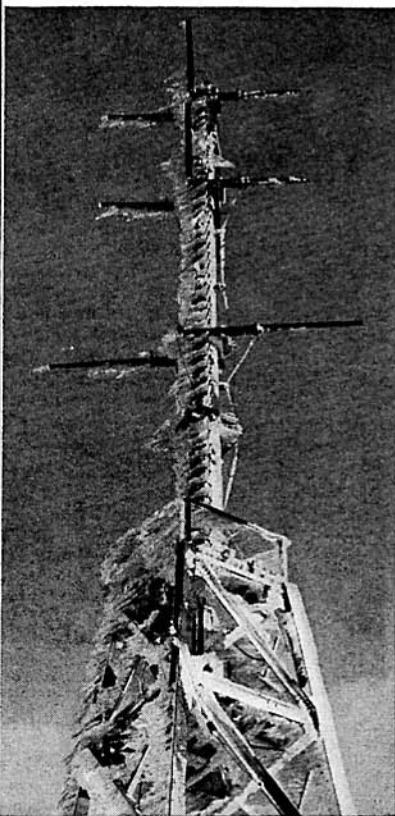


Mount Washington Highest FM Station

With tremendous winds sweeping its 100-foot tower and buildings Station W39B, located on the 6,288-foot mountain has a radius of 100 miles and reaches a potential "FM" audience of 2,000,000 people.

A. F. SISE

Member, Engineering Staff, Yankee Network



Left: Ice-covered mast of the Yankee Network's FM Station W39B, Mt. Washington. Tons of these ice feathers are continually forming on all exposed surfaces. Right: Another view of the antenna of W39B, Mt. Washington, showing peculiar auto-spring construction of antenna arms. They are constructed to stand the weights of tons of ice.

BACK in the fall of 1932, a little group of people gathered together around the old wood stove in the AMC Hut nestled in Pinkham Notch at the base of Mt. Washington, most lofty peak in New Hampshire's White Mountains. I was one of these five men, who were sitting in this isolated log cabin, listening to Joseph B. Dodge, Chief Hut-Master of the AMC (sometimes called The Old Man of the Mountains) tell of his idea of organizing a weather observatory to record the extremes of weather on the highest point of land in the Northeastern United States. We were all familiar enough with Mt. Washington to realize that even on a relatively good day in the valley below, the fiercest of storms might rage on the Mountain Slopes.

Accordingly, in October 1932, the Mt. Washington Observatory was born, under the leadership of Joe Dodge and with the active cooperation of Dr. C. F. Brooks of Harvard's Blue Hill Observatory, Mr. Henry Shaw of Exeter, Dr. G. W. Pickard of Seabrook Beach, and the N. H. Academy of Science. The old stage office building belonging to the Mt. Washington Summit Road Company was made over into suitable quarters for the Observatory. This building was anchored to the ground by means of chains to hold it against the tremendous

winds encountered. We all remember our first real storm of super-hurricane proportions and how the building swayed and tugged at the chains that held it captive.

After two months on Mt. Washington, I left this environment to go to Harvard's Blue Hill Observatory under Dr. C. F. Brooks, head of the Meteorological Department at Harvard and Dr. Pickard, to attempt to communicate with the Mt. Washington Observatory using the hitherto unexplored *ultra high frequencies* or very short radio wave-lengths. These waves were not supposed to travel beyond the horizon and one certainly cannot see Mt. Washington from the Summit of Blue Hill in Milton, Massachusetts. Imagine our surprise, when with a very rudimentary radio transmitter we were able to successfully communicate with Mt. Washington. Immediately improvements were made in the equipment used, and a permanent radio transmitter utilizing these very short waves was set up at Blue Hill. A third station was built in Dr. Pickard's residence at Seabrook Beach, N. H., another at the residence of Mr. Henry Shaw at Exeter, N. H. Immediately followed a series of experiments by this group of men, mostly in their spare time, as a hobby that was destined to play its own small part in introducing a fundamental change in the whole industry

of broadcasting. Everyone was surprised at the good reception obtained and the ease of communication. Signals from these transmitters did not fade out at the optical horizon, as was expected, but went much farther beyond.

Encouraged by this fact and foreseeing the great possibilities that lay ahead, Dr. Pickard suggested putting a small radio transmitter, utilizing these very short waves, in an automobile. This was done and many months were spent driving this car about Southern New Hampshire, Maine and Northern Massachusetts, talking most of the time that it was in motion, with Dr. Pickard, Mr. Shaw, The Mt. Washington Observatory and others. During this period Dr. Pickard displayed the most remarkable enthusiasm, which was quite contagious. His was the most inspiring sort of leadership. Night after night he would work with us until nearly sunrise, his enthusiasm, determination, always driving us on. His droll wit relieved the most trying moments. Many a night was spent on hill tops, talking with stations in the valley below.

It was during one of these trips that Mr. Paul de Mars, then Technical Director of the Yankee Network, spent a considerable period of time talking with the mobile car. Mr. de Mars was troubled with the problem of providing a better broadcasting service to the people of New England. Coupling a keen imagination with a gift for being able to foresee developments in the broadcasting industry long before many of its leaders, Mr. de Mars saw in these simple experiments the possibility of an answer to his problem. Accordingly, this work was carried on for some time by the Yankee Network under the direction of Mr. de Mars and Dr. Pickard.

A small radio transmitter using these very short waves was placed in a boat. This boat communicated with Dr. Pickard at his home, down by the waters' edge at Seabrook Beach, N. H. It then put out to sea sending out a radio signal that was recorded by Dr. Pickard. Over sea water it was easy to tell when the optical horizon was reached. There was no sudden change in the signal received after this point had been passed. In fact, the boat went many miles beyond this optical horizon and still maintained excellent communication with the shore station.

Encouraged by this experiment and foreseeing the great possibilities that might lie ahead, the Yankee Network installed a broadcasting transmitter utilizing these very short waves. This transmitter was located in the same building with WNAC and WAAB, Yankee owned stations at Squantum, Massachusetts. The transmitter was in operation for a period of years. During this time Yankee Engineers listened to these programs on receivers installed in their homes and in especially made sets installed in their cars. They finally came to the conclusion that utilization of these very short waves could never in itself solve the problems troubling the broadcasters. They solved some of these problems, did some wonderful things that they weren't sup-

posed to do, but nevertheless, the utilization of these waves under the existing method of broadcasting could never provide a better type of radio service to the public.

FM ATTRACTS OUR ATTENTION

Then, along came "Major", as he is endearingly called by his friends. Just at the time when it seemed as though these years of experimenting might be of no avail, or at least no use to us, Major Edwin H. Armstrong of Columbia University began to demonstrate to the radio art his new invention called "Frequency Modulation", or FM.

In 1935, Major Armstrong first presented a paper before the Institute of Radio Engineers describing his new miracle. The results he claimed from this new and fundamentally different type of radio transmission and reception seemed utterly impossible, fantastic. Imagine listening to a radio station seventy miles away, during a thunderstorm and enjoying crystal clear reception of the program. And doing all this on these very short waves where there was plenty of room for an almost unlimited number of stations. Well, it just seemed too good to be true.

Early in 1936 a group of three Yankee Engineers, Mr. de Mars, Mr. Irving Robinson, Chief Engineer, and myself, took a trip to New York City in order to see and hear for ourselves this remarkable new invention. This was indeed a dramatic occasion. Armstrong was the genius who had first invented the *regenerative circuit* during the early days of radio. With these thoughts in mind it was a most exciting and dramatic occasion when we were ushered by the Major into a small room with a perfectly normal, although large looking radio receiver in front of us. After a few words of explanation the receiver was turned on. Lo and behold utter silence! A most impressive absence of any sound. One could hear a pin drop. We thought the set had broken down, were about to say something, when startled by a strange voice in the room with us. It took some seconds to realize that this was FM in operation. The voice was not in the room with us, but was one of the Major's associates, Mr. C. R. Runyon, up in Yonkers, saying hello to us over the air. A few musical selections followed which were of truly unbelievable clarity, but they were unimportant. We were still recovering from our surprise at that initial silence and that first hello from the little man who wasn't there.

It did not take Mr. de Mars long to sell John Shepard 3rd, President of the Yankee Network, the idea that here was the answer to many of radio's most baffling problems. Here was the only manner by which a real improved radio service could be provided for the public. Therefore, in the spring of 1937, the Yankee Network embarked upon a program designed to provide this new FM Service to practically all of the rural sections of New England, as well as the more thickly populated urban centers. Our modest experiments of 1932-1933 suddenly took on a big league aspect.

This brings us right back to where we started, Mt. Washington. With height being a dominant factor in this new system of broadcasting, it was only natural that we should consider Mt. Washington.

It was estimated at the outset that some 2,000,000 people could be provided with a truly perfect interference-free radio service from this location. Most of these people could never have been provided with a really satisfactory radio service in any other manner as this is mostly a rural population spread over a large area. Certainly one of the most difficult problems we had to over-

come in order to build a station on this exposed peak, 6,288 ft. above sea level, was the weather. Mt. Washington has the most severe climatic conditions of any mountain, regardless of altitude, that has been visited by humans often enough to provide any sort of weather records. Mt. Washington has more severe weather than mountains in Arctic, Spitzbergen, other higher mountains in the Alps, or even Admiral Byrd's Little America in the Antarctic. The world's maximum wind velocity was recorded on Mt. Washington during April 1934, officially clocked by the Observatory at 231 miles per hour. We have seen ice and rime formations build out from exposed objects to a length of eight feet or more, giving all structures on the summit a most weird appearance.

It was at this bleak and inhospitable Arctic outpost that the Yankee Network dared to spend \$35,000 in 1937, in the belief that FM held the key to the future of radio broadcasting. An FM station was not built immediately, but during the summer and fall of 1937 the experimental broadcasting station at Squantum, which operated on the same short waves that FM would use, was moved to the summit of Mt. Washington. Space was rented in the Mt. Washington Observatory's brand new building in order to house this transmitter and its operators. Land was leased from the Mt. Washington Railway Company who own the summit of the Mountain, and the erection of an antenna tower was commenced. This tower was to be 100 ft. high and had to be especially designed and braced to withstand the super-tornado winds.

And so, radio Station WIXER went on the air during the fall of 1937, with 500 watts power and a temporary antenna. This station was used during the winter of 1937-'38, and the early part of 1939, to transmit weather reports from the Summit of Mt. Washington to the Yankee Network Studios in Boston, Massachusetts. It also

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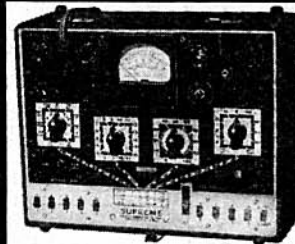
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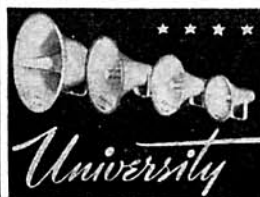
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provided the long sought opportunity to observe how an FM Station using the same wave-lengths might be expected to perform from the same location. In addition, it provided an opportunity to experiment with different forms of antennas under unusually severe conditions. No one had ever con-

structed a radio station in such a severe climate before, and no one knew just what kind of a transmitting antenna system to build.

During the summer of 1938, the remainder of the weird antenna tower on Mt. Washington took form. Instead of wires for an aerial, the heaviest-duty truck springs were used. Eight of these springs weighing 360 pounds apiece were mounted on the gigantic steel pole which rises 50 ft. above the fabricated four leg steel tower. These springs were chosen as the best available mechanical contrivance that would have the necessary electrical properties of a transmitting aerial and at the same time would have a chance of surviving Mt. Washington's climate.

During 1938-1939 and 1940 the development of FM was rapid. However in 1940 the plan evolved by Yankee in 1937, for eventually providing all New England with an interference-free radio service by means of FM, entered its second phase, the construction of an FM Broadcasting Station on Mt. Washington.

In spite of all the obstacles Yankee's FM Station W39B went on the air from the top of storm swept Mt. Washington on December 18, 1940, with a regular broadcast program. This completed the first step of the second phase of Yankee's FM program in New England.

At the time of this writing the new transmitter building is all closed in against the weather. It contains four double bedrooms, office, bath, flush toilets and two lavatories on the second floor, livingroom, dining room, and modern kitchen on the first floor. In addition to this, in another wing on the

first floor there is a public lobby and observation corridor, where one may view the transmitter in operation.

W39B is now operating from its temporary home in the Observatory Building, using a temporary power of one thousand watts. The broadcasting day begins at 6:00 AM and continues until 12:00 midnight on week days. Sundays it goes on the air two hours later. The program is picked up from W43B at Boston, by means of FM and is rebroadcast over W39B Mt. Washington, for use in Northern New England. By mid-winter W39B should be operating from its new home with a substantial increase in power.

The first year of operation of W39B has been very gratifying. Continuous rebroadcasting of programs originating in Boston, with such clarity that they are impossible to tell from the original broadcast, has become an accomplished fact. Enthusiastic letters have been received from listeners throughout New England, some from surprisingly distant points. These letters show an appreciation of the better type of radio service available through FM. Yankee Engineers have listened in at most of the cities and towns within the estimated service area. Reception has been as good as, or better than expected even, in many unfavorably located areas. With the new higher power transmitter installed this winter, everyone living within an air line distance of 100 miles from Mt. Washington—and many people at much greater distances, should be able to enjoy that clear, interference-free reception, that only FM can give.

Did YOU Buy that DEFENSE BOND Yet?

See page 390

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What Radio Leaders Think About "FM"

(Continued from page 393)

two-way radio system was required. But ordinary radio communication could not pierce the shield of static set up by the roaring Diesel powered generators in the locomotives. A few years ago the problem would not have been possible of solution, but today FM came to the rescue.

No static—whether caused by violent electrical storms, high tension power lines or electrical machinery can affect the reception of an FM broadcast. And, so, over the roar of the exhaust of the powerful Diesel engines, unaffected by the whirling generator located only a few feet from the receiving set, the messages from the control room reach the engineers in their cabs—simplifying and speeding this vital segment of national defense production.

Our own FM station, W51C, here in Chicago, will round out two years of continuous broadcasting early in February. Recently we increased our power to a full 50,000 watts and now serve the entire greater Chicago area.

FM IS A "SURE-THING" BET

... SAYS G. V. ROCKEY,

Vice Pres. Meissner Mfg. Co.

IF 1941 can be employed as a yardstick with which to measure the future popularity of FM, a prediction would fall in the same category as "betting on a sure thing"! The spectators, who witnessed '41 activity from a ring-side vantage point, require no additional proof that FM is standing on its own two feet and winning universal acceptance.

Sales statistics for 1941 might be introduced at this point as positive evidence that FM has been accepted with open arms by a "completely sold" radio public. It would be simple to observe the past sales record and to indicate how many hundred percent FM sales PROGRESSIVELY INCREASED from month to month during the past year. Although the sales record of the industry offers proof in abundance that FM is established on a foundation of complete solidity, with its future status definitely assured, I can vision the reaction of a statistically burdened public to "another flock of figures"! Without apology, our sales record will not be introduced in this report.

The future status of FM, from the standpoint of civilian use, will necessarily be affected by our war program. For the duration, little time can be spent in engineering, manufacturing and marketing radio receivers for civilian use. It is only logical and reasonable for the entire radio manufacturing industry to accept with pride, a well-deserved commission in the war program; a service commission to build the specialized equipment required by the Army, Navy, Marine and Air Corps. This is not a part time job! It must necessarily be an "all out" duty that will last for the duration.

Happily this war, like all wars, must end. Victory in war will introduce a future wherein civilian radio production can and will be resumed with a BANG! FM will not be compelled to search for friends and acceptance at that time. The countless thousands who daily enjoy FM, ("Radio Reception at its Best"), will maintain public interest at its present high level throughout the war period. Yes, we at Meissner believe in the future of FM.