

Diagram looking down upon NAA's dual array VLF antenna system. The system can be operated as two separate antennas or it may be combined into a single array. Each antenna is a base-fed monopole with a top hat for capacitance tuning.

POP'COMM Visits:

The World's Most Powerful Radio Transmitter

The U.S. Navy's Two-Million Watt Maine Monster Is Awesome!

BY TONY EARLL, KNY2AE

In a world filled with claims of "largest," "tallest," "longest," "strongest," "heaviest," and similar superlatives, it tends to become easy to begin taking adjectives with a blasé attitude. It isn't often that any of us ever come face-to-face with the persons or objects described as being "larger than life."

Within the world of communications, the U.S. Navy makes the claim that "the world's most powerful transmitter" is theirs. They say that it is used at their Naval Communication Unit, Cutler, Maine (near East Machias).

This station, which is known on the airwaves under the callsign NAA, certainly looks formidable enough to hold down at

least a dozen or so world class superlative titles.

Background

In the late 1940's, Naval planners realized the need for an extremely high-powered, low frequency transmitter located on the east coast for purposes of handling communications traffic to the North Atlantic and Arctic Oceans. Cutler, Maine (about the most north-easterly location in the United States) was selected, and in January of 1958, construction began. Three full years were required to erect this vital link in the Navy's worldwide chain of communica-

tions. NAA was formally commissioned as NAVCOMMU Cutler on 23 June 1961.

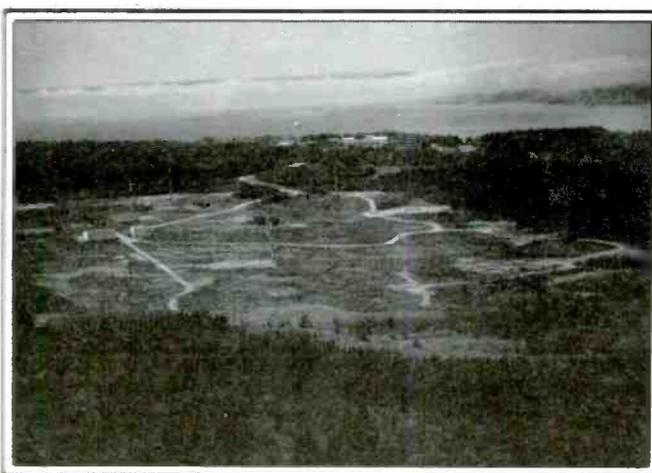
The mission of NAA is to provide a VLF communications link between high level command authority ashore and U.S. Navy ships, aircraft, and submarines operating in the northern latitudes. The station is staffed by both military and civilian personnel. High frequency transmission facilities also exist at this site.

Try This On For Size

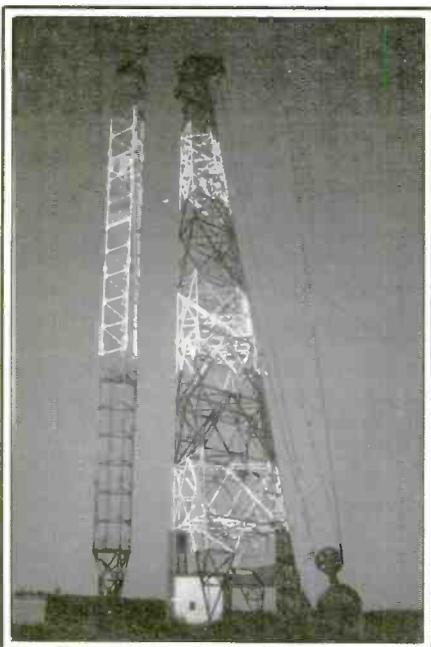
Several realities must be taken into account when visualizing the requirements of a station such as NAA. First, a truly massive



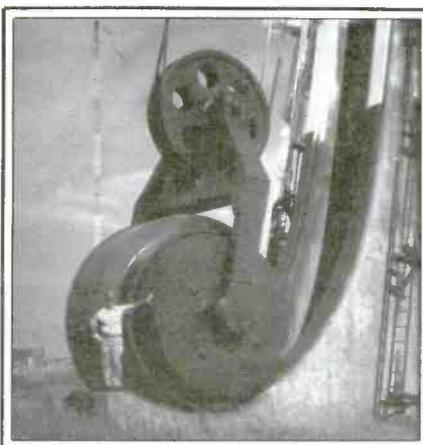
A bird's view of the VLF antenna farm. The towers range from 800 to 980 feet in height. To get an idea of the size of these arrays, realize that The Pentagon Building (in Washington) would easily fit between the center and outer towers of either of the two star-shaped antenna layouts.



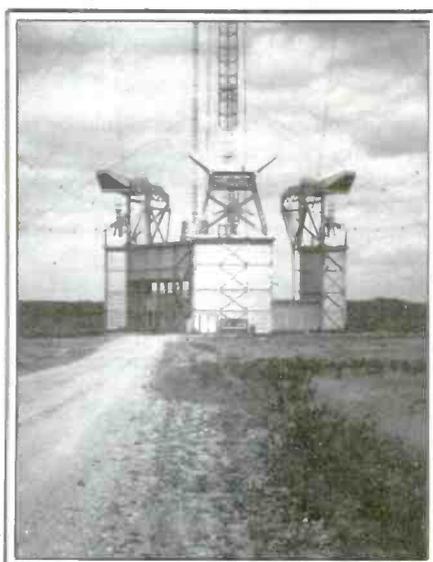
NAVCOMMU Cutler is also the site of HF transmitting facilities; here's the antenna system used for shortwave. The primary U.S. Navy HF transmitting site in the northeast provides fleet support for Naval Communication Area Master Station Atlantic (Norfolk), and to Commander, Patrol Wings Atlantic (Brunswick, Maine).



Two sets of towers (13 each) make up the antenna array. A center tower of 980 feet is ringed by six intermediate towers (875 ft. each) and six outer towers (800 ft. each). Smaller towers support the complex counterweight system. This is one of the counterweight towers.



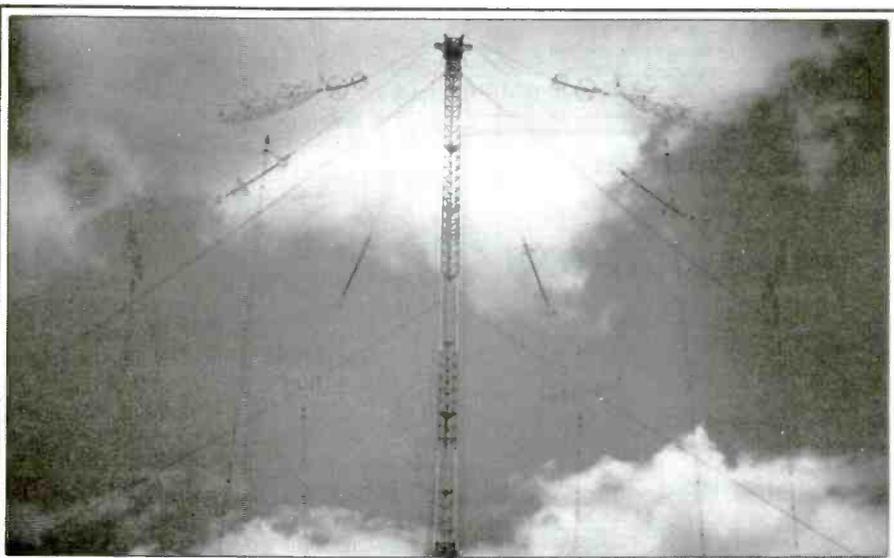
The counterweight's enormous size can be grasped only when you compare it to the man standing next to the drum. The drums are filled with 220 tons of dense concrete. During icy conditions, they are automatically pulled up the track to balance the excess weight on the antennas. The heavy steel cables required for this job are as thick as a man's wrist.



Each of two buildings houses an enormous electric coil called a helix. Rearrangement of the helix coil permits different VLF frequencies to be set.



The only station in the world using an AN/FRT-31 transmitter is NAVCOMMU Cutler. Here's how the massive control panel looks.



Atop each helix house is a 980 ft. tower, the main support tower for one of the antenna systems. At the highest point of this tower is the "top hat" capacitance tuner.



Ice guards are required throughout the system. These protect the helix houses from being damaged by icing.

antenna and ground system would be required to be efficient on the frequencies proposed (between 10 and 20 kHz). This system would have to be sturdy enough to stand up against the wind and ice of a severe Maine winter.

The enormous power levels would require the entire antenna tuning and radiating system to employ wires and cables capa-

ble of operating with superpower.

One doesn't go out and purchase a 2-million watt transmitter "off the shelf." A special transmitter would have to be designed and constructed for NAA. A power source would also have to be constructed because it isn't possible to run a 2-million watt transmitter by simply plugging it into a wall outlet and expecting the local power company to come up with the juice!

Meeting The Challenge

The challenge was met! A site at Cutler was selected. Cutler is a small village on the rocky coast of northern Maine. The NAA site is on a peninsula jutting out into the churning Atlantic Ocean. The Navy took over 3,000 acres of land there, establishing some twelve miles of roads.

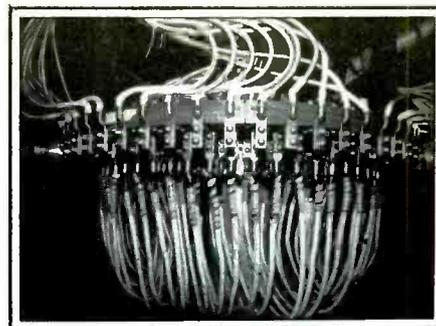
Twenty six antenna towers were built, each fully capable of withstanding winds of 150 knots. The towers are taller than Bunker Hill and the Washington Monument placed one atop the other. Building the towers required 15,000 tons of structural steel and 90,000 cubic yards of concrete.

The antenna's ground system required 2,000 miles of copper wire buried underground and in the ocean.

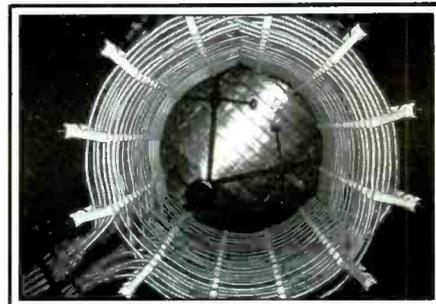
The antenna system itself needed 396,000 feet (75 miles) of 1" phosphorus bronze wire, kept under tension by 1,500,000 lbs. of counterweights.

In order to run NAA, a power system was built using a combination of four Cooper-Bessemer and other engines. This generates 15-million watts; that's sufficient to melt three inches of radial ice off the antenna!

The transmitter was built by Continental Electronics and dubbed the AN/FRT-31. It's the only one in the world. Some 2,200 miles of copper wire are required for transmitter grounding purposes. Power to operate the gigantic transmitter requires delivery of fuel oil via commercial tankers that pipe



This is the connector for tuning the vario-meter. It's located inside the helix house.



The transmitter tunes up by means of this huge helix coil. It's so large that a vehicle would fit through its core!

the fuel into a storage container holding 20,000 barrels of oil.

Getting Out

Needless to say, the signals from this rig can easily be heard throughout the station's primary service area. Indeed, NAA can be monitored throughout the world!

In addition to U.S. Navy units, NAA's signals have long been noted by the world's electronics enthusiasts. VLF signals also have other uses. For instance, POP'COMM reader Allen Linville (VE6BEQ) of Edmonton, Alberta, uses signals from NAA and other VLF stations in mineral exploration of the Canadian Arctic. These signals aid him in locating geophysical EM "conductors" that may (or may not) be mineralized.

Linville says that a small hand-held receiver is used to measure the in-phase and out-of-phase components of the EM field set up in the rocks by the primary field from the VLF transmitter. When the data are plotted of a map, (sometimes) a linear trend is noted. That is often the clue to the location of a future gold mine. The VLF frequencies are too high to penetrate the earth's crust to any depth, so the VLF receivers pick up shallow anomalies due to fractures, groundwater, changes in depth of non-conductive overburden, and also topography. Geologists will also be able to use the new ELF stations going on the air.

We present here a glimpse of NAA that few outsiders are given the chance to see, for which we are sincerely indebted to Lieut. J.S. Majka, Jr., USN, the Public Affairs Officer of NAVCOMMU Cutler.

Here's a station that's hard to view without experiencing awe.

PC

MISSING



NAME: Antonella Mattina DOB: 6/18/72. AGE: 13. EYES: Brown HAIR: Brown HEIGHT 5' WEIGHT: 90 lbs. DATE MISSING: 7/16/84. LAST SEEN: Flushing, Queens, NY

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