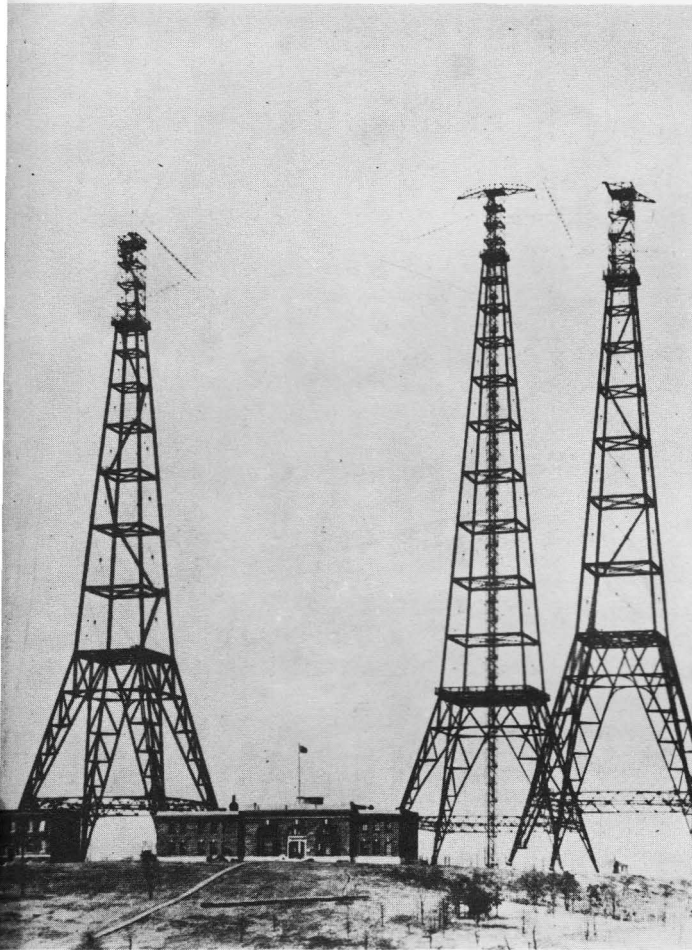


**1913** *Naval Radio Station at Arlington, Virginia*



**1963** *Navy's Moon Relay Transmitter "Dish" at Opana, Hawaii*



# MODERN NAVAL COMMUNICATIONS

**Rear Admiral Bernard F. Roeder**  
*Director of Naval Communications*

**50**  
**YEARS OF ACHIEVEMENT**





# MODERN NAVAL COMMUNICATIONS: 50 YEARS OF ACHIEVEMENT

By Rear Admiral Bernard F. Roeder, U.S. Navy  
Director, Naval Communications

The date of 13 December 1962 marked the 50th anniversary of the establishment, by a Navy General Order, of the United States Naval Radio Service — forerunner of our present Office of Naval Communications and Naval Communication System.

Significant anniversary dates are appropriate times for review and reflection. The fact that the Navy saw fit to establish a Radio Service as early as 1912 is indicative of the Navy's early, predominant, and still-continuing role in the development of radio communications equipment and techniques.

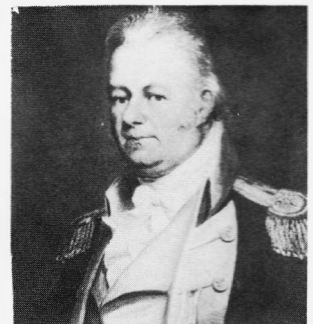
The Navy and Naval Communications have come a long way in those 50 years. It is axiomatic that a Navy which operates on a world-wide scale requires the services of a communications network that operates on a world-wide scale — to "pass the word" that makes command and control possible — and to assure that every mobile nerve center in the far-flung Fleet is responsive to the tactical and strategic needs and services of every other element. The 27 major shore stations in today's Naval Communication System form a global network that is the very backbone of Naval Communications, spreading their circuits wherever our mission requires.

Before we briefly trace the interlocking history of the Navy and modern radio communications, however, let me call attention to still another important anniversary — one that takes us back much farther in time, to the very beginnings of this great Nation and its great Navy and of U.S. Naval Communications.

The year 1962, itself now faded into the past, was the 165th year since the Truxtun Signal Book was published in 1797. As the first book of signals for use by the United States Fleet — and the first known publication

to be concerned with United States Naval Communications — this book may well be regarded as marking the beginning of present-day Naval Communications, and, therefore, of providing us with a legitimate anniversary that predates the other mentioned by 115 years.

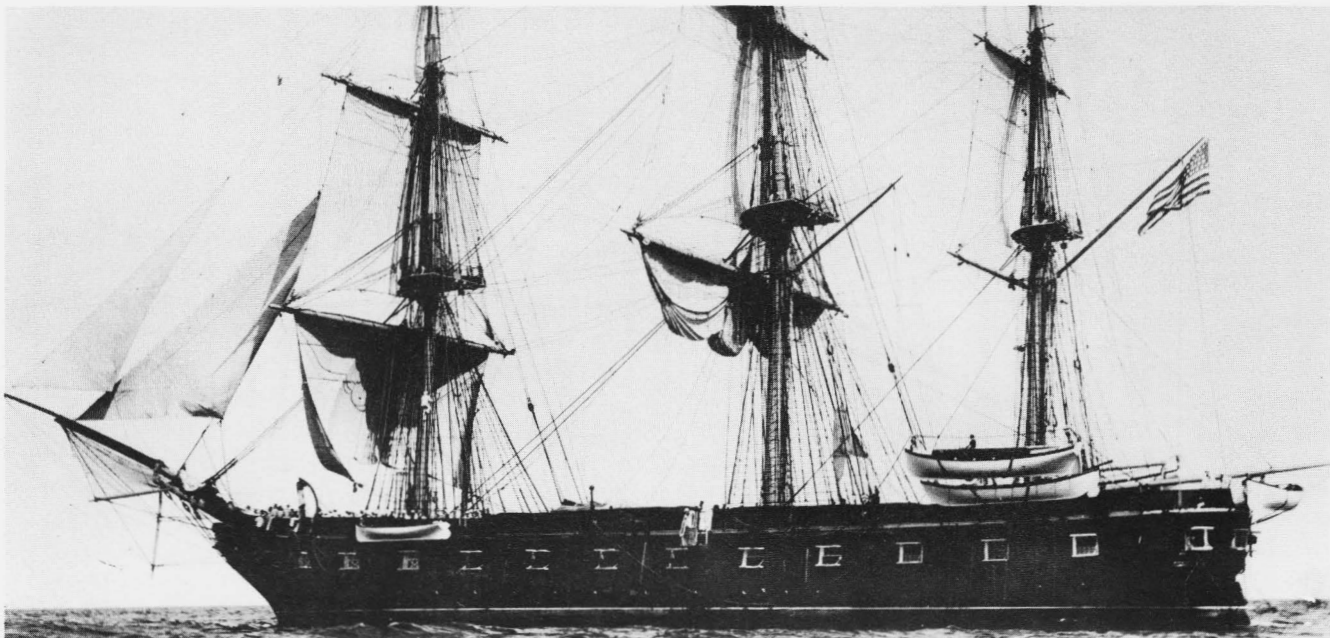
The book's author, Commodore Thomas Truxtun, was no dreamy idealist, but a practical seafaring man in every sense of the word. He was also a first-class fighting man. In the Revolutionary War, he commanded an armed private ship commissioned to sail against enemy ships. Later, after his appointment by President Washington as one of the first six Captains in our new Regular Navy, he sailed the famed U. S. Frigate CONSTELLATION to enduring glory in our undeclared sea war with France — successfully pitting his 38-gun frigate against the 44-gun INSURGENTE in 1799, and the 55-gun VENGEANCE in 1800 — actions that made the name of Commodore Truxtun a household word.



Commodore Thomas  
Truxtun (1755-1822).

Truxtun was also a firm believer in the time-honored adage that a Fleet fights best that can communicate. He said that coordinated ship movements, and the signals necessary to bring them about, were "the very sinews of marine duty." The Truxtun system included slightly less than 300 basic signals — requiring pennant displays in daylight hours, and lights, flashes from musket pans, and false fires at night.

(Reprinted from NAVAL COMMUNICATIONS BULLETIN No. 70, published in February, 1963)



U. S. Frigate CONSTELLATION.

The book was printed in Baltimore, Md., a full year before the Navy Department itself was officially established by Act of Congress. It was used — with later revisions incorporated — for the next 65 years. Today, Commodore Truxtun's own personal copy, with marginal notes in his handwriting, is the only known copy still in existence. It is a prized treasure at the Navy Department Library in Washington, and kept under lock and key in the Rare Books Section.

It is a far cry and a giant leap forward from the simple signals of Commodore Truxtun — "Father of Naval Communications" — to our present fast-moving technological era. But Naval Communications has made these seemingly impossible leaps — going from pennant hoists and carrier pigeons, to relaying messages back and forth between Washington and Hawaii by bouncing them off the moon — and flashing a radio message around the world in less than one-half of one second.

Even in 1912, the world of Naval Communications was already far different from the world Commodore Truxtun knew. In addition to setting up the Naval Radio Service, the Navy and its communicators were busy with such chores as sending a message from an airplane, flying at 300 feet, to a ship three nautical miles away — equipping a submarine to send and receive signals over a four-mile range to land — establishing Radio Re-

search Laboratories at the New York and the Washington Navy Yards — modernizing coastal wireless stations — and changing the names of these installations from "Wireless Stations" to the new term, "Radio Stations" — a term later used by the entire communications industry. The Navy, as you can see, strongly sensed that radio was here to stay. It might never replace baseball, the nickelodeon, or the novels of Harold Bell Wright — or even the carrier pigeon — but it did seem to have certain possibilities.

What had led to this happy partnership — the Navy and radio? The motivation was obvious. For centuries, the navies of the world had depended upon communications within visual range. With the coming of radio, the Navy reasoned that if this new means of communication proved feasible, these invisible waves could be made to penetrate darkness and fog — bridge vast distances — and be adapted and developed to bring about a new age in sea power, through maximum coordination in the movement and action of widely dispersed units.

The Navy, in fact, got into the game so early that Navy interest preceded that of the celebrated Marconi. Guglielmo Marconi was given his first patent for a wireless communications device in June 1896, at the age of 22. Almost eight years earlier — while Marconi was a teen-ager — an enterprising Navy



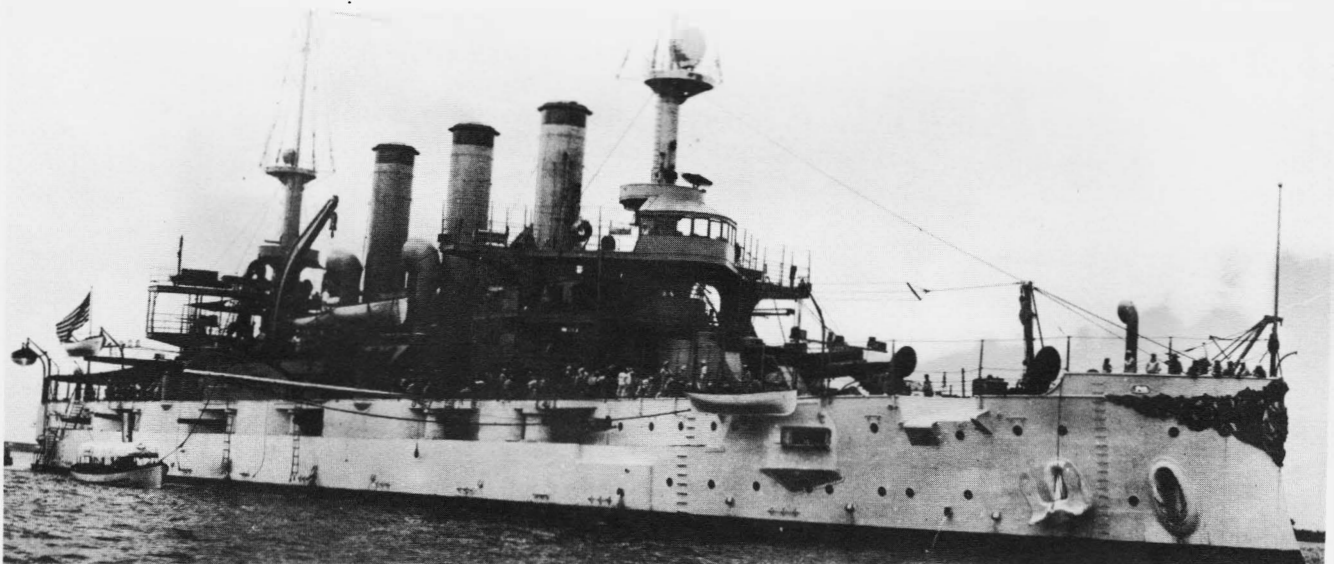
RADM Bradley  
A. Fiske, USN.

Lieutenant named Bradley A. Fiske — later a Rear Admiral — experimented with ship-to-shore wireless at the New York Navy Yard. The date was 31 August 1888. After wrapping insulated cable around both USS NEWARK and a Navy tug, LT Fiske sent interrupted current into NEWARK's coils and listened from the tug with a telephone receiver in series with the coil system. He reported: "I could get signals a short distance away."

When the first official U.S. Navy wireless telegraph message was sent on 30 September 1899, Marconi himself was the operator. The message went from the steamship CONCE (taking part in a naval parade to honor Admiral Dewey on his return from the Manila Bay victory) to the Navy's Highland Station on the Jersey Coast. That same year, the U.S. Navy invited Marconi to apply his new wireless telegraph system to three naval ships — NEW YORK, MASSACHUSETTS and PORTER.

U.S. Naval Radio began its period of rapid growth at the turn of the century. This growth rate may have been unprecedented — I know of none faster. By 1904, for example, 18 U.S. naval shore stations and 33 U.S. naval ships were radio equipped. By 1908, one half of the 387 wireless stations in the entire world were manned by United States naval personnel. That same year, when President Theodore Roosevelt sent the Great White Fleet around the world on an international good will mission, Dr. Lee De Forest — "the Father of Radio Broadcasting" — was on board the battleship CONNECTICUT, flagship of the Fleet. Employing equipment that made use of the new vacuum tubes, Dr. De Forest supervised one of the first successful tests of the wireless telephone between the CONNECTICUT and the Naval Radio Station at Point Loma, California. What we know as "radio broadcasting" — that is, the transmission of voice by radio — was in part being born.

In 1913, at Arlington, Virginia, the Navy commissioned the world's most powerful radio station, using the call letters NAA. NAA's signals were heard far out to sea and in Europe, where World War I broke out only a year later. World War I shrank the world, and before it ended, the Navy was operating the world's largest radio network. After we entered the war, the Navy's Radio Communications System handled not only the messages for U.S. naval forces at sea, but also those between the War Department and the American Expeditionary Forces in France. It was



USS CONNECTICUT (BB-19).



from the antennas (then called aerials) of the Naval Radio Station at New Brunswick, New Jersey, that President Wilson's historic "Fourteen Points" were transmitted from the United States to Germany.

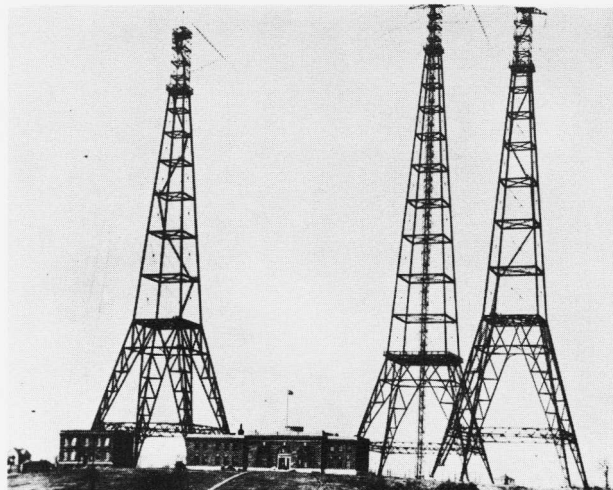
In 1919, the Navy was instrumental in helping to create the Radio Corporation of America — the first wholly U. S. owned commercial radio communications company. Foreign radio interests on U.S. soil were bought out and their radio operations in the United States were dissolved, correcting a situation unhealthy to national security.

In 1920, the Navy began scheduled broadcasting at NSF, Naval Air Station, Anacostia, Washington, D. C. — the first radio broadcasting station in the Nation's capital, and one of the first in the United States. At the Anacostia station, the Navy actually pioneered in the disc jockey field. The Navy's Anacostia station broadcast music from recordings, and received requests from listeners in 28 States — good coverage even for today.

In 1921, the Navy installed the first radio receiving set in the White House. The following year, the Navy was the first to broadcast the voice of a President of the United States — that of Warren G. Harding, during the dedication of the Lincoln Memorial in Washington.

In the early 1920's, Navy personnel were already investigating and testing radio facsimile equipment. In 1923, recognizable pictures of President Harding were transmitted by the Navy from Washington to Philadelphia. Twenty-two years later, photographs of the Japanese surrender ceremonies on board USS MISSOURI were transmitted by the Navy more than 5,000 miles to the United States and the Nation's press. Today, weather maps and other valuable pictorial data are transmitted thousands of miles for the benefit of Navy and public alike.

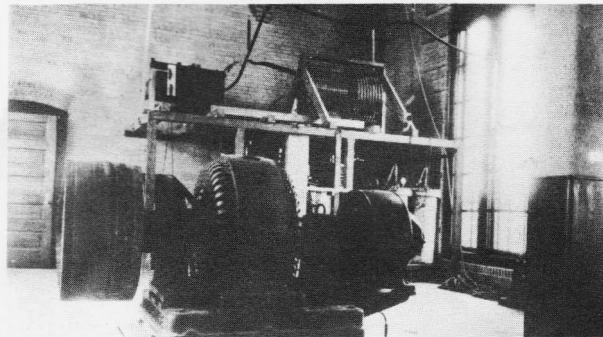
World War II made the world even smaller than did World War I. For Naval Communications, as for all military communications complexes, it was again a time of growth and expansion — spurred by the urgent necessities of a global war that pushed the development of circuits into systems and systems into world networks



Famous "Three Sisters" antennas of the Navy's historic radio station at Arlington, Va., built in 1912 and since decommissioned. The station was equipped with a 100-kilowatt spark transmitter (Fessenden type) and had a range of 3,000 miles. The station was known for many years as the "world's most powerful radio station."

— from rooms in the Pentagon to command posts in German castles.

New teletypewriter circuits were activated to link the East and West coasts of the United States. Then, the long jump to Hawaii and Pearl Harbor was made in 1945 with the opening of the first overseas radio-teletypewriter channel, and other overseas extensions followed to Guam, to Balboa, to the Canal Zone, to Adak, Alaska, and to San Juan, Puerto Rico — early moves along the long road that led to the present system which criss-crosses the continent and spans much of the globe. New relay equipment and increased circuit capacity enabled Navy circuits to clear a steadily rising volume of wartime traffic — swiftly, accurately and economically.



Motor and transmitter shown here were part of original installation at Navy's Arlington radio station, commissioned in 1913.



Messages feed into this automatic switching center at Naval Radio Station Cheltenham, Md., at the rate of 100 words per minute and move to outgoing lines for distribution at twice that speed.

At sea, tests of radioteletypewriter equipment were successfully conducted on board various Navy ships. After the landings on Leyte in the Philippines in 1944, a concerted effort was made to utilize radioteletypewriters in a shipboard environment — extending operational concepts first tested by the Navy as far back as the late 1920's. By 1947, the Navy was ready to establish its first radioteletypewriter broadcast to ships at sea.

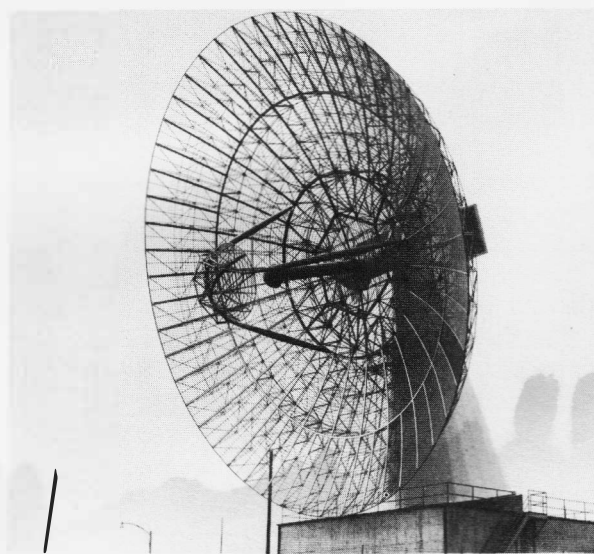
In 1945, at the height of World War II, there were more than 22,000 officers and 225,000 enlisted men in Naval Communications — or a total of about a quarter of a million in a Navy that then numbered 3,450,000 men.

In the early postwar years, Naval Communications faced many new operational requirements, and the necessity of surmounting problems of economy, personnel cuts, obsolete equipment, and ever-increasing traffic loads.

After critical studies, the decision was made to re-engineer the Naval Communication System within the continental United States, and install an Automatic Teletypewriter Switching System. The cutover to the 82B1 System was completed in 1959 with the addition of switching stations at Cheltenham, Maryland — Norfolk, Virginia — Stockton, California — and San Diego, California. The system serves a basic network of 236 stations in 103 U.S. cities, extending to

some 48,000 miles of circuitry. In addition, it connects 85 stations with the Trenton, New Jersey, switching center — inaugurated in 1958 — on a 5,000-mile semiautomatic network. From coastal locations, there is a tie-in to the Navy's overseas circuits to ships at sea and overseas naval commands — and to other Armed Forces systems. The network is flexible, expandable and reliable — and the speed of message delivery has been greatly increased through centralized control and relatively simple operations requiring minimum personnel.

Naval Communications has also made news in recent years by enlisting the aid of the least expensive communications relay satellite known to man — the moon. Experiments leading to the discovery that the moon can be used to relay radio signals began in 1951. Scientists from the Naval Research Laboratory, working with a huge dish antenna in Maryland, proved that the moon was comparatively smooth to radar waves, and therefore, usable as a natural relay station. The work continued. In July 1957, radar signals beamed from an Army installation in New Jersey were bounced off the moon and picked up by an NRL test facility in Maryland. By November 1959, moon relay communications were a practical reality. The first operational traffic was being sent by the Navy between Washington



In Navy's unique Moon Relay Communications system, this dish antenna at Wahiawa on Oahu Island is Hawaii receiver for messages bounced off the moon from transmitter at Annapolis, Md.

and Pearl Harbor — starting at a time when solar disturbances in the ionosphere disrupted conventional high frequency circuits between the two points. Not only messages, but facsimile photographs as well, can be sent by this method, and the quality of reception has improved steadily. In December 1961, the Navy conducted its first demonstration of shore-to-ship message traffic by moon relay, and in March 1962, a follow-up experiment showed the feasibility of ship-to-shore moon relay message transmissions.

In 1954, the Navy commissioned its radio transmitting station at Jim Creek Valley in the State of Washington. In June 1961,

of the Command Ship NORTHAMPTON, with its vast complex of communications equipment, as the official National Emergency Command Post Afloat.

The year 1962 brought many significant developments. The new Naval Communication Station now under construction in Spain was placed in development status by order of the Secretary of the Navy. The Navy's announced shipbuilding and conversion program for 1963 included conversion of USS WRIGHT (AVT-7) to a command ship with world-wide communications capabilities — and conversion of an ex-CVE 105 hull to a major communications relay ship (AGMR) to provide mobile communications for Navy

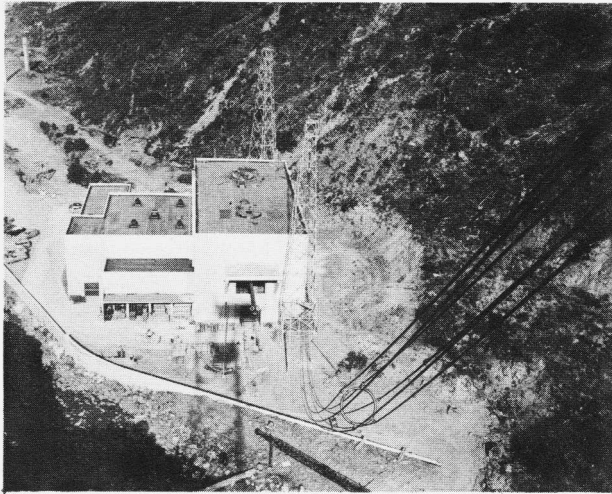


Interior view of USS NORTHAMPTON (CC-1) shows modern shipboard communications spaces.

the Naval Radio Station at Cutler, in the State of Maine, was dedicated as the Navy's — and the world's — most powerful radio station — an engineering and communications colossus. Radio Arlington's historic call letters — NAA — were assigned to Cutler. The Arlington station had been disestablished in 1956, after a good, long, serviceable life.

Other Naval Communications highlights during the 1950's and early 1960's have included the expansion of single sideband circuits and the installation of a militarized version of single sideband equipment in Navy ships — a demonstration of meteor burst communication techniques for ship-to-shore communications — expansion of the Naval Communication System in the Pacific Ocean area to meet requirements of the Pacific Missile Range — and the designation

operating forces. In April, NORTHAMPTON sent a message that circled the world by radio and arrived back on the ship in eight-tenths of a second — and in May, the PROVIDENCE (CLG-6), testing newly installed multi-channel teletypewriter equipment, bettered this record by sending a round-the-world message in less than five-tenths of a second. Construction was completed on a new Naval Radio Station at Tarlac, in the Philippines, and the station went on the air on 1 September. The Governments of the United States and the Commonwealth of Australia reached agreement on construction of a Naval Communication Station in Western Australia, and Congress appropriated money for preliminary work on the project, scheduled for completion in early 1966. Construction began on a Naval Radio Station with both transmitting and receiving facilities, in northern Scotland — a com-



Transmitter building at Naval Radio Station Jim Creek, Wash., during final stages of construction in 1953.

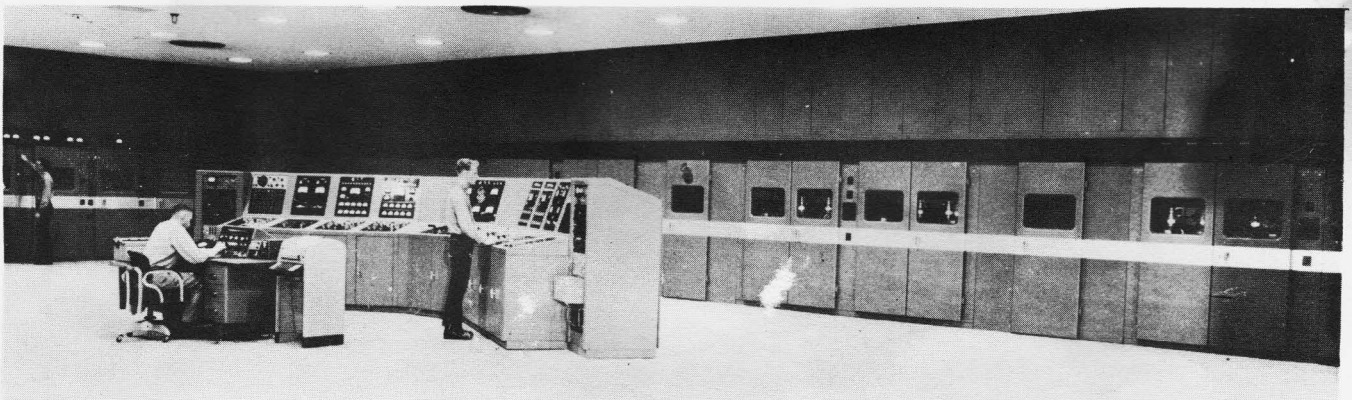
ponent of Naval Communication Station Londonderry, North Ireland. The Navy joined MARS — the Military Affiliate Radio System — with emphasis on training of amateur radio operators in Navy communications procedures, to provide a backlog of competent, Navy-affiliated operators for use in local disasters or a general emergency. Typhoon Karen caused extensive damage to Naval Communication Station Guam, and reconstruction began immediately. On 8 December, USNS KINGSPORT (T-AG-164), a satellite communications research and development ship — hailed as the forerunner of satellite communications ships for operational Fleet use — was commissioned at Philadelphia.

As we observe this 50th anniversary of the founding of the Naval Radio Service — and this 165th anniversary of the Navy's first primitive signaling system — the

importance and growth of U.S. sea power and of Naval Communications become vividly apparent.

Over the years and up to this very instant — new problems have arisen constantly. New action programs have been required. Existing programs have undergone expansion. From inception, Naval Communications has been subjected to vast, continuous change. This accounts for the significant progress made in Naval Communications against increasing demands on Naval Communicators, their time and their talents. Needless to say, the traditional dedication to duty among Naval Communicators is legendary in the Navy. This fact is a tribute to their esprit, ingenuity and resourcefulness, qualities that are inherent in the Naval Communicator.

Through the past 15 years of recurring challenge — climaxed by the most recent crisis, Cuba, — Naval Communicators have done their job with minimum fanfare. However, their efforts are known, and the Navy is grateful to each and every one of the officers, enlisted and civilian personnel whose untiring, unrelenting efforts give the Navy its vital voice. The Navy is proud of them and of their vital role in defense readiness and naval operations. In an age when trouble may emerge anywhere on the globe, the scope of Naval Communications looms ever larger as a major factor in the effective use of American sea power. As Naval Communicators pass the word throughout the world, they are bringing to bear the command and control coordination necessary to welding our fighting force for freedom.



Transmitter at NAVRADSTA (T) Cutler in Maine develops a continuous output power of more than two million watts.