

Owners of the First 100 National HROs and Other Jim Millen and National Stories

As Told by Dr. Peter C. Patton (WØEWQ)
and James Millen (W1HRX)

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Introduction

The National HRO was a real “game changer” for communications receiver technology in the middle 1930s. In an era when many hams were using regenerative receivers or basic superhets without any RF preselection and thus with many images on 40 and 20 meters, when the best superhets had just one RF stage and tuned no higher than 22 Mc, the HRO burst on the scene with two

stages of tuned RF amplification giving it excellent image rejection and “the ears of an Iroquois Indian scouting party¹,” coverage from 50 kc to 30 Mc with bandspread on the 80, 40, 20 and 10 meter ham bands, an updated, well-performing crystal filter, a signal strength meter, good AVC, and excellent mechanical and thermal stability. Through the rest of the ‘30s, the 1935 HRO stood the tests of time, cost and performance well against newer competition from the Hammarlund Super Pro, various Hallicrafters Super Skyriders, and the RME 69. When the war came in 1941, the HRO was adopted

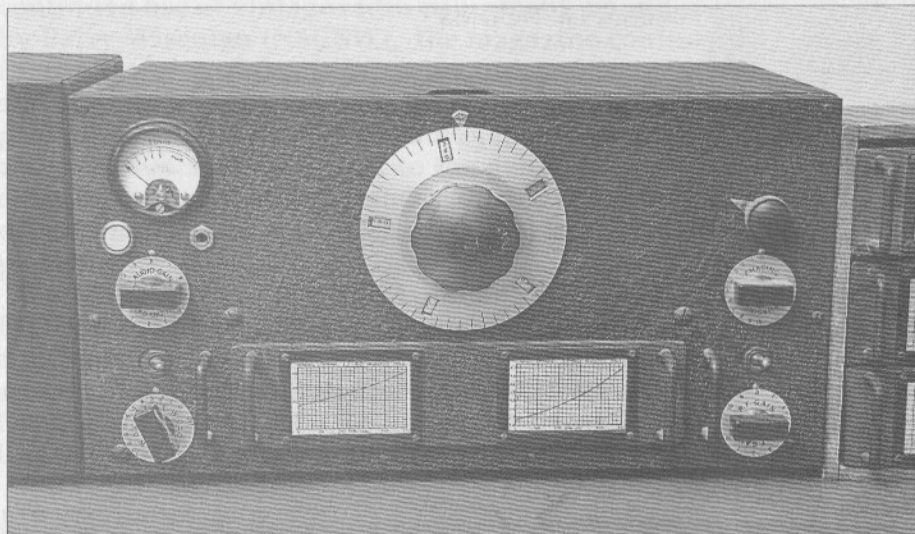
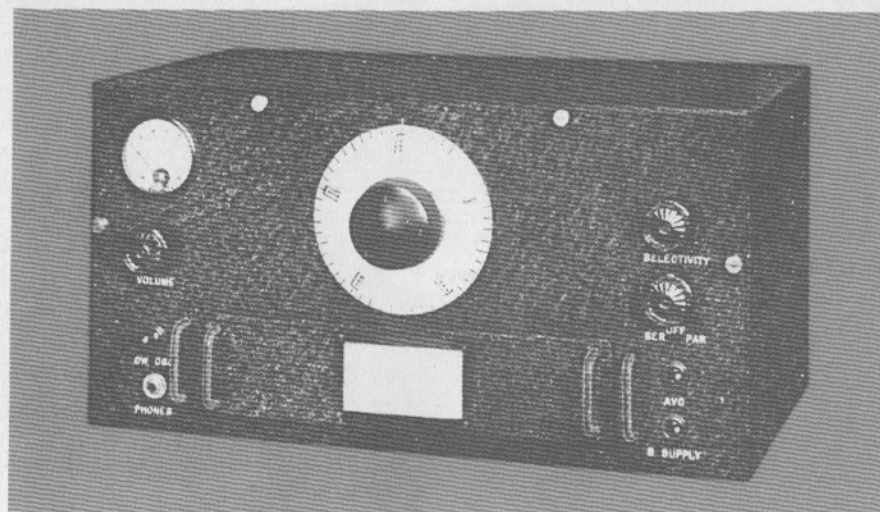


Figure 1: This “Pearl Button” HRO is serial number E159, which was built during the first 3 months of production in 1935. This is how the original 100 receivers would have looked to the first lucky owners discussed in this article. (Photo Courtesy of Gary Halverson, K6GLH)

NATIONAL High Frequency RECEIVERS



TYPE HRO AMATEUR RECEIVER

In designing this new receiver National has attempted to meet every requirement of the most advanced amateur. It embodies every feature which we have found to be desirable in such a receiver.

Its circuit is notable in the use of two preselector stages, giving remarkable image-frequency suppression, and weak signal response. The first R.F. stage has been designed to provide maximum gain to minimize effects of Thermal Agitation, and provide highest Signal-to-Noise Ratio. The two high-gain I.F. stages employ Litz-wound coils and are tuned with air condensers. As would be expected, the usable sensitivity and selectivity are remarkable.

As a further aid when operating under adverse conditions, a Lamb-Single-Signal crystal filter precedes the I.F. amplifier. All controls are brought out to the front panel.

Other circuit details include automatic or manual volume control (with panel switch), and a vacuum tube voltmeter indicating carrier intensities directly in R. Units. A neon lamp is wired across the input circuit, automatically shunting the terminals whenever excessive voltages are picked up by the antenna, such as may occur during transmission, heavy static, etc. In addition to protecting the receiver, this device eliminates blocking and permits quick come-back when operating on the break-in system. A phone jack is, of course, provided on the front panel, as well as a Send-Receive switch for cutting B Voltages during transmission.

Most notable among the mechanical details is the use of a new precision four-screw condenser with worm drive tuning, providing a ratio of 20-1. Due to preloading of the gears, backlash is entirely absent. The micrometer dial has fifty divisions and revolves ten times in covering the tuning range, thus reading direct to 1 part in 500. Quarter divisions may be easily estimated. Every tenth division is numbered, the figures being changed automatically as the dial is rotated. The condenser and dial are described more fully on Page Two of this catalog.

The HRO Receivers employ plug-in coils rather than coil switching. This is because we have found that, other things being equal, much better performance is obtained with plug-in coils. The principal reason for this is the necessity for crowding coils into a small space, without well-proportioned individual shielding, when the switch is

employed. This increases image frequencies and signal-to-noise ratio, and tends to introduce dead spots. These difficulties are not insuperable of course, and we have designed a new coil switch, as well as a new receiver employing it, which we believe represents the highest development in this type of equipment. This receiver though in many other respects similar to the HRO, is not listed in this catalog, as we consider it a Short Wave Broadcast Set, rather than preferred equipment for amateur use. Our choice of plug-in coils for the HRO Amateur Receivers is based on definite engineering experience with both types of receiver, as well as on the expressed preference of a number of amateurs. A description of the geared plug-in coils used in the HRO will be found on the opposite page.

The HRO has been designed to employ an external power supply, as many amateurs already possess suitable power supplies. However, an HRO Receiver with built-in power supply is also available and listed below, for those who prefer to sacrifice performance to convenience.

Tubes required for 2 volt HRO: Four 5B, Three 57 One 2B7 One 2A5. Power Supply requires 1 Type 2B0.

Tubes required for 6 volt HRO: Four 6D6, Three 6C6, One 6B7 One 42. Power Supply (for AC operation) requires 1 Type 2B0.

HRO Receiver, 2 volt or 6 volt A.C. model, complete with coils, as described above, but without tubes, speaker or power supply.

List Price, \$233.00

HRO-S Receiver (2 volt), with built-in power supply, 115v. 60 cycle, complete with coils, as described above, but without tubes, or speaker.

List Price, \$257.50

HRO-P Panel for Relay Rack Mounting, leatherette finish, engraved and machined to fit over the regular front panel of the HRO.

List Price, \$20.00



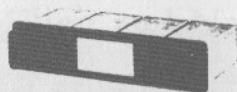
NATIONAL COMPANY, INC., MALDEN, MASS.

Figure 2: The October 1934 QST ran full page ads for the new National HRO receiver. According to historian Gary Halverson (K6GLH), the receiver pictured in this ad is likely a prototype unit and the production models were different per figure 1.

NATIONAL High Frequency RECEIVERS

OUTSTANDING FEATURES:

- Nine Tubes, not including rectifier
- Two Preselector Stages.
- Single Signal (Crystal Filter) standard equipment.
- Ganged Plug-in Coils, with each coil individually shielded.
- Strictly single-control Tuning.
- Calibration for each range mounted on coil.
- Four gang Precision Condenser, with preloaded worm-drive tuning, 20-1 ratio.
- Micrometer Dial, spreading tuning over 500 divisions, numbered every 10 divisions, direct reading.
- Automatic or Manual Volume Control.
- Vacuum Tube Voltmeter with instrument calibrated in R scale of carrier intensity.
- Electron Coupled, air padded oscillators.
- Two I.F. stages with Litz-wound coils, air condenser tuned.
- Beat Frequency Oscillator for "Offset" C.W. Tuning.
- Phone Jack on Panel.
- 2½ Volt AC and 6 Volt AC or Battery models.
- Relay Rack Mounting available.
- Built-in Power Supply available.



GANGED PLUG-IN COILS

Each of four coil units in the HRO ganged plug-in assembly has an individual aluminum shield, and is mounted on an aluminum panel, on which is formed the calibration curve for the range covered. The assembly is illustrated above.

Due to special features in the design of both the tuning condenser and the coils, it has been found possible to combine Calibrated full band-spreading on the 20, 40, 80 and 150 meter amateur bands with continuous coverage of all frequencies from 1.7 M.C. to 30 M.C. Special band-spaced coils are not required.

A complete set of coils for the range from 1.7 M.C. to 30 M.C. is supplied as standard equipment with each receiver.

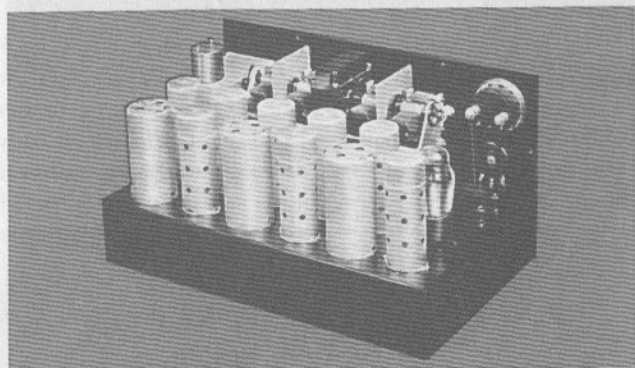
Two additional sets of coils covering the broadcast band (550-900 K.C. and 900-1700 K.C., respectively) are available at extra cost. List Price, each \$20.00

POWER SUPPLY

The 2 volt HRO Receiver is designed to operate from the TB-7 power supply, Type 5897. Similarly, the 6 volt HRO, operates from the AGS Power Supply, or from the Type 5885 (588 Power unit). Amateurs already owning any of these power supplies may employ them without alteration. Types 5887 and 5888 may also be used if available, but are not recommended. For general description of National Power supplies, see Page 14.

Power Supply Unit, Type 5897, for 2½ Volt HRO Receiver, 115v, 60 cycle, less tubes, List price, \$26.50

Power Supply Unit, Type 5885, for 6 Volt HRO Receiver, 115v, 60 cycle, less tubes, List price, \$34.50



NATIONAL COMPANY, INC., MALDEN, MASS.

Figure 3: This is the second page of the original October 1934 QST ad for the HRO.

by the U.S. Navy and Coast Guard and the British government and Royal Navy. British and Australian copies were authorized by National, while unauthorized copies were built by both Germany and Japan.

After the war the HRO was updated several times. The 1946 HRO-5A1 used octal tubes and gained a noise limiter and an updated crystal filter. The 1947 HRO-7 switched from the old "black box" to a

modern gray cabinet with rounded corners and modern knobs and gained a voltage regulator. The 1950 HRO-50 switched to miniature tubes in the front end, added 8 watts of audio output and a built-in power supply, and gained a direct reading, slide-rule dial. In 1951 the HRO-50-1 added a third IF amplifier stage and went to 12 tuned circuits in the IF for greater skirt selectivity. In 1953 the HRO-60 added dual conversion above 7 Mc for even better image rejection and a filament current regulator for the oscillators. This last version of the classic HRO continued in production until 1964. It still had the micrometer dial and PW tuning condenser, the plug-in coil

drawers, the two tuned RF amplifier stages, and the crystal filter of the original 1934 HRO. The design work on the original HRO started in late 1933. It was to be a replacement for the 1932 National AGS "Aircraft Ground Superhet" developed for the Department of Commerce as a receiver for airports. As reported by Henry Rogers (WA7YBS) "Herbert Hoover Jr. was selected by the Bureau of Aeronautical

Commerce to coordinate the job of designing a replacement for the AGS receiver. He was living in Pasadena, California, and teaching part-time at Cal Tech. Hoover, of course, contacted James Millen (Chief Engineer and General Manager) at National Co., since the creation of a 'sophisticated' design was going to require the expertise that National had gained building the AGS receivers. Hoover set up a lab in his garage, employing Howard Morgan from Western Electric Co. and a few of his technicians, to develop the new receiver circuitry. The new receiver would be a team effort with engineers working on the project on both coasts."²



Figure 4: This classic photo is taken from page 4 of Frank Jones' *The Radio Handbook*, the 1936 edition. Its caption reads "One of the World's Finest Amateur Radio Stations. W9DXX, Owned and Operated by Alice R. Bourke, Chicago, Illinois." There is more about Alice on page 10.

My involvement in this particular HRO story began back in the spring of 2007 when I was collecting information for a series of ER articles about the 1938 National transmitters. One of those articles was about the National 600 watt transmitter that had been restored by Mort Jones (W6KLG). This particular transmitter had originally belonged to James Millen until 1982 when Professor Peter C. Patton acquired it from him. It went from Pete to Bill Smitherman (KD4AF), and then to Mort in 1995. Mort very kindly supplied me with copies of letters exchanged between Pete Patton and Jim Millen in the late '70s and early '80s, mostly concerning the 600 watt transmitter, which added a lot of information about the rig for my article. One of those letters, however, went well beyond the subject of the transmitter to discuss the early HRO receivers. Pete had been perhaps the world's most avid collector of HROs, at one time owning around 100 of them, from the original 1935 receiver to the HRO-500 and 600. Jim Millen appreciated Pete's passion about the HRO and he wrote a letter to Pete, in which he listed as best as he could

Commerce to coordinate the job of designing a replacement for the AGS receiver. He was living in Pasadena, California, and teaching part-time at Cal Tech. Hoover, of course, contacted James Millen (Chief Engineer and General Manager) at National Co., since the creation of a 'sophisticated' design was going to require the expertise that National had gained building the AGS receivers. Hoover set up a lab in his garage, employing Howard Morgan from Western Electric Co. and a few of his technicians, to develop the new receiver circuitry. The new receiver would be a team effort with engineers working on the project on both coasts."²

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remember in 1979, the original owners of the first 100 HROs. I've never seen that information anywhere else, either in print or on any of the several good Internet sites that cover the HRO, and I've always felt that it should be published somewhere where folks who know and love "Electric Radios" could find and appreciate it. So that's what I've set out to do in this article.

One of the first things I did in preparing for this article was to contact Pete and ask him to get involved. He responded with

a letter containing several good stories about National, Jim Millen, and the HRO. Rather than botch it up with my editing, I've just decided to share Pete's letter verbatim with you all as well. I'm sure that for you ER subscribers it will be like reading some correspondence from a friend.

So, without further introduction let's look at Jim Millen's letter to Pete Patton and his list of the owners of the original 100 HROs. I'll add some comments after the list about who those owners were in

JAMES MILLEN
TARBOX LANE
NORTH READING, MASS.

June 4, 1979

Dear Pete:

Enclosed is a partial list of the owners of the first 100 HRO's. I have not done very well due to fading memory and the "side-tracking" that happened when I started to research and suddenly discovered long forgotten side paths! Enclosed, also, is a photocopy of a letterhead used by a group of HRO owners in the mid-thirties which may be of interest. Have not yet been able to locate the photos I have of HRO users when Thorne Donnelly (W9PZ) entertained them over a summer week-end at his super-elegant ham shack on his estate at Lake Bluff near Chicago. (I think it was in 1936 or '37.) Also enclosed are pamphlets on AGS, HRO and NC600.

Due to the death of Mr. Thordarson and the sale of his company, there were very few NC600 transmitters made and sold (it was a cooperative deal with Thordarson). We probably did not make more than 100, if that many, of the complete transmitters and probably 400 or 500 of the Exciters and Final Amplifiers.

Thanks for advising Bill Orr regarding my concern about RFI and the pace-maker. He not only gave me helpful information on RFI but also alerted me to something I had completely overlooked; the need, after the years of non-use, to let the Eimoc tube filaments in the Collins Final burn for half an hour or more before applying plate voltage.

Regards,

Jim Millen
W1HRA

Prof. Peter C. Patton
University of Minnesota
University Computer Center
227 Experimental Engineering Bldg.
208 Union St. S.E.
Minneapolis, Minn. 55455

Figure 5: This is the letter from James Millen to Prof. Peter C. Patton, dated June 4, 1979.

A few of the more prominent of the 1935 owners
of the original 100 HRO's in addition to
airlines, U. S. Navy, Press Wireless, etc.

Grant Corby	W6CIN -- Geologist, Union Oil Co.
(Herbert Hoover, Jr Howard Morgan <i>(see Ball Tab)</i>)	W6ZH - Prof. Col. Tech. - TWA
(Howard Hughes Charles Perrine	
Wilmer Allison Buck Taylor Ned Crossett	W5VY - Tennis champ. of the '30's Lookout Mountain, Tenn. "Lumber King" - winter in Arkansas and summer in Wianno, Cape Cod
Zan Mortland E. B. MacDowell Bob Smith Herb Hollister	W7DEF - Pres., Kansas City Bridge Co. W9ZD W9LD W9DRD - Pres., Hollister Crystal Co. and KANS Broadcasting Co.
Cy Reed George Joyce Stanley Harris Paul Davis Thorne Donnelly Bill Hillyard Mrs. L. W. Midas Mrs. Burke (Paul Lovegren, W9AFN operator)	W9AA W9AR - Pres. CHIRAD Pres., Harris Bank & Trust Co. Pres., Chicago Board of Trade Pres., Lakeside Press 1st Pres. Bendix Radio W9LW Novelist
Doc Simpson	W8CPC - Pres., Hooker Chemical Co.
Gene Fritschel	W2DC (G.E.)
Prof. Archibald	Yale - Exploration expedition to New Guinea, etc
John Wells	W1ZD - Pres., American Optical Co.
Percy Spencer	W1GBE - Raytheon co-founder
Admiral Byrd	South Pole Expedition
George Bailey	W1KH - Pres. ARRL Pres. Bailey Tile Co.
ARRL Staff	W1EH - K. B. Warner F. C. Beekley Ross Hull Clark Rodimon Jim Lamb George Grammer R. B. Bourne Doc Woodruff Bud Long Handy, Ed. Byron Goodman
Willard Wilson	W3DQ

Figure 6: Here is the original letter titled "A few of the more prominent of the 1935 owners of the original 100 HRO's in addition to airlines, U. S. Navy, Press Wireless, etc."

case you don't recognize them today, as indeed I did not either in many cases.

Detailed Information on Some of the First 100 HRO Owners

Grant Corby: "W6CIN – Geologist, Union Oil Co.," Grant White Corby is listed as the author of "Geology and oil possibilities of the Philippines," 1951 (a book) and of "The geology and paleontology of the San Joaquin and Niguel Hills, Orange County, California."

Herbert Hoover, Jr.: "W6ZH – Prof. Col. Tech. - TWA," was indeed the son of United States President Herbert Hoover. There's a good, short biography for him on Wikipedia.³ Among other things, he was a General Engineering graduate from Stanford in 1925, and he was hired by Western Air Express in 1928 to set up its communications system. Wikipedia reports that Hoover rose to chief engineer of Western Air Express in 1930, which became Transcontinental & Western Air (TWA) in 1930, hence Millen's reference to TWA. In the early 30's Hoover was teaching Engineering at the California Institute of Technology, thus the "Prof. Col. Tech." in Millen's notes. That article by Henry Rodgers, WA7YBS, on the Radio Boulevard web site² reports that Hoover and his design team may have been involved in the electronic design of the AGS, an "Aircraft Ground Superhet" receiver designed and built by National for the Department of Commerce and a predecessor of the HRO. Hoover was selected by the Bureau of Aeronautical Commerce to design a replacement for the AGS, and he contacted James Millen at National to do the mechanical design of what became the HRO. There followed a long career in Geophysical Engineering and service

as U.S. Under Secretary of State from 1954 to 1957. Hoover was the 5th President of the ARRL from 1962 to 1966.

Howard Morgan: "(ex Bell Lab)" Henry Rogers says of the development of the HRO, "Hoover set up a lab in his garage, employing Howard Morgan from Western Electric Company and a few of his technicians to develop the new receiver circuitry. The new receiver would be a team effort, with engineers working on the project on both coasts." The "ex Bell Lab" note written in on Millen's list may come from the fact that Bell (Telephone) Laboratories was the R&D arm of AT&T while Western Electric was the AT&T manufacturing branch in the 1934-5 time frame.

Howard Hughes: Howard Robard Hughes, Jr. (December 24, 1905 – April 5, 1976) was an American business tycoon, investor, aviator, aerospace engineer, filmmaker and philanthropist. He was one of the wealthiest people in the world. As a maverick film tycoon, Hughes gained prominence in Hollywood from the late 1920s, making big-budget and often controversial films.

Hughes was also one of the most influential aviators and aviation tycoons in history: he set multiple world air speed records, built the Hughes H-1 Racer and H-4 "Hercules" (better known to history as the "Spruce Goose" aircraft), and acquired and expanded Trans World Airlines, which later merged with American Airlines. Hughes is also remembered for his eccentric behavior and reclusive life-style in later life.⁴ Hughes connection with TWA maybe the reason why he acquired an original HRO.

Charles Perrine: This was probably Charles Dillon Perrine Jr., W6CUH. He was a technical consultant to *Radio* magazine prior to WWII and he worked for (Howard) Hughes Aircraft at Burbank, California.⁵

Wilmer Allison: "W5VV – Tennis champ. Of the '30's" Wilmer Allison W5VV, won the Wimbledon doubles title in 1929 and 1930 with partner John Van Ryn. They are considered by many tennis historians to be the best doubles combination of the period. He achieved the number one ranking in the US in 1934 and 1935. Wilmer was featured in the February 1934 *QST*, *Hamdom* column.⁶

Buck Taylor: "Lookout Mountain, Tenn." Perhaps William B. Taylor, W4LU, of Signal Mountain, TN.⁵

Ned Crossett: "Lumber King" – winter in Arkansas and summer Wianno, Cape Cod" Probably Edward C. Crossett (died 1955), son of Edward Savage Crossett (1828 – 1910) who was the founder of Crossett Lumber Company.⁷

Zan Mortland: "W7DEF – Pres., Kansas City Bridge Co." The Kansas City Bridge Company built many bridges throughout the Midwest in the early 1900s. The company was founded in 1893 and ceased business around 1960.⁸

E. B. MacDowell: "W9ZD" Earl B. MacDowell, W9ZD came from Kansas City, Missouri. He was born in 1876. Listed as an SK in *QST* in 1945.⁵

Bob Smith: "W9LD" Robert M. Smith of Kansas City, Missouri. was W9LD before WWII and became WØLD after the war when the Ø district was formed.⁵

Herb Hollister: "W9DRD - Pres. Hollister Crystal Co. and KANS Broadcasting Co." Herbert J. Hollister, R1 Knox Road, Merriam, Kansas. Also

listed as "Lake Forest Club, Edwardsville, Kansas" in December, 1928. Published 7 articles in *QST*, some about Crystals and Crystal Oscillators July, 1935 article, "A Four Band Exciter," describes a rig with a half 53 as crystal oscillator, three half 53s as doublers, and an RK23 amplifier, covers 80 through 10 meters. April 1936 article describes a variable air gap, A-cut crystal giving variable oscillator frequency. In 1936, Herbert Hollister was the Registered Agent for KANS Broadcasting Company located in the Hotel Lassen, Wichita, Kansas. For more on Herb Hollister see *The Hollister Crystal Company*, by Chip Owens (NWØO) *Electric Radio* #166, page 33, March 2003.

Cy Reed: "W9AA" Cyrus T. Read, W9AA, was a Chicago native and occasional contributor to *QST*. In 1944 and 1945 he is listed as an Assistant Secretary, ARRL. In April, 1945 he is listed as Director of Sales Engineering, The Hallicrafters Company.

George Joyce: "W9AR – Pres. CHIRAD" CHI-RAD was the Chicago Radio Apparatus Company, established in 1921, located at 415 Dearborn Street. Their 1939 line card⁹ shows that they carried National, RME and Hallicrafters receivers, also the Hammarlund Super Pro, Breting 9, and Sargent receivers. They also offered transmitters, completely built or in kit form. George E. Joyce, W9RA, of 6342 Sheridan Road, Chicago, Illinois, was Vice President of CHI-RAD before WWII. He died in 1996. Apparently he was a spark operator in 1907.⁵

Stanley Harris: "Pres., Harris Bank & Trust Co." N. W. Harris & Co., the predecessor of Harris Trust & Savings Bank, was founded in Chicago in 1835.

It is now BMO Harris Bank N.A., part of the Bank of Montreal, and the 16th largest commercial bank in the U.S.¹⁰

Thorne Donnelly: "Pres., Lakeside Press" The R.R Donnelley Printing Plant, sometimes known as the Lakeside Press Building or more simply The Calumet Plant and now known as the Lakeside Technology Center, was built between 1912 and 1929 to house the operations of the RR Donnelley printing company. The building supported printing operations for the company and was the Donnelley headquarters until 1991 when they moved the headquarters to 77 West Wacker. In 1993, the plant was closed after the discontinuation by Sears, Roebuck and Co. of its mail order catalog, which had been the last major account printed there.¹¹ The predecessor to the current WGN (Chicago, 50 kW, 720 kHz AM, clear channel) was WDAP, which signed on the air on May 19, 1922, and was founded by Thorne Donnelly and Elliott Jenkins.¹²

Bill Hillyard: "1st Pres. Bendix Radio" "Although the histories of the parent companies can be traced back to the late Twenties, it was not until 1936 that the Bendix Radio Corporation was formed as a result of the sale of an interest in the Radio Research Company, of Washington, D.C., to the Bendix Aviation Corporation. As the benefits of this association became apparent, Radio Research became a fully owned subsidiary of Bendix Aviation Corporation and was joined by the W. P. Hilliard Company, the Jenkins & Adair Corporation and Industrial Instruments, Inc., all of Chicago, and the Radio Products Company, of Dayton, Ohio. After several years of operation as a subsidiary, Bendix Radio became a full-fledged division of Bendix Aviation Corporation and has

maintained this status up to the present time."¹³

Mrs. L. W. Midas: "W9LW" Miss Lucia W. Mida, W9LW, of Chicago, Illinois, was a traffic handler and DXer in the 1930s. Her other claim to fame was that she was a champion ladies golfer. Interestingly, her receiver prior to getting the HRO was a Hammarlund Comet Pro.⁵

Mrs. Burke: "Novelist" This is Alice R. Bourke, W9DXX. Her 1935-era picture is shown at the top of Henry Rogers' Radio Boulevard web page beside her very early "pearl button" (S-meter switch) HRO and an AGS-X. Note the white calibration charts on the coils of her HRO. These switched to black in the middle of the third production run. Her receiver also has no pilot lamp, a characteristic of the very early HROs. Her picture in the Radio Boulevard web page came from the 1936 *Radio Handbook*, but it originally appeared in the Christmas 1935 issue of *Radio* magazine. In a 1934 issue of *Radio*, the spot on her operating desk where the HRO later took up residence was occupied by a Comet Pro.

At the time she bought her HRO, she was no longer a "Police Reporter" for the Chicago Tribune. She had resigned in late 1933 to look after her husband, who was quite ill at the time. Although she had become interested in wireless in 1921, and was first licensed in 1930, she really hadn't had the time to operate much because of her reporting job. It was only after her resignation that she found the time to get on the air. Then, when her husband recovered and went back to work, she got into operating in a big way. She probably did not return to reporting or write any novels, but she did write articles for magazines, some of which

were fiction, and did editing work for publishers. She was born in 1891 and died in 1956, according to the OOTC records.⁵

Paul Lovegren: "W9AFN operator" Paul B. Lovegren was from Fort Wayne, Indiana.⁵

Doc Simpson: "W8CPC - Pres., Hooker Chemical Co." Dr. Burton T. Simpson, MD, of Buffalo, NY was the author of a letter in *QST*, May 1930 protesting the presence of Mexican station XDA in the 20 meter band. He also authored *A Square 'Signal Squirter' for 14 Mc.* in *QST*, October 1937. Unfortunately, Hooker Chemical Company used the Love Canal area of Niagara Falls to bury 21,000 tons of toxic waste, and then sold the site in 1953. Housing development and rainstorms released the chemical waste, leading to a public health emergency and an urban planning scandal.¹⁴

Gene Fritschel: "W2DC (G.E.)" Listed in prewar and 1948 Callbooks as Eugene H. Fritschel, 19 Irving Road, Scotia, Schenectady, NY.⁵ Born in Iowa in 1904. The March 1940 issue of *QST* has a story beginning on page 9, *QST Visits G.E.*, in which E. H. Fritschel of G.E. showed George Grammer, Clark Rodimon and Byron Goodman of the ARRL around the G.E. compound in Schenectady.

Prof. Archibald: "Yale - Exploration expedition to New Guinea, etc." I can't verify the Yale connection, but Wikipedia offers the following. "Richard Archbold (April 9, 1907 - August 1, 1976) was an American zoologist and philanthropist. He was independently wealthy, being the grandson of the capitalist John Dustin Archbold. He was educated at private schools and later attended classes at Columbia University though he never

graduated. He used his share of his family's wealth first to sponsor a series of biological expeditions to New Guinea for the American Museum of Natural History, and later to establish, maintain and endow a biological research station in Florida. In 1929 Archbold joined the ranks of members of the Explorers Club in New York.¹⁵ Another web page about the Archbold Expeditions¹⁶ verifies this information. *QST* mentions these expeditions three times. *QST* for March 1936, page 43, discusses the American Museum of Natural History Expedition to New Guinea. *QST* for October 1937, page 46, *New Guinea Expeditions*," says in part, "The Museum plans are made in cooperation with Mr. Richard Archibald, research backer." Later in the article we read, "Two HRO receivers will be used ..." *QST* for June 1938 says, in part, "Operator Harold G. Ramm (W2BVB) of the Archbold New Guinea Expedition writes from Java that the expedition has been assigned the call PK6XX." Note the change in spelling of Archbold's name from 1937 to 1938.

John Wells: "W1ZD - Pres., American Optical Co." A Harvard graduate, better known to hams as the co-founder with Clifford Harvey, W1RF, of Harvey-Wells Electronics in 1939. Among other things, Harvey-Wells produced the well-known TBS-50 Bandmaster series of transmitters in the '40s and '50s.

Percy Spencer: "W1GBE - Raytheon co-founder" Percy Lebaron Spencer was a self-taught electrical engineer. While not a co-founder of Raytheon, he was, by 1939, the chief of Raytheon's power tube division and an expert in radar tube design. During WWII he increased magnetron output from 17 per day to 2600 per day. After the war he developed the Microwave Oven. He became Senior

Vice President and Senior Member of the Board of Directors of Raytheon, and received 300 patents during his career. He was awarded an honorary Doctor of Science degree by the University of Massachusetts.¹⁷

Admiral Byrd: "South Pole Expedition" Rear Admiral Richard Evelyn Byrd, Jr., USN(25 October 1888 – 11 March 1957) was an American naval officer who specialized in feats of exploration. He was a pioneering American aviator, polar explorer, and organizer of polar logistics. Aircraft flights, in which he served as a navigator and expedition leader, crossed the Atlantic Ocean, a segment of the Arctic Ocean, and a segment of the Antarctic Plateau. Byrd claimed that his expeditions had been the first to reach the North Pole and the South Pole by air. Byrd was a recipient of the Medal of Honor, the highest honor for heroism given by the United States.¹⁸

George Bailey: "W1KH – Pres. ARRL, Pres. Bailey Tile Co." In January 1935 George W. Bailey was the New England Division ARRL Director. As W2KH, he was ARRL President from 1940 through 1952. He helped many hams find radio-related work with the government and the Military Services during WWII.

ARRL Staff:

W1EH – K. B. Warner: In April, 1925, Kenneth B. Warner was the Secretary of the ARRL, *QST* Editor, and Business Manager. In January, 1935 he was listed as Secretary, Editor-in-Chief, and Business Manager.

F. C. Beekley: In the April 1925 *QST* F. Cheney Beekley, W1GS, is listed as Assistant Editor, *QST*. In January 1935 he was the Advertising Manager. He was 3JS in 1915, 1KP and then W1KP in 1929 and earlier, W1GS in 1933. His

writing appears 11 times in *QST* from 1925 to 1944, from one paragraph *Strays* and *Hints and Kinks* to an editorial and to an article about his 1915 receiver.

Ross Hull: Born in Melbourne, Australia in 1902. Joined ARRL Staff in 1926. Lead ARRL's Technical Development Program to develop new transmitting and receiving apparatus to meet the requirements of the 1929 Regulations. Returned to Australia in 1929 and became Technical Editor of *Wireless Weekly*. Returned to US and Managing Editor of *QST* in 1931. In 1935, Associate Editor of *QST*. In 1938, General Manager of ARRL Publications. Editor of the ARRL *Radio Amateur's Handbook*. Pianist, artist, and amateur photographer, interested in astronomy and model airplanes. Golfer and skier. In 1938 died of electrocution while working on an experimental television receiver.

Clark Rodimon: In 1928 *QST* article lists Clark C. Rodimon as "1SZ/1BIZ ARRL Headquarters." Progressed to Editorial Department in 1929, Associate Editor in 1930, and Managing Editor from 1930 to 1942. W1SZ through 1941. Went with Raytheon in 1942 and organized their field Engineering Department. Stayed with Raytheon after the war. W4SZ in 1951.

Jim Lamb: James J. Lamb, W1CEI and later W1AL, Technical Editor of *QST* and creator of the "single signal" receiver. After the ARRL, Lamb went on to Remington-Rand (Director, Electronic Research) and Sperry-Univac, finally serving as chief scientist for the U. S. Army at Ft. Huachuca.¹⁹ Introduced the crystal filter to amateur receivers in 1932, and the noise silencer in 1936. *Technical Information Service* and *Experimenters Section* ARRL, 1928. *QST* Technical Editor, 1929 to 1939. Consultant

(ARRL), 1939. Research Engineer ARRL, 1940 to 1945.

George Grammer: George Grammer, W1DF, was a longtime *QST* associate. In 1929 he is listed as "ARRL Technical Information Service." In 1930 he became the *QST* Assistant Technical Editor. In 1939 he was promoted to the full Technical Editor, succeeding James J. Lamb. His last *QST* publication was in November 1971 when he was listed as a Technical Consultant. True to his name, George's *QST* articles were always impeccably written.

R. B. Bourne: W1ANA, An occasional contributor to *QST* in the 1930s. In an October 1937 article with Ross Hull, *Radio Control of Model Aircraft*, listed as from "Maxim Silencer Co., Hartford, Conn." In the '60s he was Curator of the ARRL Museum and wrote the *25 Years Ago* and *50 Years Ago* in *QST* columns.

Doc Woodruff: In the January 1935 *QST*, Dr. Eugene C. Woodruff, W8CMP, is listed as the Atlantic Division ARRL Director, resident in State College, PA. In 1936 he succeeded Hiram Percy Maxim as President of the ARRL, serving until 1940.

Bud Long: Arthur Lyle Budlong, W1BUD, was a longtime ARRL staffer. In February, 1924 he appears as "Secretary, ARRL Railroad Emergency Service Committee." In July 1929 he was the Conductor of the *IARU News* column. He wrote many *QST* editorials in the 1930s. In May 1936 and in April 1940 he was the ARRL Assistant Secretary with call W1JFN. *QST* for December 1945 lists him as Senior Assistant Secretary, ARRL on leave of absence as Lieutenant Commander, USCG, and as the ARRL representative to the Rio Conference. In January 1947 he is ARRL Assistant Secretary and American advisor

to the Five-Power Telecommunications Conference in Moscow. In October 1947 he is a U. S. Delegation representative to the Atlantic City world (radio allocation) conference. In September, 1949 he is the Managing Secretary, ARRL. At the November, 1960 ARRL Executive Committee meeting, he is the ARRL General Manager.

Ed Handy: F. Edward Handy, W1BDI, was the ARRL Traffic Manager in 1925 and the Communications Manager from 1926 through 1967 with time off for service from 1942 until 1945. He wrote the original ARRL handbook, known as *Handy's Handy Handbook* in 1926.

Byron Goodman: Byron H. Goodman W6CAL, W1JPE, W1DX, starts to show up in *QST* as an ARRL staffer in November 1936 when he is listed as an Assistant Secretary ARRL and the conductor of the *IARU News* column. Prior to that he contributed an article and a letter in 1934. Also in the '30s and '40s he runs the *How's DX* column in *QST*. In 1941 he is listed as Assistant Technical Editor, his job through 1967. He's absent from *QST* from March, 1942 to November, 1945 suggesting war service. In September, 1948 he began the *On the Air with Single Sideband* column.

Willard Wilson: Willard S. Wilson, W3DQ, 405 Delaware Ave., Wilmington, Delaware, wrote two articles for *QST*. In May, 1936 he wrote, *An IF Coupling Amplifier for the Cathode Ray Oscilloscope*. In June 1937 he wrote *A 28-Mc Mobile Installation*, which included an HRO-Jr in his car's back seat. He does not appear to have been on the ARRL Staff. Back in the '30s he was the proprietor of the Delaware Radio Sales Company and the Wilmington Electric Specialty Company.⁵

Bill Orr also reported¹ that Percy

Spencer, Thorne Donnelly, Ross Hull and K. B. Warner were recipients of the first HROs, and he contributed one additional owner, Charlie Kolster, the Radio Inspector in the FCC Boston Office. As Bill tells it, "Charlie was quite impressed with the receiver and when Jim Millen wished to replace his old 2BYP call with a first district call, Charlie confided that Jim could have W1HRO, in honor of the new receiver. Alas! The fledgling FCC goofed and instead Jim ended up with the call W1HRX!" It's perhaps understandable that Jim Millen would leave Charlie off his list.

I was not able to find any further information on Paul Davis, "Pres., Chicago Board of Trade." If any readers of this article can supply further information Mr. Davis or on the other original owners, please write a letter to Editor Ray Osterwald and let us all know more about them.

James Millen and HRO Stories

Now I'd like to switch to the present time and share with you the letter that Pete Patton wrote to me when I proposed this article to him. Pete has a number of good stories about Jim Millen and the HRO to tell, and they are best in his own words.

"Dear Jim,

"*What a surprise to receive your letter. It brought back many memories of my dear friend Jim Millen, W1HRX. I visited him in the fall of 1978 when I was planning a book on the history of the HRO, which alas, I was never able to complete. At the time I owned about 100 HROs including an HRO 500 and a 600. I would be happy to contribute my memories of Jim's many stories about the HRO for use in your possible ER article. I was about 54 then and he was 82; I was consulting for Medtronic as an expert*

witness in patent infringement suits and Jim was wearing out his third Medtronic pacemaker at the time so we had that in common as well as amateur radio and the HRO. I guess this will be stream of consciousness in format so you can edit it to suit your purposes.

"Naturally one of the first things I wanted to see was the HRO (0 to 500) tuning knob patent. He said they had never patented it (Jim was an ME and had a hand in the design of it) due to the rush to get the HRO into production and the market place. He said the Germans and the Japanese both tried to copy it for their HRO circuit-equivalent plug-in coil radios (which I had in my collection) but could not. Near the end of the war the Germans gave a contract to the Czechs who were the only ones able to do it. No surprise there, the Slovak proverb says 'the Czechs have hands of gold.'

"Naturally National Radio's early major market was to the FAA and the airlines. Millen had already had some success with the AGS with the FAA but his HRO breakthrough came in 1937 when he got to this factory in Maiden and found a Boston taxi waiting for him to open the doors. In the taxi sleeping was 'a tall lanky cowboy with western boots and a western hat asleep in the back seat with his boots sticking out a rear window.' (Millen's words) That 'cowboy' was Howard Hughes who was planning his round-the-world flight the following year and wanted to buy three HROs for strategically located ground stations on his flight path. He gave the radios considerable credit for his success, and when he founded TWA, flying from St. Louis to Los Angeles, he bought a large number of HROs with only the D coil, tuned to the early aircraft HF frequency 3380 kc. (I checked my memory of this

frequency with the TWA museum), mounted two-each in waterproof steel boxes with loaded whip antennas on telephone poles along the route of his Ford Trimotors, each pair having an audio line to the nearest airport. Millen said that kind of care made a very big impression on the FAA and the potential role of radio communications in air safety. Also TWA used the pilot's check list for safety before Boeing adopted it during the B-17 test program (after they had lost two planes and their best test pilots). For many years I taught aircraft structural design and always started my classes by asking: "What technology has contributed the most to air transportation safety?" The students would come up with all kinds of high-tech guesses that were not available in 1938-9 but never guessed the answer; the pencil and paper, i.e., the pilot's checklist. Never overlook low-tech, I would advise them.

"Millen was also pretty proud of the long walls of rack-mounted HROs at Bletchley Park in the UK during WWII. The operators gave a lot of credit to the HROs for being able to accurately copy German wireless radio traffic anywhere on the continent.

"My degrees are in EE, ME, and Aerospace Eng. so naturally I enjoyed discussing the role of mechanical engineers in the development of radio. I told Jim [Millen] that if you don't think it takes an ME to design a radio just look inside a Collins R-390A! Or, figure out how an HRO tuning dial works. An interesting side-bar I never got into was the role of Herbert Hoover, Jr. in the design of the HRO electronics.

"Although Jim saw the FAA as his premier customer he was never very fond of bureaucracy. When he renewed his call he made a deal with the FCC to get

the call letters 'W1HRO' because of his role in the development of the HRO. The head of the FCC at the time thought that was a very fitting tribute and accepted his application for it. When the call came it was unfortunately W1HRX. Naturally, Jim appealed but was told by the bureaucracy that there was no procedure for changing a call once it was issued. Like the Ancient Mariner who 'stoppeth one in three' to tell his sad tale, Jim never overlooked an opportunity to tell this story.

"Another, but pre-HRO Millen story arose from the two entrances and addresses on his factory building in Maiden, I was only there once in 1955. At the time I was a student at Harvard and owned an HRO-60R and called the factory to see if they would sell me an empty 60T cabinet. They were happy to do so for only \$30 but I had to come and pick it up. I went there by public transit but the box was too big to 'schlepp' back to my dorm room that way so they called me a cab. As I remember the cab fare was \$4.10, hi hi! Well it was 60 years ago.

"When I first met Jim many years later I asked him why his factory had two street addresses, one around the corner from the other. He said they had activated the side-street address and entry when 'old man Cardwell' (Jim's words) threatened to force out of business everyone using his patented variable capacitor design. At that time National's product was the 'Thrill Box' the SW-3, so they offered their products in kit form, complete with the variable caps, but offered complete radios from the alternate side address under another corporate name. That way if Cardwell actually won his shotgun patent infringement suit they could just take the phony company down without risking the main firm. Cardwell

misunderstood the patent system and tried to gain a strangle hold on the manufacture of all radios by refusing to license his patent for the Cardwell capacitor. Millen said that the new RCA (which began life as a patent licensing organization in 1918 to protect the new American electronic industry from the giant Dutch Phillips company called Gloelampenfabriken) took up the radio manufacturer's cause and won the case forcing Cardwell to license his technology. So the side-door corporation on the cross street was no longer needed, but it was still there in 1955 when I visited the plant. If anything else comes to mind I will let you know. Vy 73,

Pete

Pete, WØEWQ (since 1950)"

I have just two comments on Pete's letter. First, the HRO Micrometer Tuning Dial did receive patent number 2,060,537, issued November 10, 1936, to William Graydon Smith and assigned to the National Company. You can see a copy of that patent at this Internet address:

http://n4trb.com/AmateurRadio/National/Lamb/images/2060537_INDICATING_DEVICE.pdf. Perhaps Jim Millen had forgotten about the patent over the years.

Secondly, I'd heard Pete's story about the side-street address for the National Factory before. It was reported by Bill Orr²⁰ and I repeated it later in my ER story²¹ about the SW-3. Per my ER article, "The very first SW3s were apparently not made under an RCA license. To limit liability, receivers were sold as 'unwired

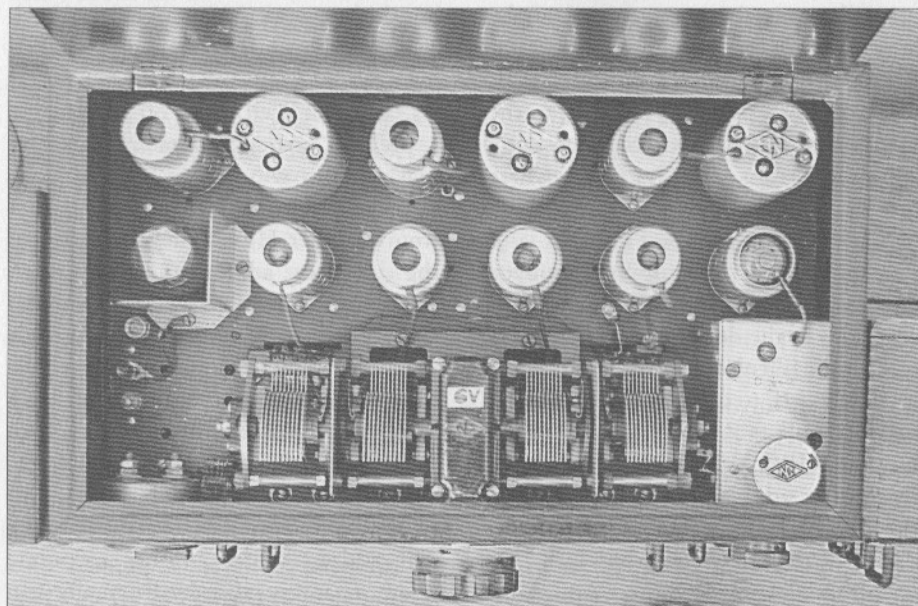


Figure 7: Here is a view under the lid of Gary Halverson's original 1935 HRO. (Photo Courtesy of K6GLH)

kits' and (presumably) were wired by 'Jackson Laboratories' before shipment. Jackson Laboratories was a dummy company named after one of the streets on which National was located. An early SW3 with the Jackson Laboratory stamp on its shipping carton is indeed a vintage collector's item."

Other than the difference between RCA and Cardwell being the bad guy, it seems to be the same story.

In conclusion, I want to acknowledge the several people who have made this

article possible. Thanks first of all to Doctor Peter Patton for allowing us to publish his correspondence with Jim Millen and for his most recent letter. Thanks to Mort Jones for saving the Millen letters and passing them on to me. Thanks to Dave Gordon-Smith for finding more information on many of the original HRO owners. And finally thanks to Jim Millen, Herbert Hoover, Jr., Howard Morgan, and the other members of the HRO design team for such a wonderful receiver.

Footnotes:

1. Bill Orr, W6SAI, *The Wonderful HRO Receiver*, 1975, CQ, May 1975. Also Jim Hanlon, W8KGI, *An HRO Story*, Electric Radio, ER #62 and 63, June and July, 1994
2. <http://www.radioblvd.com/National%20HRO.htm>
3. http://en.wikipedia.org/wiki/Herbert_Hoover_Jr
4. http://en.wikipedia.org/wiki/Howard_Hughes
5. Private correspondence, David Gordon-Smith, G3UUR
6. <http://amateurradio.eu/gm/silent-keys/w5w-wilmer-allison.htm>
7. www.encyclopediaofarkansas.net/encyclopedia/entry-detail.aspx?entryID=3588
8. http://en.wikipedia.org/wiki/Kansas_City_Bridge_Company
9. <http://chuckmanchicagonostalgia.wordpress.com/2012/02/10/postcard-chicago-chicago-radio-apparatus-company-415-s-dearborn-short-wave-1939/>
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13. http://bendixradiofoundation.com/hist_early.htm
14. http://en.wikipedia.org/wiki/Love_Canal
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16. <http://www.archboldexpeditions.org/html/history.html>
17. http://en.wikipedia.org/wiki/Percy_Spencer
18. http://en.wikipedia.org/wiki/Richard_E_Byrd
19. <http://n4trb.com/AmateurRadio/National/Lamb/JamesJLamb.htm>
20. William I. Orr, W6SAI, 1971, *The Year is 1931. National Radio introduces the SW-3 All-Wave Receiver*, CQ, July 1971, pp 34 to 38, 94, 96
21. Jim Hanlon, W8KGI, 1993, *The National SW-3 or, The Quintessential Regenerative Receiver*, Electric Radio, ER #52, August 1993, pp 10 to 14, 33

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