

The Golden Anniversary of the Collins KWM-1

2007 marked the 50th anniversary of the introduction of the amateur rig that became the model for modern radio communication gear—the Collins KWM-1. transceiver.

Mike O'Brien, K0MYW

Not much larger than a shoe box, the KWM-1 was in stark contrast to the typical amateur station setup of hefty separate receiver and transmitter, the latter sometimes as bulky as a refrigerator. The QST review (Apr 1958, pp 23-27) of the new transceiver prophetically observed that "... the KWM-1 may well mark the end of one era and the beginning of another."

Although the KWM-1 was developed by the renowned Collins Radio Co, one of its most remarkable aspects is that it originated not in a sophisticated factory laboratory but rather in a home basement workshop. In 1956 Gene Senti, W0ROW (SK), then 38 years old and in his 14th year as an engineer with Collins in Cedar Rapids, Iowa, began tinkering with his personal 75A-4, the top-of-the-line receiver he had designed for Collins a couple of years earlier. He described his home experimenting as "... taking the receiver's block diagram and running it backward."

"I was trying to figure out a way to use the 75A-4's high-stability PTO (permeability-tuned variable oscillator), with its good linearity, along with the crystal oscillator for injection purposes in a transmitter," Senti told me in a 1991 interview.

"I took the signals from the oscillators out of the 75A-4 with some pieces of coax and re-combined them in a separate chassis. I also took out the BFO (beat frequency oscillator). So I was using all three of the receiver's oscillators. All I had to do was come up with new mixers."

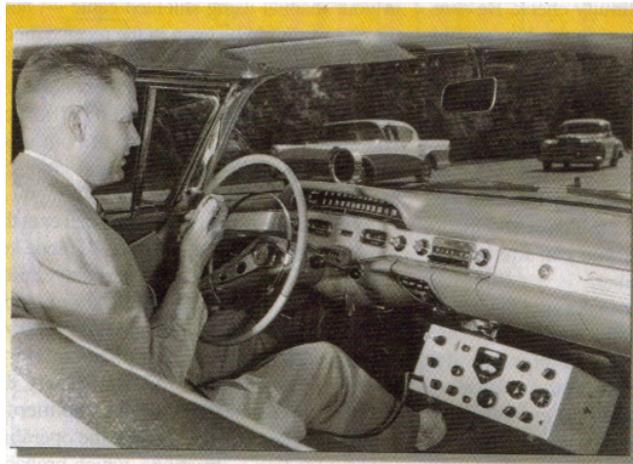
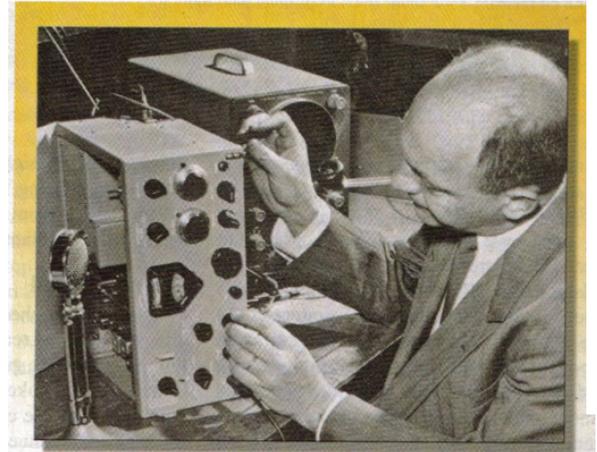
While he toyed with the circuitry, Senti also began dreaming of the convenience such a setup could bring to his amateur station.

"After I saw where I was heading, I thought to myself, 'Gee, this could be neat! All I'll have to do is tune in a signal and my transmitter will be zero-beat with it.' So I went ahead and hooked it up - and, by golly, it worked!"

Refinement of Old Idea

The concept of a station-in-a-box can be traced back to the very beginnings of Amateur Radio. It might be said that early regenerative receivers were accidental transceivers because their oscillations sometimes could be copied a mile or more away.

When Gene Senti was reflecting in 1991 about his homebrew experiments that pointed the direction that radio manufacturers have followed over the half-century since, he modestly conceded that his brainchild, the KWM-1, "turned out to be a pretty good little rig:"



The Collins KWM-1 in a 1958 Chevy Impala. This picture, from a Collins ad in the July 1958 issue of QST, featured John Hunt, K7XE (ex-W0YBE), the amateur product manager for Collins. The car belonged to Arlo Meyer, W0ISK, who designed the KWM-1's mobile mount.

Compact transmitter/receiver combos were popular as far back as the 1920s for portable and emergency use. In the 1930s, the ARRL's Radio Amateur's Handbook promoted such rigs for the 5 meter (56 MHz) band because short antenna length requirements encouraged mobile operation. The 1935 Handbook used the term "transceiver," noting, "In such a unit the same tubes, power supply and other components are used for both transmission and reception, with the obvious result of reduction in the cost, size and weight of the apparatus."

Over the next 20 years, many homebrewers and a few commercial manufacturers produced rigs that were called transceivers, though they were mostly separate transmitters and receivers packaged to-

gether in one cabinet. They did not have the KWM-1's ability to electrically vary receiving and transmitting frequency synchronously with a single knob. By the 1950s, Collins engineers were very familiar with the advantages of easytune rigs, thanks to extensive experience with designing avionics for military, commercial and private aircraft. So it was natural for employees such as Phineas Icenbice, W6BF (then W0NKZ), to explore to transceiver schemes - in his case, experimenting with a 75A-2 receiver and a simple exciter he still displays in his California shack.

Although the KWM-1 was marketed as a ham rig, the US military and government agencies were among the first to put the transceiver to use.

For instance, when Richard Nixon visited South America in 1958, the Secret Service detail accompanying the Vice President carried a KWM-1 in a special suitcase. When the trip was disrupted by violent mob scenes in Venezuela, agents used the transceiver to communicate with Washington and coordinate a hasty exit for Nixon, according to Jay Miller, KK5IM, in his book *A Pictorial History of Collins Amateur Radio Equipment* (Trinity Graphic Systems, 1999)

Art Collins' personal friendship with Strategic Air Command chief General Curtis LeMay, K0GRL (later 4FRA and W6EZV) (SK), and SAC's vice commander, General Francis "Butch" Griswold, K0DWC (SK), led to widely publicized airborne demonstrations of Collins SSB equipment that helped promote acceptance of the mode in the mid-1950s.

But SAC's most exotic application of the KWM-1 went unpublicized - because the transceivers were installed aboard U-2 aircraft that were secret until one piloted by Francis Gary Powers was shot down over the USSR in 1960.

KWM-1 s in the U-2

Powers' plane was operated by the Central Intelligence agency and, contrary to ham lore, was not equipped with a KWM-1. The CIA fleet of U-2s carried no long-range radios "for fear that any HF transmission from an overflying U-2 would give away its position to the unfriendlies on the ground below," says Chris Pocock, author of *50 Years of the U-2* (Schiffer Publishing Ltd, 2005), the comprehensive history of the spy plane.

After Powers' shootdown, the CIA did install an HF rig, the Collins 618T avionic transceiver, in the agency's U-2s, but only to transmit automatic bursts of data that indicated aircraft performance during flights over hostile territory.

Meanwhile, the mission of U-2s procured by SAC was not to invade enemy airspace, but rather to sniff for highaltitude traces of nuclear testing while staying in friendly or international skies. So, says Pocock, in late 1957 SAC began installing KWM-1s in its U-2s to allow pilots " ... communication during their long, lonely sampling flights across remote wastelands."

The choice of the KWM-1 for that role probably came from Ray Meyers, W6MLZ (SK), who at the time was manager of radio operations for Lockheed Aircraft Co, which created the U-2 in its clandestine "Skunkworks." Generals LeMay and Griswold, avid Collins buffs, no doubt readily concurred.

The only spot in the cramped U-2 that initially could be found for the KWM-1 was a pressurized compartment called the Q-bay, located behind the pilot, says Joe Donoghue, who



served with an overseas CIA U-2 detachment in the 1960s and more recently has researched declassified U-2 documents in the National Archives. Later, space was found to mount the KWM-1 in the U-2's "cheek" behind the rightside engine intake, although that installation required addition of a pressurized box to house the transceiver to ensure proper operation at the U-2's extreme operating altitudes (70,000 plus feet).

Because the KWM-1 was out of the pilot's reach in either configuration, there has been speculation in ham circles that mechanical extensions must have been fashioned to allow the pilot to operate at least some of the transceiver's panel controls; however, Lockheed documentation specifies only an electrical wiring harness.

Both Pocock and Donoghue describe the KWM-1 's setup aboard the SAC U-2s as "fixed channel." With the KWM-1 pre-tuned to a locked frequency, all the pilot would need was a push-to-talk microphone - and not even that if VOX were used - and receiver audio plumbed to his helmet.

In that light, it seems likely that a couple of rare KWM-1 accessories made available to amateurs by Collins may have been rooted in the transceiver's mission aboard the SAC U-2s. The 399B-1 was billed as a "OX Adapter," allowing split-frequency operation of the KWM-1 (an "export model" was labeled the 399B-2). The 399B-3, described as a "Novice Adapter," provided crystal control of the KWM-1 transmitter section to comply with restrictions imposed upon Novice class licensees for 15 meter CW operation in the 1950s.

The KWM-1s in the U-2s operated by SAC apparently remained in operation until the mid-1960s, when they were replaced by the more cockpit-friendly 618T.

Warren Amfahr, W0WL (then W0WLR), was working for Boeing in Wichita, Kansas in 1954 when he put his own homebuilt SSB rig on the air and found himself talking with Art Collins, W0CXX (SK), who was using one of the first Central Electronics 10A SSB exciters to drive the final stage of a Collins KW-1 AM transmitter as a linear amplifier. Collins invited Amfahr to Cedar Rapids for an interview. When Amfahr accepted Collins' job offer, he found other engineers, such as Leon Griswold, W0DXN, toying with the idea of using common oscillators to control the frequency of a receiver and transmitter simultaneously.

Amfahr says he may have influenced Art Collins' leaning toward a mobile transceiver. "I went in to work on a Saturday morning and parked my car on the first row, which was something you didn't dare

do during the week because it was Arthur's row. Just as I was getting out of my car, Arthur pulled in next to me.

I thought I was going to be in big trouble. But he wanted to look over my homebrew mobile rig. I was using a pair of 6146s as the power amplifiers. That was unusual for a mobile setup in those days, and Arthur expressed quite a bit of interest. Of course, the KWM-1 wound up using a pair of 6146s."

Top Boss Gets Involved

Of all the Collins engineers experimenting on their own with transceiver schemes, Gene Senti was having the most success. He shared his growing excitement with fellow engineers at the factory. Scuttlebutt eventually reached the top boss, and there came a knock on the door of the Senti home one evening in the spring of 1956.

"Mr Collins came to my basement for a demonstration in my junky workshop," Senti recounted. "I was kind of embarrassed, but he seemed to enjoy it."

Art Collins promptly set a factory team to work on Senti's concept. Before the year was out, 25 pre-production KWM-1s were up and running.

The KWM-1 employed two dozen vacuum tubes, putting out about 175 W of SSB or CW. In keeping with the company philosophy of promoting SSB, there was no provision for AM in the KWM-1, although at the time, AM still was the dominant mode of voice transmission on the amateur bands.

The 15 pound KWM-1's dimensions - 14 inches wide, 10 inches deep and just a bit over 6 inches tall - would make it an impossible fit in most of today's tightly packed automobile interiors. But there was sufficient free space beneath the dashboard in most 1950s sedans to mount the KWM-1, with the separate mobile power supply going into the trunk. A Collins mechanical engineer, Arlo Meyer, W0LBK, who later helped Senti design the 30L-I amplifier, was called in to create a mounting kit.

"Ernie Pappenfus, K6EZ (then W0SYF) (SK), director of SSB development for Collins, told me, 'I'll give you one of the (KWM-1) prototypes, if on your own time, you'll go figure out how to mobile-mount the thing,'" Meyer recalls. "I took a wooden mock-up to all the local car dealers and made measurements to see what length of brackets and screws would be needed

to mount the rig under the dash or on the floor-board of all the popular models."

Introduction of the KWM-1

When introduced in the spring of 1957, the KWM-1 carried a list price of \$770. A 12 V transistorized de mobile power supply (516E-1) was priced at \$248, while a 115 V ac power supply (516F-1) for fixed use sold for \$103. Other available accessories included the MM-1 handheld dynamic microphone for \$25; the 351 D-1 mobile mounting tray for \$22; the 312B-1 speaker in cabinet for \$25, and the 312B-2 speaker console with a directional wattmeter and phone patch for \$146.

The KWM-1 featured a plug-in module that held 10 crystals, each allowing the transceiver to cover a 100kHz span. The operating crystal was selected by a rotary switch. The standard crystal complement covered much of the 20, 15 and 10 meter amateur bands. (The 11 meter band was closed to amateurs in September of 1957, just as the first production KWM-1s were hitting the airwaves.)

A rare accessory was the 399B-1/2, the "DX Adapter," which replaced the standard crystal module and allowed the KWM-1 to transmit and receive on split frequencies. An even scarcer item was the 399B-3 "Novice Adapter" that provided fixed crystal control for the transmitter.

The KWM-1's standard ability, however, to precisely vary the transmit and receive frequency with one dial led Art Collins to conclude that "the simple frequency control would appeal to the mobile operator because he wouldn't have to take his eyes off the road so much to tune," said Senti.

Just making SSB intelligible was a challenge to many AM-oriented operators in the 1950s. In his QST review of the KWM-1, Byron Goodman, WI DX (SK), observed, "There are still some hams who claim that tuning in a side-band signal is something that requires the patience of Job, the fine touch of a cross between a surgeon and Michelangelo, the luck of a Croesus and a lot of natural talent. They have never tuned the KWM-1. Combining a slow tuning rate (22 kc per knob revolution) with a good ave system makes it no trick at all to tune in a side-band signal."

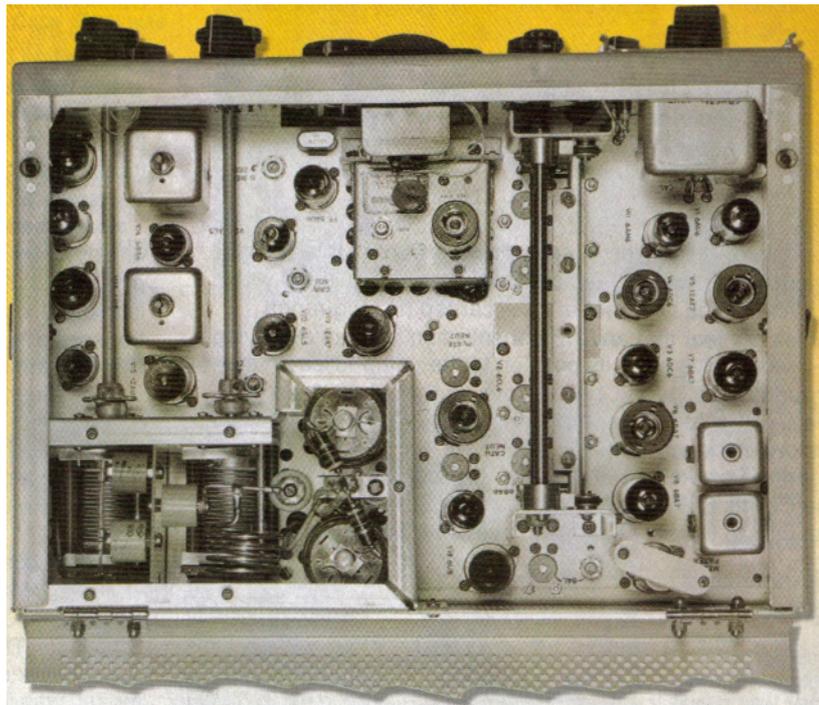
Practical mobile antennas also played a role in the decision to limit the KWM-1's coverage to 14-30 MHz, according to Senti. "Mr Collins said to us, 'The lower in frequency you go, the more loading coil and less antenna you have.' He told us to concentrate on 10 through 20 meters, and to worry about the rest later. Also, there were bad spurious emissions in the 80 meter band in our early models that weren't the type of thing you'd want to sell to the public."

Clever and Successful Marketing

Despite the early emphasis on mobile operation, Collins eventually began touting its ad-



The front of the KWM-1.



An inside look at the KWM-1.

vantages for home stations, as well. Recalled Chuck Carney, W0DGJ (SK), Collins amateur product manager in the late 1950s, "Our field salesmen were mentioning little incidents at the ham shows and symposiums. A couple would come up to the KWM-1 table, and she would say something like 'Now why can't your radio look like that?' with maybe a little elbow jab. And I decided to try something that I don't believe had ever been done before - direct some of our magazine ads to the XYL."

For instance, in the usual page 2 full-page Collins advertisement in QST for April 1958, the headline addressed the message "To XYL's Only" and asked:

"Does your OM's hamshack resemble a surplus store? Are you afraid to clean 'that corner' for fear the vacuum cleaner will inhale cables, spare tubes or crystals? For your own future peace of mind, why not describe Collins' compact KWM-1 to him: small enough to fit neatly into the bookshelves in the living

room ... "

Present day company engineer Rod Blocksme, K0DAS, has determined approximate production totals for several pieces of vintage Collins amateur gear, combining surviving company records with survey results conducted among members of the Collins Collectors Association. When KWM-1 production ceased in the autumn of 1959, about 1150 transceivers had been built, Blocksme's research indicates.

By that time, the Collins 32S-1 transmitter and 75S-1 receiver were on the market, with the capability of being cabled together for common frequency control. November 1959 saw introduction of the KWM-1's successor, the KWM-2 transceiver, which added 40 and 80 meters and other refinements to the original KWM-1 package. The KWM-2 continued in production until 1982, with nearly 30,000 built, according to Blocksme.

The Collins legacy continues under the

Rockwell Collins banner. The company is a major producer of electronic hardware and software for the military and the aviation industry.

The last Collins rig marketed to amateurs was the KWM-2's successor, the Rockwell Collins KWM-380. That solid-state transceiver was introduced in 1980, and about 3000 (including a general coverage version, the HF-380) were built during its six year production run.

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For more information on the KWM-1 and its competition, visit www.arrl.org/files/qst/binaries/iobrien0107.pdf.

Mike O'Brien, K@Myw, an Amateur Extra class licensee, was first licensed in 1957 when he was 12. After 20 years as a newspaper journalist, he came back to ham radio and began acquiring the rigs he lusted after in his youth. Currently a college journalism instructor, he continues to write for newspapers and other publications. He has been published before in QST, writing articles on early Hallicrafters transmitters and the 1947 Gatti-Hallicrafters DXpedition to Africa. Mike lives in Springfield, Missouri and can be reached at kOmyw@sbcglobal.net.

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TO XYL'S ONLY

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mc frequency range—and when he is moping in the family car, it makes a neat installation, easily removable, not a "shin bumper". Cost? Through the years it will cost him less than anything he can build or buy. Tell him to call his Collins Distributor for the facts about the revolutionary KWM-1 mobile transceiver. Available on easy

The April 1958 QST ad targeting XYLs.

