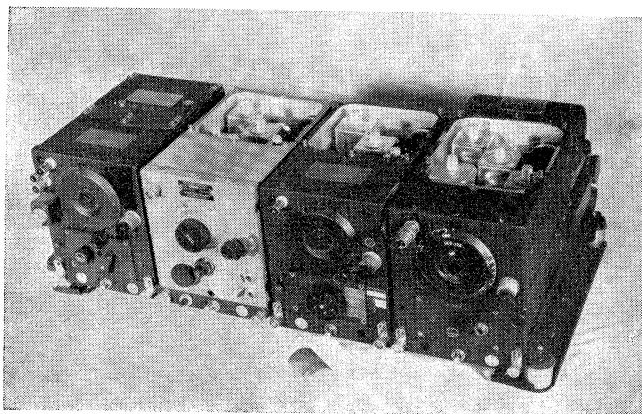


# The



## Command Set Story

BY GORDON ELIOT WHITE\*

*If one could count the number of command sets in use by the amateur or the number and types scavenged for parts, one would begin to realize the impact they have had on amateur radio. It seems only fitting that we should know something about the history of this equipment. Covered below are the three stages of development for the command sets, pre-war, WW II and post war.*

**W**HEN the Type K Command equipment was first conceived, in 1934, very high frequencies were generally unknown and untested for communications. Despite advances in frequencies above 30 megacycles, it was not until the British proved that the u.h.f. region above 100 mc provided excellent voice channels for aerial combat that the U.S. armed forces took an interest in the shorter wavelengths. The result, in 1940, was a rush by this country to get equipment which would operate in the 100-156 mc area.

Both the Army and the Navy had just emerged from a frustrating process of choosing a new combat aircraft radio set for the lower frequencies. The Army Air Corps in particular had made several false starts, and finally had been forced, in June, 1940, to procure the Type K design built to Navy specifications, in order to equip the 50,000 plane force proposed by President Franklin Roosevelt in May of that year.

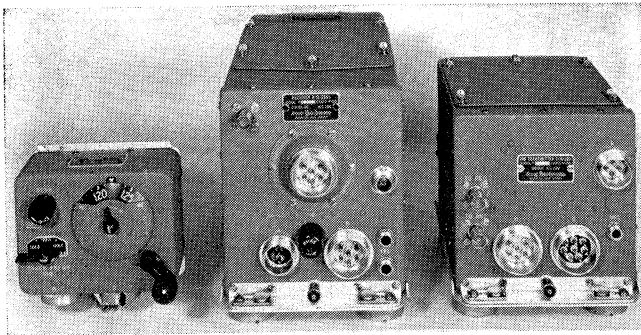
The Type K equipment had been designed in 1936 and 1937. It was to be manufactured for the Army as SCR-274-N, and for the Navy as

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RAT, RAT-1, RAV, ATA/ARA, and AN/ARC-5, in larger quantities than any other military radio ever made. At least 1,450,000 receivers and transmitters were eventually produced before the war ended in 1945.

The entire story of the Command Sets, and how tiny Aircraft Radio Corporation, in Boonton, New Jersey, with a handful of engineers, won design competitions against the giants of the U.S. electronics industry, is much too long to be told in a single magazine article; much of it is covered by long-obsolete but still effective security restrictions, or is hidden deep in the trivia of War Department contract files.

Briefly, the Command Sets were the creation of Dr. Frederick H. Drake, chief designer at Aircraft Radio Corporation. He apparently conceived the idea of independent, miniaturized, modular, plug-in transmitters and superheterodyne receivers during the winter of 1934. The Army had been ordered by F.D.R. to fly the Air Mail, a task which it was not equipped to handle. Bad weather, complicated by communications failures, killed 11 pilots in six weeks. The standard combat aircraft radio in



Model XRAV receiving equipment designed for installation aboard a Navy Patrol plane.

the Army Air Corps was the Aircraft Radio Corporation SCR-183. The Navy was using an almost identical A.R.C. set, the GF/RU. Neither was designed for long range communication or navigation. Both were TRF types.

With the advice of a few Navy friends, and a circle of Air Corps cronies that included Carl Spaatz and Hap Arnold (but no federal money) A.R.C. worked out the complete "channel" receiver design in 1935 and 1936. In 1937, Dr. Atherton Noyes was brought from General Radio to design the transmitters.

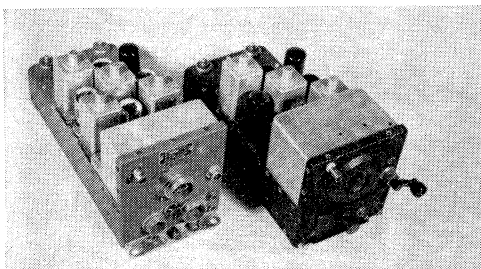
The design established a number of firsts: It was the first superheterodyne receiver to be standardized and widely used in U.S. combat aircraft.

It was the first truly miniaturized military electronic equipment, much smaller than the Model D (SCR-183/GF-RU), and one of the first to use modular, plug-in components. Dr. Drake, Paul O. Farnham, John Johanson, A. W. Parkes Jr., and A.R.C. President Dr. Lewis Hull all worked on the set.

### Testing

After 1937, the next five years were spent in testing, improving, and selling the set to the military.

The Navy tested a prototype in 1939, and immediately bought production models starting with RAT (13.5-20 and 20-27 mc receivers) followed by RAV (eight receivers from 190 kc to 27 mc) RAT-1 (24-volt version of the RAT) and ordered the GT/RBD set of receivers and transmitters in June, 1940.



On the left is a post-war v.h.f. Command receiver. Note the smaller tuning capacitor shield and the four 15 mc i.f. transformers. On the right, for comparison, is the familiar R26/ARC-5 (3-6 mc) receiver with three 1415 kc i.f. transformers.

The Army, after suffering a failure in its new crystal-controlled SCR-240 design, tested the type T, but put it aside in 1940 for competitive bidding on command set specifications. Under the urgency of F.D.R.'s 50,000 plane air force, announced in May, 1940, the Air Corps turned to A.R.C. in June, buying the design under the Navy specification, as the SCR-274-N. (The N stood for Navy.)

The British had proved the utility of very high frequencies (known then as ultra high frequency) above 100 mc, in the Battle of Britain, in 1940. The U.S. military then took new notice of the v.h.f. bands, which had been used, until then, only experimentally, although the C.A.A. had been trying v.h.f. for airport control tower use.

Contracts were let early in March, 1941 for v.h.f. experimentation to Western Electric, which had taken over the Army's production of the A.R.C. SCR-274-N, for a v.h.f. component for the command set. The specifications stipulated that the receivers and transmitters fit the SCR-274-N racks, and be compatible with the existing command system, and to use no crystals. Frequencies were to cover the 100-156 mc band.

Western brought in a sub-contractor, Colonial Radio (later Sylvania) for SCR-274-N production, and both companies worked on the v.h.f. design along different, but parallel, lines.

### Crystal Control

Bendix Radio was given, at British insistence, a contract to copy the Royal Air Force v.h.f. set. Under extreme secrecy the Bendix Company copied and improved the British design, producing it eventually as a 4 channel crystal-controlled transceiver covering 100-156 mc, under nomenclature SCR-522. The first units went into combat planes in mid-1942.

Bendix also was given a contract to design a v.h.f. set for the SCR-274-N equipment, using frequency synthesis to get multiple crystal-controlled channels with only two or three crystals, since crystals were in extremely short supply.

Fairchild was given a v.h.f. design contract, in July '41, for a non-crystal transceiver.

At Aircraft Radio, production of the early SCR-274-N sets, and conversion to the Navy ATA/ARA, absorbed the energies of the handful of design engineers. Stromberg Carlson, in Rochester, N.Y., was also set up for ATA/ARA

