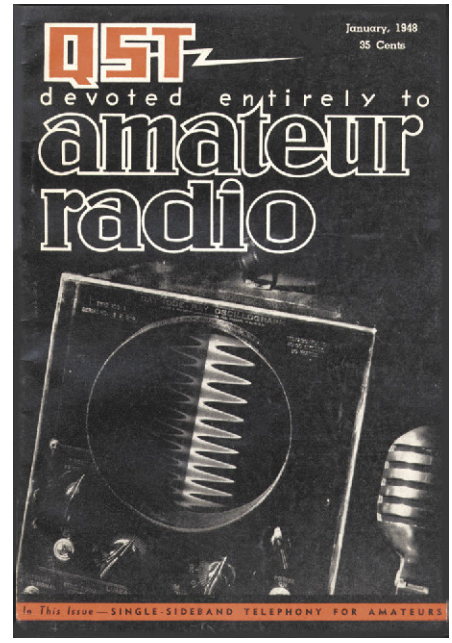
By Gil McElroy, VE3PKD

Amateur Radio and the Rise of SSB

The hams who were first to get on the air with single sideband created a revolution in Amateur Radio. Along the way, sideband would even affect the course of the Cold War.



The cover of the January 1948 issue of *QST* was, well, different. An oscilloscope was pictured, and though it was a piece of equipment few hams owned or were familiar with at the time, that wasn't what made the cover so unusual. Rather, it was the strange-looking modulated wave envelope displayed on its CRT screen. Or actually, only one side of the modulated wave envelope. Normally symmetrical about one axis, the envelope was missing one entire half. What was this all about?

Inside the issue, there was no "On The Cover" to explain the picture. Rather, there were an editorial and three articles all devoted to introducing hams to the arcane subject of "s.s.s.c."—single-sideband, suppressed carrier. The articles also discussed the messy state of the ham bands, clogged as they were with frequency-hogging AM signals often interfering with one another. "In the usual present-day snarl of 'phone interference," *QST* editorialized, "we have the piercing shrieks of heterodynes." It went so far as to predict boldly that "everything points to s.s.s.c. becoming the accepted amateur method in the near future." The three articles that appeared in the issue laid the groundwork for the transformation of Amateur Radio that was to come over the next quarter-century. For most hams, the strange-looking oscilloscope pattern on the cover was to be their first introduction to what would eventually come to be simply called "sideband" or "SSB."

Enormous Impact

If there has been a technical advancement that distinguished ham radio over the past half-century, it would have to be single sideband. The move from AM to SSB would be as controversial in its time as the move from spark to CW had been in the 1920s. Sideband's impact has been enormous and the changes it has created in Amateur Radio far-reaching. It is ubiquitous today, a standard feature on virtually every commercially produced piece of amateur equipment. And it isn't simply useful for voice communication; sideband technology is employed in computer modems, and vestigial sideband (VSB) has been developed for use in digital television.

The existence of sidebands as distinct from a carrier was first determined mathematically in 1914. A year later, John R. Carson, an engineer working for AT&T, invented sideband technology for use in long distance telephone carrier circuits as a means of increasing the number of calls that could be transmitted simultaneously. Carson's invention, which involved the use of filters to remove a carrier and one sideband while passing the other through, was patented in England that same year, but court litigation held up his US patent until 1923. In January of that year, the first experimental one-way transatlantic single sideband transmissions were made from Long Island, New York, to London, England. In 1927 a regular two-way transatlantic low-frequency radiotelephone circuit using sideband technology opened for commercial use at a cost of $75 for a three-minute call (that's about $760 in today's money!).

It wouldn't take hams long to take note of this new technology. A series of three articles on sideband by Robert Moore, W6DEI, appeared in the Amateur Radio magazine *R/9* in 1933 and 1934, and *QST* Technical Editor James Lamb, W1CEI, published the magazine's first article on the subject, "Background for Single-Side-Band 'Phone" in October 1935. An

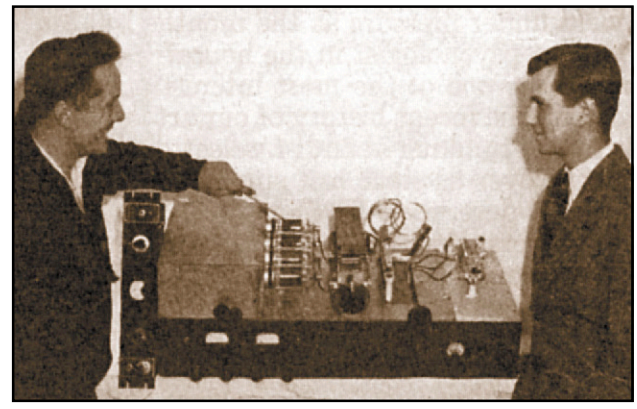


Figure 1—This photo, from the February 1948 issue of *QST*, was captioned: "Although full technical information on the single-sideband suppressed-carrier transmitter at W6YX is not available at this time, this photograph shows Dave Thomson, W6VQB, pointing out the final amplifier to Robert D. Smith, W6QUW, president of the Stanford Radio Club… The transmitter was designed by Oswald G. Villard, Jr, W6QYT, of the electrical engineering faculty at Stanford University."

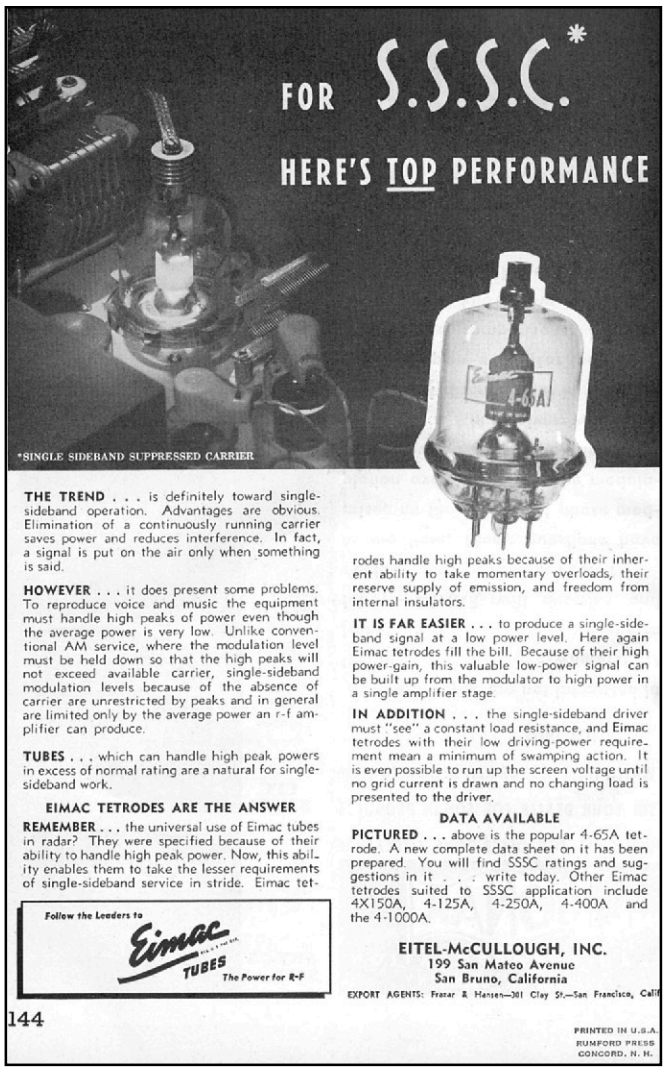


Figure 2—This full-page ad for Eimac tubes, published in the July 1948 issue of *QST*, touts the advantages of SSSC.

Figure 3—This ad, for Eldico, features the company's new 7-tube, 5-W sideband rig. "Everyone can now enjoy all the benefits of single sideband transmission," the ad proclaims.

editorial introduction to his article noted that by "action of the 1933 A.R.R.L. Board Meeting, the technical staff of *QST* was instructed to investigate the feasibility of single-side-band carrierless 'phone transmission on amateur frequencies." Some sideband experimentation was carried out in the mid-1930s by a small group of hams,[1] but it was hampered by technological limitations of equipment at the time. World War II changed all of that, making enormous advances in radio technology. After hostilities ended and Amateur Radio resumed, there was no longer any technological reason for sideband to stay on the sidelines and a very pressing need for a communications mode that would occupy less bandwidth than did AM and so free up space on ham frequencies. Sideband was exactly what the doctor ordered, and a concerted push by the ARRL would effectively spread the word, altering the course of ham radio.

W6QYT at Stanford

It was experimental sideband work begun in 1947 on the 75 and 20 meter bands at W6YX, the Stanford Radio Club at Stanford University in California[2] that inspired the series of January 1948 articles in *QST*. In the issue, Assistant Technical Editor Byron Goodman, W1DX, described this new mode of communicating in "What Is Single-Sideband Telephony?" In addition, Oswald Villard, W6QYT, of Stanford, explained the results of his club's test transmissions and informed hams how to go about tuning in these new signals ("it is very desirable to use the minimum r.f. gain setting when the b.f.o. is used for demodulation," he would write, advice repeated through many issues of *QST* for hams unaccustomed to tuning in these strange-sounding signals). Finally, Art Nichols, WØTQK, detailed the sideband rig he built to communicate with W6YX in "A Single-Sideband Transmitter for Amateur Operation." A follow-up Stray the following month showed a photo of the Stanford station. See Figure 1.

The following month, a full-page advertisement by the National Company in *QST* extolled the possibilities of duplex sideband. By April, *QST* Technical Editor George Grammer, W1DF, was able to prognosticate:

> It may not be too much of an exaggeration to say that our present-day 'phone methods will be just as obsolete, a few years from now, as spark was a few years after c.w. got its start. "Old-fashioned 'phone" will eventually be something that can be tolerated only where there is plenty of room for it.[3]

In July of the same year, Byron Goodman's column "On the Air with Single Sideband" debuted in *QST*, keeping hams informed of the increased sideband activity in the United States and

[1]Notes appear on page 47.

around the world. The same issue also featured a full-page ad for tetrodes from Eitel-McCullough specifically aimed at sideband enthusiasts. See Figure 2. It was a sign that the radio industry was beginning to see the potential of a market in equipment for amateur sideband use.

Another sure sign of sideband's potential could be gauged by letters to the editor in *QST*. In October 1948, a writer decried "single-sideband gibberish," and accused the magazine of "trying to shove it down the throats of the ham fraternity." But more hams than not were open to the possibilities that sideband offered, realizing that it offered a solution to the very real problems that plagued the ham bands. "I personally have had no experience as yet with single sideband," wrote a Canadian ham in the December issue, "but anything that may relieve the overcrowded conditions of our bands today and make for QRM-free QSOs, I'm all for it."

Filter vs Phasing

The next year, "On the Air With Single Sideband" was discussing the merits of generating sideband signals with filter versus phasing systems. The former involved sharp filters and multiple frequency conversions, sophisticated technical requirements that many hams felt they couldn't achieve. But phasing systems, which used a 90° phase difference in two signals to balance one out while augmenting and passing the other through, offered a simpler solution to getting a sideband rig on the air. Ralph V. L. Hartley of Western Electric, best known to hams for his invention of the Hartley oscillator circuit back in 1915, had patented a phasing SSB system in 1928, but Don Norgaard, W2KUJ, would pioneer its use in "A New Approach to Single Sideband" in the June 1948 *QST*. By April of 1950, the magazine would report that hams using phasing methods outnumbered those using filter 2 to 1.

Manufacturers began taking more notice. In the June 1950 *QST*, a full page ad from the Collins Radio Company claimed its 75A-1 receiver to be the "SSSC Receiver of the Year," and in January 1951, the magazine announced a commercially produced amateur sideband transmitter, the "SSB Jr.," new from Eldico. See Figure 3.

By April 1953 *QST* had reported a tally of over 300 US sideband stations active, and the first two-way 75 meter sideband transatlantic QSO. In November 1956, *QST* reported the first sideband awards for WAC and WAS (there were 48 states then). The first sideband DXCC had been accomplished a year earlier.

Figure 4—This photo of General Curtis LeMay, then K3JUY/K4RFA, from the July 1961 issue of *QST*, announced his nomination as chief of staff of the US Air Force. During the mid '50s, Gen LeMay had converted Strategic Air Command communications from AM to SSB, based on his ham experience with the newer mode.

The Military Takes Note

In the mid-1950s, hams and amateur sideband actually had a hand in altering the course of the Cold War. General Curtis LeMay, W6EZV, was Commander of the Strategic Air Command (SAC), charged with deterrence of the Soviet nuclear threat. See Figure 4. New jet aircraft then being introduced were resulting in the elimination of in-flight radio operators and SAC was planning on the use of AM voice equipment in the cockpit. LeMay became aware of the successes of amateur SSB work, and in 1956 undertook two flights, one to Okinawa and the other to Greenland, during which SSB was put to the test using Amateur Radio gear and hams themselves. Two of the hams invited to operate on those flights were Art Collins, WØCXX, of Collins Radio, and Leo Meyerson, WØGFQ, of World Radio Labs. SSB far outperformed the conventional AM communications systems then in use by the military. In 1957, it was formally adopted by SAC for use in its (then) new B-52 bombers,[4] the same year that General Francis "Butch" Griswold, KØDWC, of SAC would give the keynote address on the subject at the ARRL National Convention in Chicago.

Writing in the January 1953 *QST*, Byron Goodman would report that "Art Collins, WØCXX at Cedar Rapids, Iowa, is making a lot of the a.m. diehards think 'maybe there's something to this single-sideband stuff after all.'" Indeed he was. In addition to his personal involvement in helping SAC decide on SSB for its communications systems, his company, Collins Radio, would end up making arguably the largest single contribution to amateur use of SSB when, in 1955, it all but abandoned production of AM gear and threw its considerable resources behind development of sideband gear, having prepared the way with a series of full-page "Engineering Notes" that appeared in *QST* in late 1954. In May of 1957 Collins would make history with the launch of the KWM-1 transceiver, "the first mobile transceiver," the advertisement in *QST* read, "and the first to offer SSB." A review of the rig in the April 1958 issue would be positively glowing:

> It is the writer's opinion that the KWM-1 may well mark the end of one era and the beginning of another. This unit is more than another piece of ham gear; it could be a way of life (in Amateur Radio).[5]

Byron Goodman's column "On the Air With Single Sideband" was discontinued after March 1954 and the ARRL's handbook, "Single Sideband for the Radio Amateur," made its first appearance in December of the same year. SSB had made a secure place for itself within Amateur Radio. Change, however, didn't come easily or quickly for a few hams. The disagreement between AM diehards who disparaged the "Donald Duck" sounds of SSB, and those who disdained the frequency-hogging of "ancient modulation" would continue well past mid-century. As late as 1963, a letter to *QST* urging the ARRL to "get on the ball and ask FCC to give the a.m. boys six months to go s.s.b.,"[6] resulted in an outpouring of mail in support of the "a.m. boys." In the end, the issue would finally only be overshadowed by another controversy: the regulatory changes of incentive licensing.

Sideband had won the day.

Notes

[1]"Correspondence from Members," *QST*, Feb 1948, p 64.

[2]As if its role in the sideband revolution wasn't enough, Stanford University would later be at the forefront of another technological revolution—the computer—and instrumental in the development of nearby "Silicon Valley." Oswald Villard himself was a pioneer in early meteor scatter investigations.

[3]"Technical Topics," *QST*, Apr 1948, p 29.

[4]Charles A. Keene, "Once Again, a Ham Operator in Command," *QST*, May 1997, p 43.

[5]"Recent Equipment," *QST*, Apr 1958, p 23.

[6]"Correspondence from Members," *QST*, Jan 1963, p 87.

Though his interest in ham radio goes back to the late 1960s, Gil McElroy, VE3PKD, didn't get his ticket until 1991 at age 35. His ham radio activities center around his love for straight-key CW. You can contact the author at PO Box 7, Colborne, ON Canada, K0K 1S0; **gmcelroy@eagle.ca**.