 for transfer to the 14th Naval District in Hawaii. I made the trip from the mainland on the USS HENDERSON, a Navy transport used to carry Navy passengers back and forth across the Pacific, and at times through the Panama Canal to the east coast.

Conditions on the HENDERSON were crowded. Joe Bridges and I avoided working details each morning. We usually sneaked away while they were mustering details and lay up on the spud locker munching on raw potatoes while watching others peeling the spuds for the meals. We washed our clothes and hung them over the railings. We slept in hammocks.

We arrived in Honolulu on 29 October 1931. I was assigned to the Naval Radio Receiving and Control Station at Wailupe, located between the outskirts of Honolulu and the southeastern tip of the island, called the "blow hole," where ocean waves splashed through a crevice in the lava or coral rocks.

My wife, Pat, arrived on the SS Lurline on the 18th of November. We had to pay for that trip as the Navy furnished transportation for the dependents of only the higher ratings in those days.

I was stationed there for the next two years, living with my wife in four different places in Kaimuki, about three miles from Wailupe, and then the last year in a shack in Waikiki where we exerpienced some of the happiest days of our lives, making many friends and having many interesting experiences.

While waiting for my wife to arrive, I lived in the single men's barracks. My first assignments were guard duty and mess cooking. Later I was put on the ship-shore circuit. The operating building was built out over the shallow bay with a walkway to the building. There were some receiving antennas there but the main ones were the diversity antennas on the hill in the back of the station.

I was studying for advancement to the next higher rating - radioman second class. I finally made it and got an increase of about $12 a month, which helped out a lot.

The Hawaiian Islands, being in a semi-tropical zone, had warm days but things cooled off in the evenings from the trade winds. Often times there were intermittent showers. One could walk on one side of the street and be dry while on the other side it would be raining. The fragrance of flowers pervaded the air. Shrubs and trees were luxuriant in many places, but I must have been allergic to some of the flowers as I did a lot of sneezing and coughing.

"Tony," a seaman who helped the truck driver pick up Navy commissary orders for the station mess and the married Chiefs who lived on the station, also stopped at the Army commissary and picked up dozens of loaves of Army baked bread. Those loaves cost us one cent per loaf. Later the price was increased to two cents a loaf. They were available to all married men living off the station. You may be sure that we took advantage of that offer!

We made friends with many of the radiomen, including Tom Donegan and his wife, Peggy. Tom had a car in which we were able to drive with him clear around the island. Coming back over the Pali, we saw where King Kamehameha pushed his enemy over the precipice and conquered the island.

We saw occasional mongooses (mongeese?) that ran across the roads. They were not native but had been brought in to keep the snakes down. I never saw any snakes. I suppose some cobras did make it ashore from the cargo ships. The mongooses became pests digging holes worse than ground squirrels do!

It was here that I built an amateur radio transmitter and obtained my first Ham license with the call of K6HBV, then later as a portable call of K6HJJ. Tom Donegan gave me some help. He also had an amateur station which was built by Harvey Cameron. His transmitter final was a pair of 45's in push pull which was self rectified and put out a signal which was quite raspy. Mine was a breadboard job with a Type 10 in the final called a "TNT" (Tuned-Not-Tuned), with an output of about 10 watts. The receiver was also home made.

I did very little operating from this place because of the limited space and too much foliage to put up much of an antenna. Mick, George and "Quick Trigger," also obtained Ham radio licenses. There were very few amateur stations in the Hawaiian Islands in the daytime on the 40 meter band. After sending out a CQ sometimes a response might be from a Japanese American. One time when I ventured up on 20 meters CW with a CQ I was called by a Chinese Hawaiian ham who, after a brief QSO, said: "This band is sure getting crowded!"

My wife, Pat, and I moved from Kaimuki to a shack on Saratoga Road in Waikiki close to the beach. It was across from Fort De Russey. It was quite convenient for us to go to the beach near the Moana and the Royal Hawaiian Hotels where we watched the tanned Kanaka beach boys ride their surf boards in the waves and sometimes see movie celebrities vacationing from the mainland. One time I took a picture of Clara Bow and Rex Bell. We enjoyed life, often times going down to the beach and lying in the sand, or swimming in the surf.

There were two or three other radiomen living at Waikiki, all on the same watch. Parks was the Chief of the watch. One of the radiomen, named Rider, had a car. We shared gasoline expenses and found that mode of transportation quite convenient.

There were huge house spiders, some as big as your hand, crawling over the walls and ceilings. We learned to ignore them even if they crawled over us while we were sleeping. We would sometimes find scorpions in our shoes or under the mattress of the bed. Centipedes were also common. None of these were poisonous. Giant cockroaches would run across the sidewalks at night. When we stepped on them real hard they would pop like firecrackers.

Several events occurred in 1933 worth mentioning. There was the earthquake in Long Beach, California. I happened to be on watch when the first news came in, exaggerated with the statement: "500 killed in Long Beach earthquake!"

Franklin D. Roosevelt was sworn in as President. He started doing many things to bring the country out of the depression. One of the things that hurt us most was a cut in military pay of 15%. That raised havoc with us. We were just barely getting along, paying our rent, buying food and trying to save some money for transportation of my wife back to the States. We did talk our landlord into reducing the rent!

In the latter part of October 1933, my wife, Pat, left for the mainland, using the money we had saved for the trip. I moved back into the barracks at Wailupe.

I continued standing watches in the radio room, gradually advancing to the faster circuits. From the ship-shore circuit I went to the Tutuila (NPU) circuit then to the Hypo-Prep intercept circuit with San Diego. This required copying NPL for 15 minutes, repeating that traffic back for 15 minutes, then transmitting our traffic for 15 minutes and listening to the repeat back from NPL for the final 15 minutes. I was getting along fine while transmitting my traffic. The Chief brought me a priority message. I speeded up to try to get it sent within the allotted 15 minutes, which extended the total time with the repeat back well beyond the normal 60 minutes. A priority message came through lifting me from the circuit. Apparently ships at sea were having trouble copying the increased speed. I was put back on the ship-shore circuit and reprimanded. It had one

constructive ending. The times were reduced on the Hypo-Prep circuit from 15 to 12 minutes for each transmission to take care of corrections and any other contingencies.

We had circuits to Cavite (NPO) in the Philippines and to San Francisco (NPG). The best operators manned those circuits. At times the circuit to Cavite required sending double (each word twice). Operators such as Mick Morrow, English and others could copy signals I could barely hear. When the signals were stronger, the transmitting speed was increased. The San Francisco circuit was a fast circuit. It was too fast for me where speed keys were used at speeds over 35 words per minute.

Some time in the latter part of 1933, the high speed Boehme tape transmission was introduced. There was a need for operators to learn to transcribe this new tape. Grant Horsley and Joe Ansak asked me if I wanted to try out on the San Francisco circuit. I was soon transcribing this new tape to their satisfaction so was taken off the lower speed circuits. During the night hours I would venture to copy the NPG manual circuit which greatly improved my speed.

There were some trial experiments with radio teletype but there were so many garbles and corrections that we all decided to stick with the Boehme tape transmission. The amplitude modulated signals just didn't work on radio teletype. I understand that later in the middle 1940's, when frequency shift keying was used, radio teletype became practical and Boehme became obsolete.

I gradually increased my receiving speed on tape reading and my manual speed on the radio circuits which went into my record and followed me the rest of my career as a radio operator in the Navy.

There were many scuttlebutt stories floating around the station. There was a small notion store alongside the station operated by a Japanese family named Kimura. The old Jap used to go out into the shallow water alongside the station at night with a row boat to catch shrimp, using lights to attract the fish and get them into his nets. We sometimes wondered if he was a spy contacting Jap ships off shore. One weird story told about his employment as the official hangman in the Oahu prison. Later he was supposed to have found someone in bed with his wife and he either shot her or the man. He was found guilty and hanged. Having a thick neck, he managed to survive although he was unconscious when they cut him down and was pronounced dead. When he recovered, he was set free. No one could provide any confirmation of that story.

There was another weird story about five radiomen who had explored an ancient burial ground up in back of the station. It was located in a cave. They brought back skulls which they used as souvenirs for ash trays and lamps. They were supposed to have had a "Kahuna" or bad luck spell put on them. I was told later they had all met disaster in various ways. I could never get verification of this. Al and I explored the area and found the same cave. It had remnants of a canoe, bones and other items. We decided not to remove anything for fear of bringing down another "Kahuna" on us. It may have been coincidence but something did happen to us. We borrowed a station boat and rowed it out in the shallow water. The water seemed smooth at the time but we drifted too close to the reef. A giant wave smashed the boat between two pinnacles of coral rock. One end of the boat was smashed and the patent anchor was missing. We swam with the boat back to the station and told our story. We received little sympathy and were told to replace the anchor. We finally went over to the Navy Yard and brought back a large anchor. It probably would have sunk the boat it it had been used!

Sometime later in November 1933, I received my orders for transfer back to the Fleet. I left on the USS Cuyama on 13 December 1933.

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