

Central Oklahoma Radio Amateurs

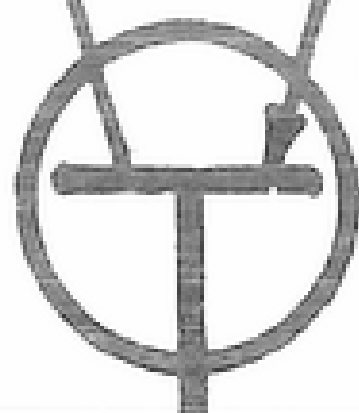
COLLECTOR

AND

EMITTER

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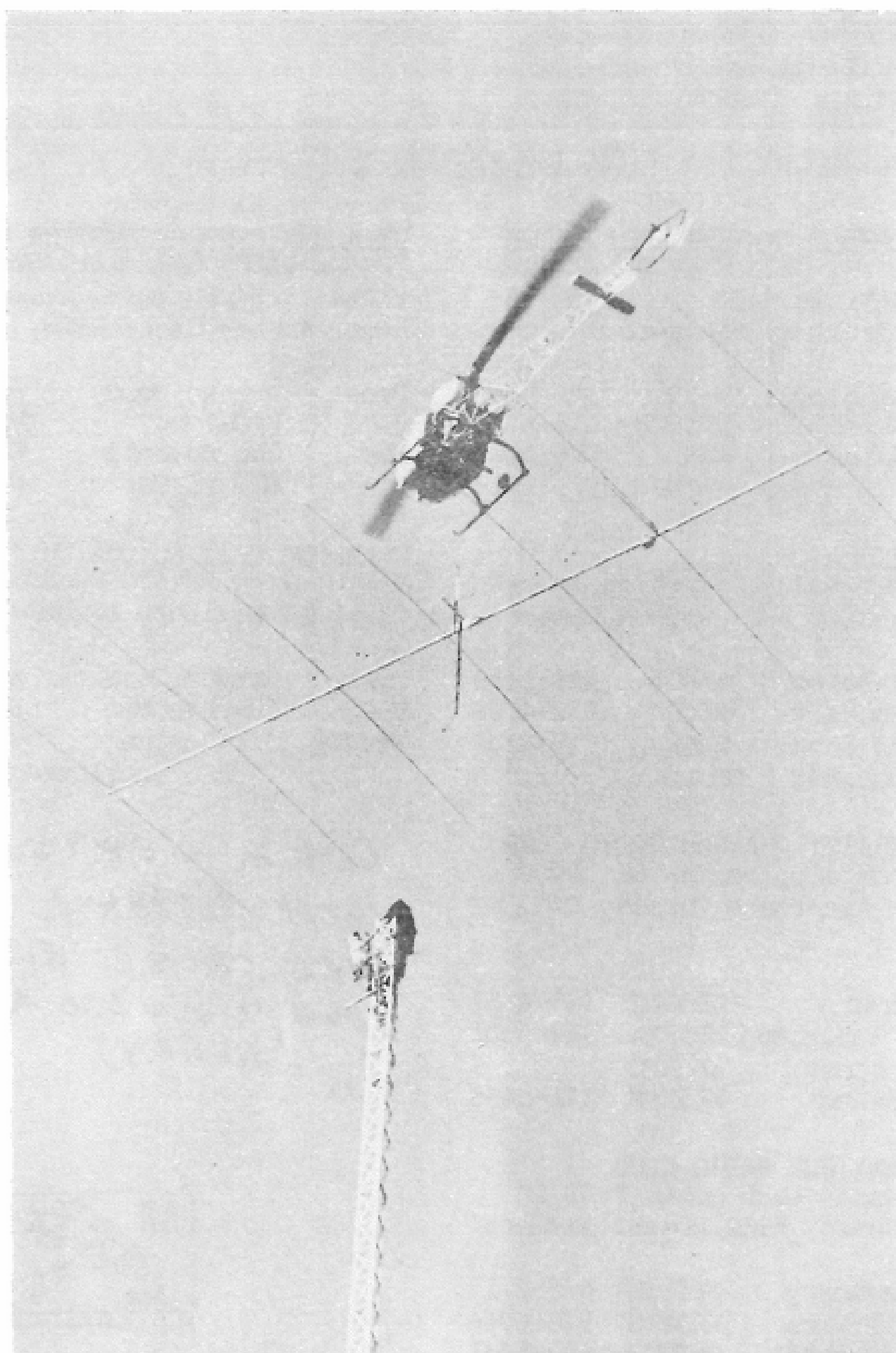


MAY 1977

VOL 3 No 28

AN INFORMATIVE MAGAZINE  
PUBLISHED MONTHLY BY AND  
FOR OKLAHOMA RADIO  
AMATEURS

AND ANYONE INTERESTED IN  
LEARNING ABOUT IT



#### HAMMING IN THE GRAND MANNER

Yes Virginia, that's really a helicopter carrying a seven element twenty meter beam! Phil Ashcroft, N5DD, and friend, astraddle a 145 foot tower, await air freight delivery of a new antenna. Story Page 3.

Central Oklahoma Radio Amateurs

COLLECTOR AND EMITTER

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Managing Editor Joe Harding, WA5ZNF 737-1044

Central Oklahoma Radio Amateurs, Inc. (CORA) is a not-for profit association of radio amateurs, founded for the promotion of interest in amateur radio communication and experimentation, for the advancement of the radio art and of the public welfare and operates to enhance the cooperation of member clubs in sponsoring activities of mutual interest to the clubs and all radio amateurs.

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### PARTICIPATING CLUBS FOR CORA COLLECTOR & EMITTER:

AERONAUTICAL CENTER AMATEUR RADIO CLUB  
Poatal Station 18, Okla City OK 73169  
MEETS; 8:00 PM First Friday each month  
Flight Standards Bldg, FAA Aero Center

Pres	Dave Langley	W4YDY	722-0462
Assist	Lloyd Kirk	WB5HUP	685-6566
v-P	Bill Hulse	W5NI	376-2125
Sec/Tr	Robert Runyon	W5JES	373-1818

OKLAHOMA CENTRAL AMATEUR RADIO CLUB  
323 NW 10th, Okla City OK 73103  
MEETS: 8:00 PM third Friday each month  
American Red Cross Bldg, 10th & Hudson

Pres	T. Van Woody	W5FMX	942-2831
V-P	Ken Ford	WB5KHU	528-8770
Sec	Joe Buswell	WA5TRS	732-0676
Treas	Ellard Foster	W5KE	789-6702

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MEETS: 8:00 PM Tuesday, first full week in month. Okla City EOC, 4600 N Eastern

Pres	Chet Hazelwood	W5GDL	427-1439
V-P	John Huckaby	K5QDR	672-4706
Sec/Tr	Richard Zanni	WB6FYL	691-1809

Dues: Sid Gerber, 829 E Bouse, MWC, 73110

OKLAHOMA CITY AUTOPATCH ASSOCIATION  
MEETS: 7:30 PM 3rd Tuesday, Bi-Monthly  
Oklahoma Military Academy 36th & Grand

Pres	Gary McCormick	WA5ETV	946-2898
V-P	Guy Liebman	K5GL	787-9547
Sec/Tr	Jim Denman	WB5EOL	681-6048

7705 S Charlotte Dr OKC 73159

OKLAHOMA UNIVERSITY AMATEUR RADIO CLUB  
202 W Boyd, Room 219, Norman OK 73069  
MEETS: 7;30 PM Alternate Tuesday STUDENT UNION Room 161

Pres	Kim Elmore	WB5CLC	325-6717
V-P	Kenny Hutchison	WB5RXZ	364-3001
Sec	James Jones	WB5RKO	
Treas	Mike Salem	WA5EPK	321-5453

BICENTENNIAL AMATEUR RADIO CLUB  
MEETS: 3rd Tuesday each month 7:00 PM  
AIR National Guard, Will Rogers Airport

Pres	Ken Newberry	WB5PYN	685-2717
V-P	John Oltmans	WB5PZG	525-6066
Sec	Jim Townsend	WB5VCB	632-5445
Treas	C Y Chandler	WB5TKG	232-9005

CORA MEETS 7:30 PM  
4TH FRIDAY  
RED CROSS BLDG  
10TH & HUDSON  
(ALLEY)



## C & E COVER STORY--HAMMING IN THE GRAND MANNER

I once had a professor who suggested to his students that they should practice law as it used to be done in the olden days in what was noted as the "Grand Manner." Alas, the problems and difficulties associated with working in our modern society leave something to be desired when contemplating the significance of present day employment. Needless to say, there are some individuals who do make an attempt to establish a type of "Grand Style" if not in their employment, then certainly in their hobbies. Our cover photograph shows one station that should qualify under this description and the way he goes about it is its subject.

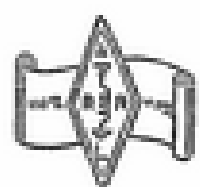
Several weeks ago while a few of us were rummaging south of the Red River in Dallas, we ran across an amateur station which must qualify as some type of record, at least for this region. While driving on the Interstate approaching downtown Dallas, I spied an antenna farm that looked like a splinter organization for Collins Radio. As we passed, I counted some nine separate towers that ranged in heights up to 145 feet with a multitude of antennas ranging from what looked like dipoles to gigantic monoband arrays. I was not able to verify the setup until later in the day when Stan WB5UIY took us by the station of Phil Ashcraft, WB5DTX. We stopped in a caravan of three cars and all of us piled out to examine what must be the biggest antenna farm north of the Pecos River. Even by normal Texas size standards, this antenna setup was huge. Phil had set up his station in a separate building from those buildings of his business. On the land which comprised his station, he managed to erect some 9 different towers with several over 100 feet and the tallest antenna support topping out at 145 feet. On top of that tower, as the cover photo shows, is a 7 element Yagi 20 Meter beam. The antenna was so big that the only practical way to hoist it into place was with a helicopter. (That's Phil on the tower!) On the other towers around the premises rested a variety of multielement beams for the various bands. VHF and UHF omnidirectional antennas of the type usually used for commercial service repeater operation were in place on a few towers. Several dipoles and inverted vees were tied up a few of the towers. Phil has winches and seats on several of the towers to make access to the top easier. A complete description of area is difficult. The concentration of so many towers and antennas in what appeared to be about 300 foot by 150 foot area was boggling.

Inside the shack is complete living quarters (for those all weekend long contests) and a well equipped station. The station sports a complete Collins S-line including a KWM2 and the 2K amplifier. Alternative, Phil can select a Signal One CX7A and an ETO 2k amplifier. Several rotor controls, Heathkit station monitor, frequency counter, typecoder unit, plus all types of coaxial switches are just a few of the many accessories.

The station doesn't stop here. WR5AMK repeater is located in downtown Dallas on the Greenville Avenue Bank and Trust Company. The repeater is open and operates on 147.87-27 Mhz with a closed autopatch. It has a continuous output of 100 watts and is manufactured by RCA. Phil has been known to pass out free memberships to visitors of WB5DTX.

WB5DTX is a multi-station contest facility. Phil has previously held the call of WB5BFZ and currently hold N5DD. And it gladdened my heart to find out that he is a transplanted Okie who graduated from Oklahoma University in 1929 and was a member of Alpha Tau Omega. Good Show! Hey Phil, will the station be open for business during the OU-Texas game next year?

Micheal Salem WA5EPK



W5PAA

## YAKKEY-DEE-YAK FROM THE PRESIDENT

I want to thank Leonard Hollar, WA5FSN, for coming over from Kingfisher and talking to the club in April. Everyone enjoyed his presentation and that was evidenced by the discussion that followed.

Bill, K3TGY, is still waiting for parts from the manufacturer of his computer, so we have delayed his presentation until a later date. For the May program we will have Norm Crawford, KG6JBH. He will present a slide program on Field Day activities while he was with the FAA in Guam. This should help spark more interest in our own Field Day coming up soon.

The ACARC now has both HF operating positions at W5PAA equipped with new transmitting and receiving equipment. Those that attended last months meeting saw the new Kenwood twins. And this month, our old Drake twins have been upgraded to a new Drake TR-4CW Transceiver, George, W5NTL, should have alot less HF station maintance to perform now. The club wishes to thank those that assisted in this project and most of the appreciation goes to Rob, W5JES, for his time and energy spent in making the transactions for the club. The next time I plan to trade equipment, I think I shall hire him for my agent!

I think our next big project for W5PAA next year might be upgrading the 2 meter position to a 4 MHz FM-SSB-CW transceiver. This is something we can all be think about.

Dave, W4YDY/K5NC

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## Minutes of the ACARC Meeting - May 6. 1977

The meeting was called to order by President Dave at 2005 with 57 members and guests in attendance.

OLD BUSINESS: Bob, W5HXL, reported on the pending flea market to be held at OMA. Bill, K5KDR, reported on current CORA activities. The bumper sticker project has progressed to the point of ordering the stickers to be given out at Ham Holiday, and clubs to be able to order extras as need for internal use. A discussion was held concerning coming up with an award for working Oklahoma City stations. Joe Harding is looking for an understudy for the Collector & Emitter... He needs a circulation manager.

Following the CORA presentation, a discussion was held resulting in a motion which carried for the ACARC to take 100 of the stickers provided the language on the sticker includes "Amateur Radio".

Ivan, W5HFU, announced he is in charge of ads for C&E, and suggested members consider taking out ads for Christmas as a way of greeting.

The Secretary rendered a report to the membership on the new equipment which has been installed in the club station.

Bill, K5KDR, requested and received volunteers for C&E publication this month, as follows: George, WB5QNU, Howard, W5WSW, George, W5NTL, Bob, W5HXL, JW, WA5KFT, and Norm, KG6JBH.

NEW BUSINESS: Bob, W5HXL, announced final plans for the Roman Nose Outing to be held the weekend of April 16.

Charlie, WA5JGU, reported on status of the redio classes.

CORA Collector & Emitter



Dave, W4YDY/5, advised the membership that the FCC rules still require notification to the Commission on permanent moves.

The Secretary rendered a report on the Central States VHF Society meeting in Stillwater, and the formation of an interim group to form an organization representing Oklahoma VHF interests. Several members of the ACARC are on the pilot committee.

Gene, WB5SQC, reported that programs promoting amateur radio are available from CORA.

PROGRAM: Leonard Hollar, WA5FSN, ARRL SCM gave the program for the evening with stress on the "public service" aspects of our hobby, and the emergency coordination aspects. Leonards presentation lead to considerable discussion which was both fruitful and informative. Thanks Leonard, for a fine program.

The meeting was adjourned at 2118 for coffee, donuts, and good fellowship!!

73 Robby WSJES

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#### ACARC FOUNDATIONS:

Since becoming an official of the club, I've engaged in some dialogue with various of the "old timers" in the outfit relative to the origins, and history of the ACARC. Starting with this little story, and continuing for a while, I'd like to retrace some of the history of the organization, and give some credit to those who have nurtured the club along until it passed into the present. I do not appoint myself the club historian, and therefore do not represent these as absolute fact derived from scholarly and intensive research. By way of disclaimer, if I gloss over an important piece of history or fail to credit someone along the line with having made a significant contribution, then it is through my ignorance, and by no means to slight anyone. I was quite active in the club for a short period until about 1964 when my activity waned. I never held office nor did I contribute anything by my presence. I did play the gadfly on occasion for Bill Todd, W5UZX. Bill and I were good friends and at no time allowed our differences on any subject to escape control. There was alot going on in those days, and some strong wills were needed at the helm to establish the directions which the organization would take. Directions, by the way, which are today still valid. Two things stand out among many: first, the early decision to affiliate the club with ARRL, and maintain 100% joint membership. The wisdom of that policy has often been called into serious question, and the policy has been reaffirmed each time. The wisdom of the choice is becoming more apparant during the current unsettled times for our hobby (and for some, avocation). Second, the negotiations with the Employees Association for the bookstore, and residual financial support, giving the club a financial base for our activities that has been crucial to continued survival during past years, and destined to be even more so in the future. The men involved in these matters, as well as the multitude of lesser decisions over the years should enjoy a very good feeling that the hard, and often controversial choices that were made have stood the test of time and proven correct.

Birth of the Aeronautical Center Amateur Radio Club was attended by three midwives. In alphabetical order; Carl Drumeller, WØEHC, Claude Gardner, W5AGM, and John Ott, W5HEV. The birth was affected early in 1946 when the FCC lifted the war-time ban on radio operation. Carl, Claude, and John were all working at the old CAA Signals Training Center in Ft. Worth. All three were amateurs, and had a yen to get back on the air. They did get on the air together, and formed an informal organization around common equipment. This

informal club relationship came with the men to Oklahoma City along with the transfer of personnel and equipment from the Signals Training Center to the then new Aeronautical Center. The club put its station back on the air from the Center, and applied for formal recognition from the FCC with a club station license.

At about that same time, the Employees Association was formed at the Aeronautical Center. One tenent of the new Association was to sponsor specialty-type clubs with the employee group at the Center. The Radio Club was the first such organization to be constituted in that category having already been in existence and having foundations already laid for the affiliation. Thus, the ACARC pre-dates the EA by some little bit and claims to be the senior employee organization of the Center.

The club has brought not only national, but international attention to the Aeronautical Center. Radio Station W5PAA is known the world over through its operation by resident employees, and students alike. The magazine Collector and Emitter, ranks high among amateur publications throughout the world, and that high quality has been maintained under subsequent CORA publication. The club has maintained a high standard of excellence among other employee organizations throughout the years.

That is how it all began. In subsequent articles, we will examine various aspects of the club and its development with an eye toward establishing some sort of assembled historical framework for the club up to this point in time. For this series I have, and will continue to draw heavily on material provided by Carl, W5JJ, and others. I do so with full recognition that any one of the men remaining who were there could do a better job on the project. However, if they will permit, I will continue to plagiarize their material wherever possible, and complete the series as started. I would appreciate any information from anyone about anything involving the history of the club. I promise not to distort the facts too much when incorporating it into the articles.

#### DX-PEDITION:

W5CJZ/C6A, and W5CPI/C6A will be in operation at Harbour Island May 7 through 13. They will operate as follows:

7285 MHz Darktime (after 2100 hours)  
14285 MHz Mornings and late afternoons  
21385 MHz Early afternoons  
28585 MHz As open  
(Operation on CW 30KHz up from bottom of bands)

Specific watches for Oklahoma City area stations will be maintained as follows:

14285 MHz 1700 - 1800 CDT  
21385 MHz 1300 - 1400 CDT

Concentration will be on Oklahoma City Area contacts most of the day Sunday May 8, 1977.

Thanks for the information Jack...Have a pleasant trip, and enjoy the DX.

Robby W5JES

As this copy is being prepared, I just learned that Dave, W4YDY/5 has received his new secondary call K5NC... Congratulations Dave... The new call was added to the Yak-de-Yak column for this issue.

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TECHNICAL REVIEW  
- W5JJ-

ELECTRONIC PRODUCTS, Mar, shows 25 years of advancement in digital multimeters. Remarkable!

73, Apr, describes a 21-MHz vertical antenna, tells how one opr got started with teleprinters, continues on with its series about PC boards, gives hints on how to minimise noise in a mobile station, tells how to mate a telephone handset to a mobile transceiver, revives the old idea on a resistive-input RF amplifier, tosses out hints on resurrection deceased NiCad cells, has another episode of its enchanting series on the early days of amateur radio, reproduces infor thats been in every Handbook since the year zero on widening filament transformers, shows a complex but effective way of making a two-meter antenna double for MF BC reception, describes the construction of a complex receiver, and tops it all off with a factual article on VSWR myths. Quite an issue!

IEEE SPECTRUM, Mar, introduces Gallium Arsenide "MESFET" devices tells how space shuttle communications will be handled, and describes GE's IC thats the guts of a whole AM-FM receiver.

ELECTRONIC TECHNICIAN/DEALER, Mar, courtesy of WSKE, touts the many uses of a Field Strength Meter.

HAM RADIO, Apr, starts off with a block-buster on microwave RF generators then trickles off to lesser one on a SS SSB xmtr, remote-controlled stations as an alternate to repeaters, and the start of a series on designing and understanding antennas. This appears to be the carbon copy of an article the smae auther sold to CQ!!!

RADIO COMMUNICATION, Feb, is shipped in a plastic sack that provides dual service: It bears advertising, and it defies destruction by the Postal Service! This issue describes the building of a transistorized send-receive VHF converter, continues its series on crystal filters, and has many commendable ideas in its Technical Topics.

QST, Apr, has its usual April Fool article. Its main forte concerns antennas and feedlines. After reading Lew McCoy and By Goodman's two articles, even the most fanatic devotee of the cult of transmission line mythology should have his faith shaken! Top this with a number of well-written items on several types of antennas, and you'll conclude this is a memorable issue. The creme de creme, though, is W5DA's article on solid-state substitutes for vacuum tubes.

CQ, May, provides instruction for converting a "cheap and dirty" VSWR meter into one thats at least semi-trustworthy. W6SAI tells why tubes have certain filament voltages. Also, he describes several antennas of interest to DXers. W9EGQ gives sage operating advice to Novices; many others could profit by his guidelines! K8EEG reviews the HW-8 transceiver. Note the adv for the new Swan SS747 dual-VFO transceiver. The price, \$849.95, looks highly attractive until you read the fine print about how many desired features are extra-cost options.

POPULAR ELECTRONICS, May, reviews the TS-820 transceiver and reproduces some factory-issued information on the VMOS high-powered FET Siliconix, Inc.

RADIO COMMUNICATION, Mar, describes the building of a solid-state SSB generator using the "third method." It reviews the Yaesu FRG-7 receiver; a new model has a fine-tuning control for

ease of receiving SSB, removing my main objection to the one I have. "Technical Topics," as customary, has a variety of highly interesting vignettes.

HAM RADIO HORIZONS, Jun, has a theme of antennas and towers. Jim Fisk has a superb yet simple article on HF antennas. Read it! W1SL covers VHF antennas, and W2EUQ touts the G5RV multi-band HF ant. W1KLK describes the uses of a wavemeter.

73, May, has several articles on using CB equipment in amateur bands (by amateurs, of course!). W9CI continues his fascinating account of early-day radio. WB0KTH makes a strong plea for learning CW, and WA1GFJ sez if you're going to use voice, then talk English, not a garble of CW abbreviations misused. AMEN! WA1PDY revives the old idea of dunking a dummy load resistor in oil to up its watt rating. WB0KTH clicks again with a neat idea for feeders to a vertical HF antenna.

IEEE SPECTRUM, Apr, features test instruments, a subject always of interest to amateurs of radio.

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#### AMATEUR RADIO OPERATING TRADITIONS -W5JJ-

Last month we talked about the traditional way of initiating a contact by radiotelegraphy, with a promise of going further into the matter of sustaining conversation. The key word in conversation. Your ability to initiate and to sustain a conversation with your fellow-amateur sets you apart from (and above!) the usual "report on signal strength, name, and location" type of operator. That type of "hit and run" contact seldom leaves one with a warm glow of having established a friendly rapport with the chap on the other end of the circuit!

Plan to get past the obligatory parts of the contact quickly and gracefully. Waste no words. WD5XAA R TNX FR CALL UR SIG RST 579IN OKLA CITY OKLA MY NAME IS JOE WAT GETS U UP SO EARLY OF A MORNING? CUDNT SLEEP SO THOT ID C WAT WAS ON THE BAND ES VY PSED TO GET A CALL FM U SO TELL ME WATS NEW WID U R WD5XAB de WD5XAA K

Note that you told how you were receiving him, where you were located, and your name (good for establishing a friendly exchange) quickly and without wasted words. Then you fielded a conversational opener by sliding into personal matters in a not too intrusive manner. This seldom fails to elicit a reply of a like nature. Soon you find yourself chatting on a person-to-person basis, just as though you'd met at a clubroom. And when you've concluded that chat, don't be astonished if, a few days later, you receive a QSL card thanking you for "one of the best contacts I've ever had". Sharpen up your ingenuity by devising a variety of conversational openers to fit specific operating situations. You'll find a rich reward in more satisfying contacts!

Remember the visitor, who, after an evening of pleasurable chatting, takes his leave, then, with one foot out of your door and the other inside, takes dreary minute after dreary minute in making his adieus? And how you (especially if its wintertime) stand there freezing in the breeze and having unpleasant thoughts about how those costly BTUs are escaping to the frigid outdoors, wishing he'd terminate his adieus and get t'hell outa there? Keep that vision firmly in mind each time you "sign off" with a station! Make your adieus crisp, terse, but not curt. Say it simply, politely.....and finally.

Remember, the essence of good, traditional operating procedure is

politeness and consideration of thers. All others.....not just the chap with whom you're chatting.

Although these remarks are addressed to radiotelegraph operators, they should be given full consideration by radiotelephone operators, too. Perhaps even more so, for its easier to let one's mouth "run off" than to tap out the extra words with a key!

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## ROBBY'S SOAPBOX

I counseled with a fellow amateur the other day to the effect that he really should not take this hobby so seriously, and not get upset when someone does or says something not particularly to his liking. Well, as in the case of all who try to dispense advice for others, I got caught in the "do-as-I-say-not-as-I-do" syndrome. While preparing the C&E copy today (Sunday) I was idly monitoring 34/94. What started out to be just something to do while working here in the shack, soon became a rather irritating experience. Two or three fellows, one with a rather old call (in fact, on his way to the QCWA luncheon) were engaged in conversation which sounded almost straight out of eleven meters. References to making trips, c'mons and references to the repeater as a channel were comingled with the conversation to the point I couldn't resist the urge to say something to them. I did... and was immediately misunderstood, because about that time an intruder showed up on the repeater adding to the confusion.

Well, the episode got me thinking again about the main thing setting apart an amateur from CB operator. Apart from the obvious fact of displaying a modicum of technical competence, the amateur is endowed with inherent good manners. Good manners include consideration for the other guy. Possibly even to the point of letting him make a jackass of himself on the air with inanities such as found on the eleven meter band. Good manners include also some self pride in establishing and using good operating techniques which are generally accepted among others sharing the frequencies. So...until (notice I do not say unless) until we all slip irrecoverably into sloppy, slipshod habits making us undistinguishable from our brethern on eleven...how about trying to keep the language and operating practices a cut above the other guys? Thanks good buddies, and all them good numbers on ya'all.

Robby W5JES

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## STOP PRESS -

The April 22, 1977 HR Report contains an article about the Jack Anderson Anti-Amateur Radio Column with the following information about individual letter writing:

"To Encourage Individual Efforts (letters to newspapers which carried the Anderson column) the League (ARRL) has created a special "Amateur Radio Promotion" certificate which it'll award to any Amateur whose Anderson rebuttal was published or whose other response to the column was publicized. To qualify send a clipping of your published reply to Pete O'Dell, Public Information Officer, at ARRL." ARRL's address is 225 Main Street, Newington, CT 06111.

Robby W5JES

## WANTED:

TA-4OKR, the 40m extender for a Modley TA-33 beam. Dave W4YDY/5/K5NC 722-0462

## WANTED:

Use of HF gear under 200w input operating direct on 12vdc for Field Day.

Contact Robby W5JES, or George W5NTL at the next ACARC meeting.

May 1977

## Jack Anderson

WASHINGTON — The Federal Communications Commission is quietly stifling the millions of voices that jam the Citizens Band radio frequencies. An estimated nine million licenses — truck drivers, teen-agers, housewives, even a former First Lady — now operate more than 20 million CB sets. The airwaves have become so crowded that the CB industry has appealed for more frequencies. These would have to be taken from the ham radio operators, who add up to no more than 300,000. Yet the commission has favored the few over the many.

The 300,000 hams have 100 times more airspace than is available to the nine million CB enthusiasts. The hams also have a lock on the higher frequencies, which are free from interference.

According to one confidential report, the hams now control more frequencies than all the nation's police and fire departments combined, plus all commercial and educational FM broadcasters, plus all the TV stations on the VHF channels in Los Angeles and New York City.

The telecommunications policymakers at the White House have quietly notified the Federal Communications Commission on three occasions that there would be no objections to expanding the airwaves for the CB users.

Still, the commission has refused to take the hint. One reason may be that CB radio is regulated by officials who, according to a confidential report, "have traditionally been hams." The report, prepared for Rep. Elliott Levitas, D-Ga., describes this arrangement as "the wolf guarding the flock."

The opposition to giving the CB industry a greater share of the airwaves has been generated largely by the American Radio Relay League, which the report describes as "a lobbying organization" representing ham operators.

The league has fired off a special "flash bulletin" to its members, urging them "to utilize every league resource" to prevent the incursion of CB buffs into their airspace.

Footnote: The Federal Communications Commission's chief engineer, Raymond Spence, is a lifetime member of the league. Yet he had made decisions detrimental to the CB industry. He denied that his membership is a conflict of interest.

(Open letter to Jack Anderson)

For several years I have read your column in the Oklahoma Journal and felt you were an outspoken source of reliable information. But, my faith in the objectivity of your reporting was severely shaken by your "Hams Jamming Airwaves" article in Sunday's Oklahoma Journal.

Your figures on the relative population of Amateurs and CBers were consistent with FCC releases on this subject, but otherwise the viewpoint was very narrow. You must have got your information from some CB operator who thinks, "I paid good money for my set and I should be allowed to use it any way I like," or from the DB sales industry whose only desire is to sell millions of foreign-made transceivers.

Among pertinent facts you overlooked were:

1. Most (Probably about 99%) of the CBers own sets which were designed and licensed to operate in only one band. To use Amateur frequencies they would have to buy different equipment.

2. Amateur licenses are available, presently at no cost, to any American citizen who will exert a little time to learn the basic elements of radio operating.

CORA Collector & Emitter

3. Many of the Amateur bands are established by international treaties.

4. Amateur radio operators are willing to share their frequencies, their knowledge, and their time with those who show adequate interest and a willingness to discipline themselves. Classes are being conducted throughout the nation, at small or no charge, by Amateurs who volunteer to teach.

5. Many CB operators are realize that they can progress from their crowded 40 channels to the Amateur bands. Few find the requirements insurmountable. So, it is not just the present 300,000 for whom the bands are reserved. In a year or

two, it may be a million; and maybe by the turn of the century we will be eight million.

6. The "incursion of CB buffs" into Amateur bands is an illegal act by a small percentage who own equipment with illegal power capabilities.

7. FCC reluctance to expand CB frequencies stems mostly from the flagrant lawlessness of those who report on "Smokey," pander, and brazenly ignore the restrictions of their licenses.

If indeed you are interested in being objective in your reporting, you will consider the above points.

Ellard W. Foster  
City

Dear Editor:

I am very surprised your newspaper would print such garbage as Jack Anderson's column, "Hams Jamming Airwaves." Perhaps we now know Anderson's true intelligence, or perhaps he is trying to hide the truth.

I don't understand what Anderson meant when he referred to a "confidential report." All of the Amateur frequencies are published, and copies are available at most libraries, book stores and electronics shops. In fact I have enclosed a copy to prove Anderson wrong.

The use of these frequencies will vary from person to person depending on which

## Not Hams!

Dear Editor:

Please re-read Jack Anderson's article in today's issue. Note that it contains a baseless attack upon operators licensed in the Amateur Radio Service.

Bad enough is the use of the scurrilous term "ham," but then he goes on to disclose his ignorance of the basis of the Amateur Radio Service. Its frequency assignments are defined by International Treaty, not by the whim of the Federal Communications Commission! Amateurs of radio communication and technology are perhaps unique in two aspects: Their existence and status is set forth in a series of international treaties, and their field is the only one in which one may be simultaneously an amateur and a professional!

A very considerable percentage of licensed radio amateurs are professionals in the field of electronics. A recent survey of the members of the Institute of Electrical and Electronic Engineers revealed that 16% were licensed radio amateurs.

Operators in the Amateur Radio Service have demonstrated to examiners of the FCC that they possess a comprehensive knowledge of laws and regulations pertaining to radio operation and also that

they are thoroughly acquainted with the theory of electronic communication and with the application of that theory. They earn the privilege of using frequency assignments. In doing so, they constitute a vast reservoir of self-trained technicians and radio operators. Such a reservoir is of recognized value both to industry and to the military.

To sum up, the frequencies assigned to amateurs of radio are confirmed by agreement among the nations of the world. Individuals operating in the Amateur Radio Service earn their privileges by training themselves to be of worth to their governments. And they most emphatically are not "hams"!

Sincerely,

Carl C. Drumeller

W5JJ in the Amateur Radio Service

KAGS6900 in the Citizens Band

## Hams Jamming Airwaves

# 'Hams' Reply To Anderson

class of license he or she has. It is a simple matter of taking a test to earn the right to use a frequency. The higher the class of license, the tougher the test.

Many of the clubs are more than happy to help CBers study for the tests. They are not all that difficult, either. In fact, many licensed Amateurs are grade school students who have taken and passed the test. Many new Amateurs are over 70 years young. They come from all walks of life. If CBers want these frequencies, let them earn the right just like 300,000 or so Amateurs have done.

Paul Asplin  
City

# Headline's Insulting

Dear Editor:

I am extremely unhappy with the insulting headline on Jack Anderson's column in April 3 Journal. If the headline "Hams Jamming Airwaves" was written by someone on your staff, your newspaper is guilty of cheap sensationalism, attracting attention by alluding to an activity amateur radio operators consider a most offensive, illegal practice.

Contrary to common practice by Citizens Banders, Amateur Radio operators jealously guard their reputations for lawful operation because their privileges are earned by study and hard work and have to be justified, on the basis of public interest, convenience and necessity, not bought, or demanded by using pressure of sheer numbers.

If the headline was prepared by "Tail Gunner Jack" then I apologize to your newspaper. Anderson doesn't deserve a retort. His livelihood depends on emotional appeal, distortion of facts and proliferation of half truths. For example, he refers to a confidential report that hams control more frequencies than all the nation's police and fire departments. Perhaps the unknown author of that report had a copy of Part 95 of the Federal Communications Commission Rules and Regulations which gives the frequency allocation for Amateur Radio (It

is hardly confidential). Hams have large allocations in the microwave bands (which nobody else wants, yet) and everything above 40 thousand megacycles, (which nobody knows how to use). But, whenever a group with financial interests finds a need for frequencies hams using, it takes them.

One television channel can accommodate 600 Citizen Band channels. No one has attempted to pry a single one of the eighty-two television channels loose from the broadcaster for CB use.

Electronics Industries Association, the National Association of Broadcasters and anyone else who lobbies in Washington is usually successful in satisfying its interests. The American Radio Relay League cannot lobby, it is a non-profit group. On this point Anderson's confidential report is wrong.

The last occasion for pilferage of the ham bands was reallocation to some satellite frequencies when they became commercially feasible. The existing ham satellites have to share crowded bands with land based stations and gone forever is an opportunity to provide worldwide emergency communication by amateur satellite, on those frequencies. This inferior position is hardly what I would call "controlling" or as your headline infers "Jamming" of the airwaves.

Joe Buswell  
City

CONCLUSION:

"OOOPS"



Jack Colson...  
mean, who blew the whistle on Watergate, has not asked to join.

HAMS HOLLER — Our April 4 column about the crowded Citizens Band radio frequencies produced some loud static from the ham radio operators. We reported that 300,000 hams have 100 times more airspace than is available to the nine million CB enthusiasts and that some federal officials who regulate CB radio "have traditionally been hams."

The story triggered an outpouring of mail from the offended hams. They pointed out that hams relay vital health and medical information during natural disasters, that hams are more scrupulous about policing themselves than are CB operators, that hams have helped bring about scientific advances in radio communication and that the assignment of radio frequencies is heavily influenced by international agreements.

Not the least indignant of the ham operators was Sen. Barry Goldwater, R-Ariz. We'll let him speak for his fellow amateur radiomen. He complained that the CB enthusiasts often operate without a license and amplify their transmitters beyond the five-watt limit.

They have also "abused the system," he charged, "in complete objection to all concepts of decency and gentlemanliness on the air. While this doesn't apply across the board, there are enough offenders that I don't care how many frequencies they have, they are slowly going to destroy their own function..."

"Many of these CBers," continued Goldwater, "never use their call signs or their names. There are many who use profanity and what they discuss should never be carried on any airwaves. In many cities, prostitutes use these frequencies to solicit business, and I could go on and on."

Concluded the Senator: "I think I can safely say, Jack, that the amateurs through the years have contributed more to the art of communications than all of the so-called experts in the field. Our frequencies have been diminishing, not increasing... We have great pride in our craft."

We didn't intend our story to be interpreted as an attack on the hams. We merely pointed out that the airwaves belong to the public, that there are far more citizens using CBs than ham equipment and that some of the federal regulators themselves were hams.

## Column Inaccurate

Dear Editor:

After reading the comments by columnist Jack Anderson in the April 3 edition of the Oklahoma Journal I too am persuaded to exercise my franchise to speak freely as he does.

The headline "Hams Jamming Airwaves" is a gross inaccuracy if it was intended to convey the gist of Anderson's comments. It seems to me a more accurate headline would have been "Citizens Banders Jamming Airwaves." I am not as concerned with the headline as I am with the all too common attitude which is buried within Anderson's words. While I'm not aware of exactly what axe he's trying to grind or with whom, I am keenly aware that what he espouses is contrary to a principle which I value and I am offended by those who suggest that it be compromised.

I take no issue with Citizens Band radio or those who enjoy it. So far as I know anyone purchasing this equipment is, or at least should be, aware of the operating privileges extended by reason of their purchase. Whether they want to talk with friends, promote highway safety or join a club is, and should remain, a matter of personal choice. I do, however, take issue with the implication that Amateur Radio is taking something away from anyone. Quite to the contrary, Amateur Radio has something to give to anyone who is willing to put forth some time and effort to learn the fundamentals. What it gives to participants is the satisfaction of working May 1977

towards and achieving a goal.

Perhaps what Anderson objects to is the requirement that citizens must earn — NOT PURCHASE — the privilege of operating radio equipment on the frequencies designated for Amateur Radio purposes. If because of crowded Citizens Band conditions we should redistribute the amateur frequencies, then let's carry it a little further and redistribute clothing, automobiles, money and everything else which for one reason or another is unequally divided. A guide on how to do this was written by Karl Marx some years ago.

Amateur Radio is open to anyone who is willing to work. Progression within Amateur Radio is based on an incentive program and those who work the hardest, get the most privileges. Should we exchange this concept for another welfare program? I think not!

Just for the record, I hold a Technician Class Amateur Radio Operator License. As a technician I do not enjoy all amateur privileges because I have not yet earned the right to them. But you can rest assured that I am working towards a goal rather than suggesting the requirements be lowered.

Assuming Anderson's figures are relatively accurate, I can assure you that there are 300,000 Amateur Radio operators who are willing to share their time and skills and to give encouragement to anyone who will put forth some effort towards joining their ranks.

Tommy D. Bond



TEAR ON THE DOTTED LINE, OR SEND THE WHOLE PAGE, TODAY

PRE-REGISTRATION FOR OKLAHOMA H A M H O L I D A Y  
SOUTHGATE INN - OKLAHOMA CITY - 6 & 7 AUGUST 1977

NAME \_\_\_\_\_ Call \_\_\_\_\_ Lady \_\_\_\_\_

Street \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Mail check (\$3.00 per person registered) to C O R A, Inc. P.O. Box 15013, Oklahoma City OK 73115  
Letter must be postmarked NO LATER THAN 2 August to be eligible for the pre-registration award for which you are eligible whether you are in attendance or not. Register as many people as you wish. Just list and enclose \$3 for each.

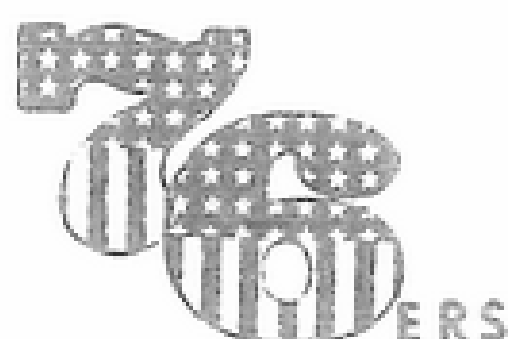
FREE Fleamarket tables will be reserved by number. Non-Commercial only. RESERVE ME A FLEAMARKET TABLE. ☐

We will stay at Southgate Inn. Reserve (Single) (Double) for me. Dates \_\_\_\_\_ ☐

expect to utilize the BUFFET Saturday evening. \_\_\_\_\_ ☐

Will make the BUFFET Sunday before the awards. \_\_\_\_\_ ☐

YOUR TICKETS WILL BE HELD AT THE RESERVATION DESK UNLESS YOU SEND s.a.s.e.!



## THE BICENTENNIAL AMATEUR RADIO CLUB



### JELLY BEANS, ETC.

The race is on! Many amateurs are taking advantage of the no fee period which the FCC has been forced into and many of these have the added incentive of trying for one by two calls. Well... Back off on the panic button. All is not roses or all is not gold that glitters, etc. The long (3 month) wait for my two letter call finally ended April 1st (The date should have told me something). A good number of fellow amateurs can relate how I ran amuck on two meters during this period, continually checking for new one by two calls. I had requested calls in the following order: W5TU (TU, cw for thank you), W5EU (EU, cw for Europe), N5OK, (OK for Oklahoma. I wanted K5OK but Cecil beat me to it.), K5SS (Double letter suffix), K5VV ect. So, there it was, N5OK. Boy, was I proud. Look at me with a two letter call. I turned K5LMG back (excess baggage). The first thing I did was call Bill, K5EA. Bill had checked with me daily, helping me sweat it out. Then I called Ken, WB5PYN. I wanted Ken to be my first contact with my new call. I asked him to call me on 46/46, but I didn't tell him that I had my new call. So here he was on 46. "K5LMG WB5PYN ... Pause ... WB5PYN N5OK!" I really got him. That was just great. From there things went down hill. An avalanche of comments such as, "What is a Navy MARS station doing in the ham bands?" and "Where did you get such a weird call?" came piling in. Even my close friends had problems with it. "K5AWD N5OK ... Hello Coy, K5LMG K5AWD, What's going on? ... Not much Bill but you have my call wrong. It's NOVEMBER FIVE OSCAR KILO ... Oh, Ok?? I'll give you a call on the phone. K5AWD clear ... N5OK clear". The best was when I called Dee on 37/97. "WB5SVH N5OK ... No answer ... WB5SVH N5OK ... Long pause ... Coy, is that you? K5LMG WB5SVH ... Right Dee, I've got my new call NOVEMBER FIVE OSCAR KILO ... Oh! I thought you were saying IN 5, OK?. Meaning that you would call me in 5 minutes." BRRRAAKK! I thought, maybe, I might have better luck down on the H.F. bands. I took off Friday the eighth. Many DX stations were supposed to be about and I thought I might snag one with my new call. Hot dog! There he was 589 on 20 cw. "CQ USA CQ USA DE EP2SV KN ... EP2SV DE N5OK N5OK AR ... NO USA ONLY USA ONLY ... CQ USA CQ USA ONLY ONLY DE EP2SV KN ... EP2SV DE USA USA N5OK N5OK EK ... EK N N N USA ONLY USA ONLY DE EP2SV KN KN ... (Long pause, frustration) ... CQ USA CQ USA DE EP2SV KN ... (Well, one more try. I checked the linear, yep 1 kw. Checked the 204BA, yep 45°. Here goes) ... EP2SV EP2SV DE N5OK IN OKLAHOMA OKLAHOMA USA N5OK AR ... L I D DE W1\_\_\_". I threw the switch. That was the last straw. Do you suppose I could get my old call back? Well ... Anyway ... At least no one has called me Jelly Bean yet.

Coy, N5OK???

### From The President

I dont have too much this time. There are no minutes this time due to paper shortage, (we just ran out).

A note of congratulation to the people who passed their FCC examinations on April 14. And to those of us who did not pass, I offer my sympathy, and say we can try again.

I want to also thank Bill, K3TGY, for comming out to our monthly meeting. Bill gave a very interesting talk on amateur teletype. I also want to invite Bill back to meet with us and invite all the guest back soon.

73, Ken WB5PYN

MORSE TELEGRAPH CLUB, INC. will have their next meeting Saturday, April 30. Members will gather around 10:30 to 11:30 AM at Queen Ann Cafeteria at NW 10& Dewey. Western Union will tie 30 cities from the east coast to the west coast and from Canada to the Gulf. This will be free of charge to the MORSE TELEGRAPH CLUB.

May 1977

# MORI

## PERSONAL SKETCHES RICH ZANNI, WB6FYL

Rich is the Secretary/Treasurer of MORI, and is on the Program Committee of CORA. He started in Amateur Radio with his Novice license in 1968, then he obtained a Technician license. He was relatively inactive until he got his General Class, then he operated 75 and 40, mostly "rag chewing." Since 1972 he has been quite active on 2 meter repeaters, and as most of us know, continued his 2 meter activity when he came here. While in California, he worked on repeaters and built his own machine.

He joined the Air Force in 1974 and attended various schools along the southern U. S. Rich was a Radio Relay Technician in Microwaves. From July 1975 until December 1976 Rich was stationed at Tinker. He left the Air Force and is now working for the Oklahoma City Fire Department as a radio technician. Rich is in the Air National Guard.

Rich's home town is McCloud, California, in the northern, mountainous region where he liked to go skiing. Rich misses the ski slopes, but started a new hobby about six months ago - photography. He has a single lens reflex camera and several lenses. This is a good diversion from so much radio at work and in Amateur Radio. Scenery and shots of people while they are engaged in their daily activities are Rich's favorite subjects. He develops most of his black & white pictures and also takes some color shots.

From a tape-recorded interview by Bill, WA5RAQ + + + + +  
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HOW FAST IS THE WIND BLOWING ?      Courtesy of Fred, K5HFN

BEAUFORT NUMBER	U.S. WEATHER BUREAU TERM	VELOCITY IN M.P.H.	SIGNS ON LAND
0	Calm	< 1	Smoke rises vertically
1	Light	1 - 3	Smoke drifts, normal weather vane unmoved
2	-	4 - 7	Wind felt on face, weather vane moves
3	Gentle	8 - 12	Leaves in motion, light flag extended
4	Moderate	13 - 18	Dust raised, small branches moved
5	Fresh	19 - 24	Small trees in leaf sway, Crests on water
6	Strong	25 - 31	Larger branches move, overhead wires whistle
7	-	32 - 38	Whole trees moving, difficulty in walking
8	-	39 - 46	Breaks twigs off trees, harder to walk
9	Gale	47 - 54	Slight structural damage
10	-	55 - 63	Trees uprooted, much structural damage

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AUTOPATCH GUIDELINE. QST, March 1977, page 77 ". . . here is a caution as it appeared in the WR8ABC/WR8AGA Newsletter. Warning! Always advise the party you are calling that they are on the radio and being broadcast. Prevent a blurt of improper language. If the conversation begins to get away from you at any time, disconnect the call. (And don't blame the control operator if he disconnects you! -Ed.)"      + + + Bill, WA5RAQ - - -

# MORI

## HOW AMATEURS CAN ASSIST THE OKLAHOMA HIGHWAY PATROL IN LAW ENFORCEMENT . . . . .

(Taken from the Highway Patrol pamphlet CB's And Bear Facts. We have changed "CB" expressions to Amateur Radio terms where appropriate).

When reporting an EMERGENCY, there are two important steps to remember in order to assure that the proper action will be taken: First, verify the fact that an emergency exists. False reports will cause authorities to lose confidence in your reports. Secondly, speak in "plain language." Not all police radio codes are the same, so avoid any confusion or misunderstanding by speaking in a normal, everyday manner.

### Reporting Traffic Collisions

Troopers and other emergency personnel can arrive at the scene faster and better prepared to handle the situation if certain information is provided.

1. Exact Location. Report the highway on which the collision has occurred. Also, give at least one reference point, such as:
  - A. Distance and direction from the nearest town
  - B. Mile marker nearest to location
  - C. Intersecting highway
  - D. River, bridge, or other landmark
2. Injuries. If injuries have been sustained, report whether or not an ambulance is needed at the scene.
3. Roadway. Report whether or not the roadway is blocked by any debris (identify) or vehicles.
4. Fire or other Potential Hazards. Report all fires or other potential hazards that may exist at the scene of a collision. Gasoline, oil, and other fuels or chemicals need to be washed from the roadway as soon as possible.
5. On the Interstate Highway System, especially in the metropolitan areas, it is extremely beneficial for troopers to know in which direction of travel the collision occurred. Specify in which lane the collision occurred (eastbound, westbound, northbound, southbound).

### Reporting the Drinking or Reckless Driver

Troopers do ask for your cooperation by reporting both the drinking and reckless driver. When doing so, an apprehension can be facilitated by providing the following information:

1. Exact Location
2. Direction of Travel
3. License Number and State
4. Make and Model of Vehicle
5. Color
6. Number of Occupants

+ + + Bill, WA5RAQ - - -

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PUBLIC SERVICE. QST, March 1977, Page 10. When you have a story on something Amateur Radio has done in the public service "Call ARRL NEWSLINE (203) 667-0138, leave your name, call, phone number and the essential details of the story on the 24-hour answering machine. Hq will then follow up with the appropriate publicity." Also see QST, April 1977, page 50. = = = Bill, WA5RAQ = = =



## Club NEWS

W5LOW  
The Elmer Gooder Memorial  
Station

### MINUTES OF APRIL MEETING

MEETING WAS CALLED TO ORDER BY PRESIDENT WOODY, W5FMX, AT 8:00PM WITH 27 MEMBERS AND GUESTS PRESENT. INTRODUCTIONS FOLLOWED AND CARL, W5JJ, PROCEEDED TO GIVE THE GROUP MISCELLANEOUS POINTERS ON OPERATING PRACTICE, BOTH PHONE AND TELEGRAPHY, FROM BEGINNING TO END OF A CONTACT. HE GAVE ADVICE FOR MAKING MESSAGE TRAFFIC MORE EFFICIENT, PARTICULARLY ON PHONE.

GENE, W5GC, PRESENTED SOME FACTORS THAT MAKE CASUAL DX'ING SUCCESSFUL. BY CASUAL HE MEANT LISTENING FROM 5 TO 10PM AND 4 TO 10AM EVERY DAY AND FIERCELY COMPETING FOR RARE COUNTRIES. HE COVERED EQUIPMENT, OPERATING TECHNIQUE, AND CONFIRMATION TECHNIQUES. BOB, W5HXL, REPORTED ON ROMAN NOSE CAMPOUT SCHEDULED FOR THIS WEEKEND. APRIL 16 - 17. JOE, W5TRS, SECRETARY

### MICROCOMPUTER CONFERENCE

MICROCOMPUTER '77, A NATIONAL CONFERENCE SPONSORED BY REGION 5, INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS, WAS HELD IN OKLAHOMA CITY, APRIL 6 - 8. THERE WERE TWENTY ONE TECHNICAL SESSIONS, EACH ONE PRESENTING TWO OR THREE PAPERS, AND THREE COMBINED SESSIONS FEATURING MANUFACTURER'S REPRESENTATIVES. THERE WAS AN EXHIBIT ROOM WHERE MANUFACTURERS AND DEALERS OF MICROPROCESSORS, MICROCOMPUTERS AND VARIOUS PERIPHERAL DEVICES SHOWED THEIR WARES. THERE WAS PRESENT ABOUT A DOZEN MANUFACTURERS AND DEALERS INCLUDING INTEL, MOTOROLA (HALL-MARK) AND OKLAHOMA CITY'S OWN COMPUTER STORE, HIGH TECHNOLOGY.

THE TECHNICAL SESSIONS RAN CONCURRENTLY BY THREES. GENERALLY, THE SESSIONS WERE DIVIDED INTO HARDWARE/SUBSYSTEMS, LANGUAGES AND CONTROL APPLICATIONS. OF THESE THREE, I CHOSE TO ATTEND THE CONTROL APPLICATIONS SESSIONS. ATTENDEES RECEIVED COPIES OF ALL PAPERS PRESENTED SO I FELT I COULD GET WHAT I MISSED ON LANGUAGES AND SPECIAL PURPOSE SUBSYSTEMS OUT OF THAT DOCUMENT.

MANY OF THE PAPERS THAT WERE PRESENTED DESCRIBED SYSTEMS THAT WERE STILL IN DESIGN STAGE. OR ONLY PARTIALLY IMPLEMENTED. THIS WAS A BIT OF A DISAPPOINTMENT SINCE MUCH OF THE PRESENTATION MATERIAL WAS HYPOTHETICAL AND GENERAL IN NATURE. THE PAPER I ENJOYED MOST WAS ONE ON "A LOW COST, MULTIPURPOSE DATA ACQUISITION SYSTEM USING A MICRO-COMPUTER FOR CHEMISTRY LABORATORY INSTRUMENTATION," BY S. CARR, A. FRITZSON, L. HULL, T. WERNER, G. WILLIAMS, UNION COLLEGE. (MUST HAVE BEEN THE WHOLE STAFF). A SOUTHWEST TECHNICAL PRODUCTS MICROCOMPUTER WAS ATTACHED TO SOME KIND OF ABSORPTIVE SPECTROMETER TO CLEAN UP SIGNALS AND LOWER NOISE BASE LINE OF THE INSTRUMENT. THE METHOD WAS SIMPLE, PRESENTATION HUMOROUS AND THE WHOLE PROJECT WAS VERY LOW BUDGET, MUCH IN CONTRAST TO SOME OF THE HIGH POWERED PROJECTS DESCRIBED BY SOME OF THE OTHERS.

I GUESS I AM SPOILED BY AMATEUR RADIO OPERATORS WHO ARE SO WILLING TO DISSEMINATE INFORMATION. IN CONTRAST, MANY OF THE AUTHORS OF PAPERS I HEARD EITHER WERE NOT DIVULGING DETAILS BECAUSE OF COMMERCIAL REASONS OR LACK OF KNOWLEDGE. I ONLY HEARD ONE THIRD OF THE PAPERS SO MY OPINION IS BASED ON A PRETTY SMALL SAMPLE. IN PART OF ONE SESSION ON BASIC (A HIGH LEVEL LANGUAGE) THE AUTHOR WAS FAIRLY INFORMATIVE.

THE MOST VALUABLE ASPECT OF THESE KIND OF GET-TOGETHERS IS PROBABLY THE PERSONAL CONTACTS THAT THOSE IN THE TRADE MAKE WHEN THEY SEE EACH OTHER EYEBALL TO EYEBALL. I AM NOT INVOLVED PROFESSIONALLY WITH MICROCOMPUTERS BUT I SAW SEVERAL PEOPLE THERE WHO I KNEW OR, AT LEAST HAD SEEN AROUND BEFORE. I LEARNED MORE SCUTTLEBUTT FROM THESE GUYS THAN I LEARNED FROM THE AUTHORS OF THE PAPERS PRESENTED. JOE, W5TRS

### MICROPROCESSORS FOR AMATEUR RADIO

NO MATTER HOW HARD ONE TRY'S, IT IS IMPOSSIBLE TO IGNORE LITTLE CRITTERS CALLED MICROPROCESSORS STIRRING UP A LOT OF ATTENTION THESE DAYS. DIGITAL LOGIC INTEGRATED CIRCUITS, WHEN THEY FIRST BECAME AVAILABLE, DID THE SAME THING. PEOPLE BECAME OBSESSED WITH DIGITAL IC'S, TRYING TO APPLY THEM TO ALL KINDS OF RADIO FUNCTIONS, AND INVENTING NEW FUNCTIONS SO THEY WOULD HAVE PROBLEMS TO WHICH THEY COULD APPLY THESE DANDY LITTLE "SOLUTIONS."



Club  
NEWS

WSLOW  
The Elmer Goodler Memorial  
Station

AMATEUR RADIO REALLY HAS NOT BEEN REVOLUTIONIZED BY DIGITAL ELECTRONICS BUT THERE ARE A LOT OF PEOPLE SENDING REALLY GOOD CODE WITH DIGITAL ELECTRONIC KEYERS AND THERE ARE A FEW DIGITALLY SYNTHESIZED TRANSCEIVERS AVAILABLE THAT ARE MUCH MORE COST EFFECTIVE THAN RIGS OF SAME PERFORMANCE, CHANNELIZED BY CRYSTAL CONTROL.

UNLESS ONE HAS A PRETTY GOOD IDEA OF A SPECIFIC APPLICATION FOR EITHER DIGITAL LOGIC CIRCUITS OR MICROPROCESSORS, IT IS PRETTY HARD TO GET INTERESTED IN THE THINGS. OF COURSE, THERE ARE THOSE WHO ARE CURIOUS ABOUT NEW THINGS WHO WILL RESEARCH THE LITERATURE AND EVEN MAKE SIGNIFICANT EXPENDITURES TO DISCOVER ALL THERE IS TO KNOW ABOUT A DEVELOPING TECHNOLOGY. THESE PEOPLE WOULD NOT BENEFIT FROM ANYTHING I WOULD WRITE BECAUSE I AM HARDLY IN THE VANGUARD OF NEW DEVELOPMENTS. WE WOULD BENEFIT IF WE COULD GET THEM AWAY FROM THE WORK BENCH AND OVER TO THE TYPEWRITER ONCE IN A WHILE.

FOR MY PART, I HAD TO FORCE MYSELF TO READ THE ARTICLES IN AUGUST, SEPTEMBER AND OCTOBER, 1976 QST TO SEE WHAT MICROPROCESSORS REALLY WERE. ROGER, WA5JXX TALKS ABOUT THE THINGS WITH FAMILIARITY EQUIVALENT TO MY KNOWLEDGE OF HALF WAVE RECTIFIERS. HE WORKS WITH THE THINGS, DESIGNING WITH THEM IN CONTROL AND DATA SUPERVISION APPLICATIONS. SINCE I HAD ALL THE CONTROL SYSTEMS I COULD IMAGINE EVER WANTING ALREADY CONSTRUCTED WITH DISCRETE DEVICES, I JUST COULDN'T WORK UP MUCH INTEREST. IF I DIDN'T ALREADY HAVE RTTY TERMINAL UNIT, SLOW SCAN TV, TELEPHONE MESSAGE TAKER, BURGLAR ALARMS, RADIO CONTROLLED GARAGE DOOR OPENER, ETC., ETC., CONSTRUCTED, I MIGHT HAVE WANTED TO FIND OUT HOW MICROPROCESSORS WORK AND COMBINE SOME OF THESE FUNCTIONS INTO ONE MULTIPURPOSE UNIT.

IN THE GENERALLY ACCEPTED TERMINOLOGY, MICROPROCESSOR IS AN INTEGRATED CIRCUIT. A MICROPROCESSOR CAN BE USED IN A MICRO CONTROLLER OR A MICROCOMPUTER, THE LATTER HAVING ENOUGH MEMORY TO PERFORM MATHEMATICAL OPERATIONS (NUMBER CRUNCHING). A MINICOMPUTER HAS LARGER MEMORY CAPACITY AND IS FASTER. A MICROCOMPUTER CAN USUALLY HOLD A MAXIMUM OF 65K BYTES OF MEMORY. FOR APPLICATIONS SUCH AS CALCULATING ANTENNA HEADINGS OR SATELLITE ORBIT PASSES, A MICROCOMPUTER WOULD BE USED. FOR POINTING THE ANTENNA AS A RESULT OF STIMULI SUCH AS SIGNAL STRENGTH, A MICROCONTROLLER WOULD BE ADEQUATE, THOUGH A MICROCOMPUTER COULD BE USED.

I WAS IN THE MIDST OF BUILDING A FAIRLY COMPLICATED CIRCUIT TO REMOTELY CONTROL A 2M FM RIG (45 INTEGRATED CIRCUITS) WHEN IT DAWNED ON ME THAT A MICROPROCESSOR MIGHT DO THE JOB QUITE NICELY AND PROVIDE ADDITIONAL FLEXIBILITY TO BOOT. OUT CAME THE OLD QST ARTICLES AND A REVIEW OF BACK ISSUES OF 73, HAM RADIO AND A BUNCH OF BORROWED HOBBY COMPUTER MAGAZINES. ZOUNDS! FOR A KILOBUCK, I COULD PLAY A GAME OR CALCULATE THE GROSS NATIONAL PRODUCT BUT IT LOOKED LIKE OVERKILL TO RUN MY LITTLE 2 METER RIG. ALL I NEEDED WAS A MICROPROCESSOR AND SUPPORT DEVICES ALONG WITH A LITTLE BIT OF RANDOM ACCESS MEMORY (RAM) READ ONLY MEMORY (ROM), INPUT AND OUTPUT CIRCUITRY AND A METHOD TO PROGRAM IT.

WAY BACK IN MY VOLATILE MEMORY BANKS WAS A FAINT TRACE OF DATA ON A SIMPLE MICROPROCESSOR BOARD THAT WAS RELATIVELY INEXPENSIVE AND WAS SHOWN AT HAM HOLIDAY LAST YEAR. WA5JXX REFRESHED MY MEMORY AND SUPPLIED THE NAME OF ROGER WALTON OF EBKA INDUSTRIES, 6920 MELROSE LANE, OKC, 787-3671. ROGER SOLD ME ON HIS FAMILIARIZOR BOARD SO I GOT ONE.

THE EBKA 6502 FAMILIARIZOR COSTS \$229.00 IN KIT FORM. IT USES A MOS TECHNOLOGY MCS 6502 MICROPROCESSOR WHICH IS NOT NEARLY AS POPULAR AS THE INTEL 8080 OR MOTOROLA 6800 BUT SERVES THE SAME FUNCTION QUITE NICELY. THE ADVANTAGE OF THE FAMILIARIZOR, I FOUND, WAS THAT IT HAD KEYBOARD AND DISPLAY RIGHT ON THE BOARD WHICH ALLOWED PROGRAMMING WITHOUT ADDITIONAL PERIPHERAL DEVICES. THERE WERE ALSO EIGHT BUFFERED INPUT AND EIGHT BUFFERED OUTPUT LINES WHICH COULD BE HOOKED DIRECTLY TO CIRCUITS BEING MONITORED OR CONTROLLED. THE THING COMES WITH A PROGRAMMED ERASABLE PROGRAMMABLE READ ONLY MEMORY (EPROM) CONTAINING A MONITOR PROGRAM WHICH ORGANIZES THE KEYBOARD AND DISPLAY AND ALLOWS SIMPLE DEBUGGING OF PROGRAMS. THE KIT INCLUDES 1K BYTES OF RAM (1024 X 8 BITS, OR MEMORY CELLS) AND PROVISIONS TO ADD THREE 1702 A EPROMS (768 BYTES TOTAL) FOR NON VOLATILE STORAGE OF USERS PROGRAM(S). ALL THAT IS NECESSARY TO MAKE IT PLAY IS A +5 VOLT SUPPLY (1.2 AMPS) AND -9 VOLTS (50MA).

PUTTING THE THING TOGETHER IS A SNAP, BEING AT THE MOST A TWO EVENING KIT, BUT IF YOU'RE NOT INTO PROGRAMMING AND COMPUTER LINGO, THE WORK IS JUST BEGINNING. PROGRAMMING IS A SKILL, JUST LIKE TELEGRAPHY, WHICH MUST BE LEARNED BY EXPERIENCE, TRIAL AND ERROR. THE INSTRUCTIONAL MATERIAL AVAILABLE ASSUMES THE USER IS ALREADY A PROGRAMMER AND TAKES HIM THROUGH THE INTRICATE DETAILS BUT OFFERS NO HELP IN ORGANIZING THE OVERALL FUNCTION TO BE PERFORMED INTO A PROGRAM. I HAVE FOUND THAT THE BEST INFORMATION AVAILABLE IS IN PROGRAMS OTHERS HAVE WRITTEN. THE MONITOR PROGRAM THAT CAME WITH THE FAMILIARIZOR GOT ME OFF THE GROUND AND AN ARTICLE IN JANUARY 76 QST ON REPEATER CONTROL WITH THE KIM-1, WHICH WAS A 6502, GOT ME PRETTY WELL STRAIGHTENED OUT. I HAD THE ADVANTAGE OF FIFTEEN YEARS OF SPORADIC COMPUTER PROGRAMMING SO I ALREADY KNEW TO START WITH A FLOW CHART!

THE NICE THING ABOUT THE FAMILIARIZOR IS THAT PROGRAMMING STEPS CAN BE LOADED AND TRIED AND, IF ENOUGH TIME DELAY IS ADDED TO SLOW THE THING DOWN TO A REASONABLE SPEED, THE RESULTS ARE IMMEDIATELY OBSERVABLE. SOME LIGHT EMITTING DIODES ADDED TO THE OUTPUT LINES ALLOW ONE TO SYNTHESIZE CIRCUITS THAT WOULD BE CONTROLLED AND SWITCHES ADDED TO THE INPUT PORT CAN SYNTHESIZE STIMULI FROM CIRCUITS BEING MONITORED.

MY FIRST PROGRAM, AFTER RUNNING THE COUNTING ROUTINE THAT CAME WITH THE KIT, WAS ONE THAT WOULD GENERATE MY CALL IN CW. BEFORE LONG, I HAD WIRED THE THING TO MY IC-22S AND HAD IT SCANNING THE 2 METER REPEATER SUB-BAND, STOPPING WHEN IT HEARD A SIGNAL AND WAITING FOR A FEW SECONDS AFTER THE CARRIER DROPPED TO SEE IF THERE WAS A SECOND STATION ON FREQUENCY. THE SCAN RATE WAS LIMITED BY THE RESPONSE TIME OF THE CARRIER OPERATED SWITCH IN THE IC-22S. IT TOOK ABOUT 4 SECONDS TO SCAN ONE MEGACYCLE IN 15 KHZ STEPS. BY LOADING SELECTED FREQUENCIES, A DOZEN OR SO FREQUENCIES COULD BE SCANNED WITH TWO BLINKS OF AN EYE.

THE FAMILIARIZOR CAN EASILY REPLACE THE FORTY FIVE DEVICES IN MY REMOTE CONTROLLED STATION AND ALLOW MUCH MORE FLEXIBILITY BUT I'LL PROBABLY USE IT TO SUPPLEMENT THE HARD WIRED CIRCUIT TO OBTAIN ADDITIONAL CONTROL FUNCTIONS WITH THE UHF CONTROL LINK.

AT THE TIME I OBTAINED THE EBKA FAMILIARIZOR IT WAS THE ONLY REASONABLE KIT AVAILABLE WITH ALL THE REQUIRED INPUT-OUTPUT DEVICES INCLUDED. THE DYNA-MICRO SOLD BY E & L INSTRUMENTS, USING AN 8080, COST OVER \$400. OTHER KITS REQUIRED ADDITION OF KEYBOARDS AND/OR DISPLAY EQUIPMENT. INTEL WILL SOON INTRODUCE A KIT CALLED SDK-85 WHICH WILL USE THEIR NEW 8085 MICROPROCESSOR AND MOTOROLA HAS ALREADY BEGUN SELLING A KIT USING A 6800 IN THE \$235 PRICE RANGE. BOTH OF THESE KITS HAVE INTEGRAL KEYBOARDS AND DISPLAYS.

THESE KITS ARE ALL EXPANDABLE IF THE USER GETS CLEAR OUT OF CONTROL AND WANTS TO BUILD A FULL BLOWN MICROCOMPUTER. THE ADDRESS AND DATA BUSES AND CONTROL LINES ARE RUN TO EITHER A SOCKET OR EDGE CONNECTOR TO ALLOW FOR EXPANSION. EXPANSION OF MEMORY TO 4K or 8K IS NECESSARY IF A HIGH LEVEL PROGRAMMING LANGUAGE IS TO BE USED. BASIC, A POPULAR COMPUTER LANGUAGE, IS USED TO CONVERT PLAIN WORDS AND MNEMONICS INTO MACHINE LANGUAGE, IN THE PROPER ORDER. FOR MOST CONTROLLER FUNCTIONS, MACHINE LANGUAGE IS SATISFACTORY AND EXPENSIVE MEMORY (AND AN ASCII KEYBOARD AND VIDEO READOUT OR TELETYPE PRINTER) IS UNNECESSARY.

I'M HAVING A DIFFICULT TIME THINKING OF USES FOR MICROPROCESSORS THAT THE AVERAGE AMATEUR RADIO OPERATOR CAN'T LIVE WITHOUT. MOST EXAMPLES OF BURGLAR ALARM SYSTEMS, LAWN SPRINKLERS, ANTENNA ROTATION, TELETYPE TERMINAL, ETC., WOULD PROBABLY MORE EFFECTIVELY MANAGED WITH SIMPLER CIRCUITS AND ORBIT PREDICTION WOULD BE MORE EFFECTIVELY DONE BY A POCKET CALCULATOR. A COMPUTER IS A POOR STORAGE DEVICE COMPARED TO A LOGBOOK. NEVER-THE-LESS, IT IS CHEAP ENOUGH NOW TO OBTAIN THE BASIC CIRCUIT AND EASY ENOUGH TO PUT IT TOGETHER AND OPERATE IT. PERHAPS WITH IT IN PLACE AND OPERATING BEFORE ALL THESE OTHER GADGETS ARE BUILT OR ACQUIRED, THE OWNER MIGHT BE ABLE TO TAKE ADVANTAGE OF THE COMPREHENSIVE ABILITIES OF A MICROPROCESSOR. THINK OF HOW SIMPLE IT WOULD BE TO MAKE YOUR TRANSCEIVER OPERATE FULL BREAK-IN CW IF YOU COULD PROGRAM A MICROCONTROLLER TO MUTE AUDIO, SWITCH ANTENNA, ENERGIZE TRANSMITTER, TURN IT OFF, REESTABLISH RECEIVER AGC VOLTAGE AND OPEN AUDIO, WITH EACH KEY CLOSING AND WITH EACH ACTIVITY PRECISELY TIMED FOR SMOOTHEST OPERATION. THE ONLY TRICKERY WOULD INVOLVE INTERFACE WITH THE RECEIVER AGC.

I AM OPEN FOR SUGGESTIONS. IF ANY OF YOU HAVE SOME IDEAS FOR SIMPLE APPLICATIONS OF MICROPROCESSORS, PASS THEM ALONG AND INFORM THE C & E GANG.

18

FOR THOSE INTERESTED IN COMPUTER PROGRAMMING, CENTRAL OKLAHOMA AMATEUR COMPUTING ASSOCIATION (CENOCA), A CLUB OF HOBBY COMPUTERISTS, MEETS SECOND SATURDAY OF EVERY



MONTH AT 10AM. MEETINGS ARE HELD AT MOORE-NORMAN VO-TECH, NW 12TH AND FRANKLIN ROAD, NORMAN. FOR INFORMATION, CONTACT KEN SLIGER, PRESIDENT, 943-0369, EVENINGS, OR CALL SOMEONE AT HIGH TECHNOLOGY DURING DAYS. JOE, WA5TRS

#### MINUTES OF MEETING OKLAHOMA REPEATER SOCIETY

THE OKLAHOMA VHF CONFERENCE MET INFORMALLY SATURDAY, MARCH 26, 1977, AT 1:00PM ON THE CAMPUS OF OKLAHOMA STATE UNIVERSITY, STILLWATER, OK. APPROXIMATELY 55 OKLAHOMA AMATEUR RADIO OPERATORS WERE IN ATTENDANCE. PRESENT WERE REPEATER OWNERS AND USERS ASSOCIATED WITH WR5AFS, AHN, AHO, AHP, AHQ, AJP, AEU, AFW, ADD, ATN, ASI, ARZ, ABW, CALUMET REPEATER AND AERONAUTICAL CENTER ARC REPEATER, CALLS UNKNOWN. GORDON MCDONALD, WB5CWX, PRESIDENT, OKLAHOMA STATE UNIVERISTY AMATEUR RADIO CLUB, PRESID-ED.

LEONARD HOLLAR, WA5FSN, SCM OKLAHOMA, DISCUSSED ARRL MEMBERSHIP, AND HOW IT HAD BEEN INCREASING. EMERGENCY OPERATION ON LOW BAND NETS AND VHF FREQUENCIES WAS ALSO DISCUSSED.

ARRL, WEST GULF DIRECTOR JACK GANT, W5GM, PROVIDED A SHORT HISTORY OF W5YJ, OSU AMATEUR RADIO CLUB STATION. JACK DISCUSSED FCC DEREGULATION AND POSSIBILITY OF NEW FREQUENCIES ON 10, 18 AND 24 MHZ. ALSO, JACK DISCUSSED INTRUDER WATCHES AND NEED FOR OPERATORS TO CALL FCC WHEN THEY HEAR ILLEGAL OPERATIONS.

PAT DEVLIN, WA5BPS, OKLAHOMA FREQUENCY COORDINATOR, PROVIDED HIS LIST OF REPEATERS IN OKLAHOMA AND SURROUNDING AREAS AND REQUESTED CORRECTIONS AND ADDITIONS FROM THOSE PEOPLE PRESENT. PAT THEN LEAD A DISCUSSION OF REPEATER FREQUENCIES AND FUTURE FREQUENCY PLANS.

LEONARD HOLLAR REQUESTED ALL REPEATERS IN THE STATE BE REGISTERED WITH ARRL SO THEY COULD BE INCLUDED IN ARRL REPEATER DIRECTORY.

JACK GANT THEN PROPOSED THAT THE GROUP FORM A NEW STATEWIDE REPEATER ORGANIZATION TO HELP SOLVE PROBLEMS OF VHF REPEATERS AND COMMUNICATIONS IN OKLAHOMA. IT WAS CONSENSUS OF THE GROUP THAT THE ORGANIZATION WOULD NOT BE LIMITED TO REPEATER GROUPS BUT OPEN TO INDIVIDUAL AMATEURS WITH INTEREST IN VHF AND VHF COMMUNICATIONS. THE PURPOSE OF THE GROUP WOULD BE TO DEVELOP AND EXPRESS THE POSITION OF OKLAHOMA AMATEURS ON MATTERS AFFECTING AMATEUR RADIO COMMUNICATIONS.

THE PROPOSAL WAS ADOPTED AND A STEERING COMMITTEE WAS FORMED TO WRITE A CONSTITUTION FOR THE ORGANIZATION. MEMBERS OF THE COMMITTEE ARE JOE BUSWELL, K5JB, CHAIRMAN, LEONARD HOLLAR, WA5FSN, RICH VANNI, WB6FYL, ROY MILES, K5GIU, DENNIS PATTERSON, WD5CSM, PAT DEVLIN, WA5BPS, AND MIKE SALEM, WA5EPK.

THE ORGANIZATION THEN AGREED THAT OFFICERS OF OSU AMATEUR RADIO CLUB WILL SERVE AS INTERIM OFFICERS UNTIL THE NEXT FORMAL MEETING. THEY ARE: GORDON MCDONALD, WB5CWX, PRESIDENT; STEVE ANTOSH, WB5BNM, VICE PRESIDENT; AND TOM REA, WA5WKV, SECRETARY/TREASURER.

A DISCUSSION FOLLOWED AS TO THE NAME OF THE ORGANIZATION. IT WAS AGREED TO TENTATIVELY CALL IT OKLAHOMA REPEATER SOCIETY. WB5CWX CALLED THE FIRST MEETING OF OKLAHOMA REPEATER SOCIETY TO ORDER AT 3:58PM. THE SOCIETY VOTED TO ENDORSE SAN ANTONIO REPEATER ORGANIZATION'S PETITION TO THE FCC REGARDING SALES RESTRICTIONS ON RADIO EQUIPMENT.

THE STEERING COMMITTEE IS TO MEET IN THE NEXT TWO MONTHS.

K5JB THEN ANNOUNCED A MEETING PLACE WILL BE PROVIDED FOR THE SOCIETY AT HAM HOLIDAY IN AUGUST. THE NEXT MEETING TIME AND DATE WILL BE ANNOUNCED BY THE STEERING COMMITTEE. MEETING ADJOURNED AT 4:11PM. RESPECTFULLY SUBMITTED BY TOM REA, WA5WKV, SECRETARY/TREASURER, OKLAHOMA REPEATER SOCIETY.

FOR SALE: REGENCY HR-2B WITH 34/94, 94/94, 07/67, 22/82, 52/52, 16/76. \$190 OR WILL CONSIDER TRADE FOR WALKIE TALKIE. CALL AFTER SIX. DON, WB5IEK, 789-1910.

FOR SALE: ICOM IC-22S, ORIGINAL CARTON, MINT CONDITION, \$250 (NEGOTIABLE). KEN, WA5DTL, 946-4973.

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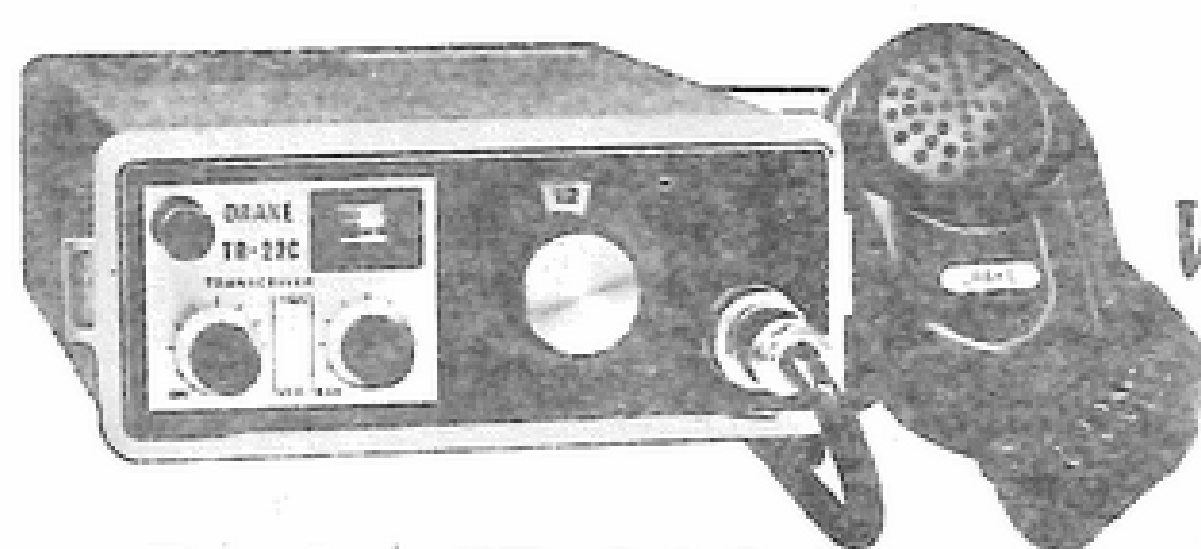


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## C O R A      C O M M E N T S

The last few times I have written this column, I have urged all to participate, just participate, that's all. The validity of participating created one of the finest weekends; blessed with the beauty of one of Oklahoma's State Parks, blessed with the companionship of some of the finest people and blessed with one of the year's first real rains. I'm referring to the Campout

at Roman Nose where Bob, Bill, Charlie, Robbie, Ken and myself with the YF's spent a very enjoyable time. Maybe these people would be better known as W5HXL, W5JES, WA5GOF, WA5JGU, WB5KHU and WB5SQC. Anyhow, the point of this is that had we chosen to not participate, we would not have had such an enjoyable time. Participate. Try it, you may like it.

We will be going to Dayton for - of course, the obvious - as well as to visit my ancestral home. All the years we lived there in that area, and now my first visit to the Hamvention will require a lot of driving. I guess there's no explaining some of life's ridiculous situations.

Speaking of ridiculous - I heard a rumor the other day. The rumor was that the Oklahoma Ham Holiday was about to be cancelled. Perhaps it is rumored that CORA is folding. If you have heard any of this, don't believe it. Ham Holiday is moving along, needing help perhaps, but still moving toward those wonderous days in August. CORA is strong and getting stronger.

At the meeting in Stillwater, the decision reached at the preceeding CORA meeting was presented; All Oklahoma Amateur Radio Clubs will be invited to join CORA and the Collector and Emitter was chosen as the instrument to communicate the ideas of all, which should make the C & E a better bargain. More Input - More Ideas.

There should be something somewhere else about the Stillwater meeting so I won't go into that here. There was one thing that happened there that raised my faith in the dedicated Amateur. There were enough volunteers to develop the ideas proposed. VOLUNTEERING - I thought it was almost a lost art.

Perhaps I will have something to say about our Dayton trip soon, so 'til then, 73.

Gene

FREQUENCY	AREA	TOWN	COMMENTS
	6 M E T E R S		
52.525-52.680	N East	Tulsa OK	WR5AHP
	Central	Okla City OK	WR5ADL
	4 5 0 M H Z		
449.1-444.1	N East	Tulsa OK	WR5AHN
	Central	Okla City OK	WR5AJP
	N Border	Chanute KS	
449.2-444.2	Central	Okla City OK	
449.5-444.5	S Central	Lawton OK	
443.725-448.775	Central	Norman OK (Control on 443.775)	
448.95-443.95	Central	Norman OK	
449.0-444.0	N East	Tulsa OK (RTTY interconnect)	
442.8-447.8	N East	Tulsa OK	WR5ACB
449.7-444.7	N East	Ponca City OK	W5TXF

# Central Oklahoma Radio Amateurs Inc.

All Clubs Co-operating To Advance Amateur Radio

COMMENTS  
ON  
RADIO  
ACTIVITIES

MINUTES OF C-O-R-A MEETING 22 Apr 77 7:30pm

Most of this meeting was given over to discussion of plans for Okla Ham-Holiday. It was pointed-out that sponsoring of the yearly Ham-Holiday and publication of the monthly Collector And Emitter are the principal activities of CORA.

It was decided it would be advisable to make an early selection of the grand prize for Okla H-H, and to have its description well publicized in C&E. Flyers, for H-H, will be mailed to Okla addresses only, unless requested. It was thought that trying to mail to the entire West Gulf Division would cover an area too large to handle the possible attendance. Flyer will be mailed in the C&E to all clubs in Okla and to all C&E subscribers.

Joe, WA5ZNF, reminded the prize committee that they should be busily contacting exhibitors for their commitments, and getting their rooms assigned and reserved.

Program Committee had no representative present. Registration Committee reported they are mailing announcements to all major amateur radio magazines.

Notice is given to all CORA Board members that every meeting your attendance becomes more important as we come closer to H-H time and as H-H plans are finalized.

Budgets were recommended for the various H-H committees as follows,

Program committee	\$150
Ladies activities	200
Publicity & Registration	100
Prizes	850

It was recommended to the Prize committee that \$350 be allotted for the Grand Prize, \$250 for Pre-Registration prize and \$250 for smaller prizes with retail value of not less than \$10 each. It is anticipated that after H-H registration is complete there will be much additional money available to be allotted to small prizes.

C&E will be mailed, with pre-registration forms, on June 23. All info from all committees, that is to go into C&E, must be in to C&E editor before June 20.

It was resolved, on motion by Bob, W5HXL, second by Ivan, W5HFU, that CORA treasurer be authorized to use, if necessary, up to \$500 from C&E account to underwrite H-H budgets. Any funds so used to be replaced from receipts from H-H pre-registrations.

Gene, WB5SQC, reported that at the OSU VHF Repeater Conference, C&E had been volunteered as an instrument for dissemination of news of further activities of that group.

Ellard, W5KE, discussed a recent newspaper article written by Jack Anderson, syndicated columnist, in which he "reported" of "jamming by Hams". Ellard suggested that CORA secretary be instructed to write the *Oklahoma Journal* expressing thanks for that local paper's fairness in publishing, on its "Letters to the Editor page", the letters from five local amateurs giving their answers to the Jack Anderson article.

Meeting adjourned at 9:40 for the usual coffee and doughnuts and gossip  
JW, WA5KFT, sec.

FOR SALE: All Round Emblem Collins Station. KWM-2A, 516-F2, 312-B5,  
30L-1, Complete crystal pack, All manuals and cables.  
\$2300, Don K5CKQ, Lawton (405) 355-0685. After 7 pm.

# C O R A   M I N U T E S   F O R   M A R C H

MINUTES FOR MEETING OF C-O-R-A BOARD OF DIRECTORS    25 Mar 77

Meeting at Red Cross Hdqtrs, Bldg. @ 7:30 local. Fourteen present, list attached to these minutes.

Public Relation Presentation. There was a discussion of future usages the P-R materials, which include films, slides and lecture outlines for talks on amateur radio and its activities. It was stressed that Hobe, WB5MLN, would welcome any requests to present this program to any group of any nature as long as there is interest in amateur radio. The Board of Directors recommends to all clubs that they "talk it up" and let it be known that such a presentation is available to promote amateur radio to one and all.

Okla Ham-Holiday Committees. Joe, WA5TRS, reported for the Program committee. Coy, K5LMG, reported for Prize committee.

FCC exams at Okla H-H. Question was raised whether we should write FCC about possibility of an inspector attending H-H. No decision was reached.

Tom Rea, WA5WKV, from the Stillwater club, invited all to attend the VHF co-ordinating conference to be held at Stillwater the day following (26 Mar 77). He requested some time on one of the H-H programs to report on any progress and plans developed by this conference and its future activities. The Board approved this.

Motion passed. (By Frank, WB5JBL 2nd by Hobe, WB5MLN) C-O-R-A to send a letter to all Okla amateur radio clubs inviting their membership in C-O-R-A. It was thought that this be limited to OKLA but clubs and individuals outside the state would be accepted at their own request. This letter to include a copy of Collector And Emitter with a copy of CORA by-laws, and make clear the purpose of CORA and the responsibilities of participating clubs. Bob, W5HXL, volunteered to draft this letter.

Motion (Fred, K5HFN / Hobe, WB5MLN) passed requesting Joe, WA5ZNF, to check and report at next meeting his costs for printing 600 bumper stickers to be given as favor with registration at Okla H-H. Joe stated he could do these by silk screen process if he could get volunteer help and space about the size of a two-car garage. Each club representative was instructed to check with his club to determine how many each club would buy at a cost of approx. 30¢ each.

Motion (Joe, WA5ZNF / Hobe WB5MLN) passed to raise C & E subscription to non-CORA members to \$3.00 per year to cover actual costs. This to apply to all those not members of clubs that participate in CORA.

World Radio News. Permission granted Joe, C & E managing editor, to spend approx. \$5.00 to subscribe to this publication for news and for fill material for C & E.

Advertizing manager for C & E is Ivan, W5HFU. All amateurs should send him any prospects for buying ads. Rates are 50¢ per square inch with \$5.00 minimum or \$17.00 for full page.

Discussion of need for volunteers to act as back-up and understudy to Joe, WA5ZNF, as editor of C & E. Joe really spends more time on our publication than he should spare from his other activities. Also, it would be wiseto have someone else familiar with all aspects of getting out C & E.

Adjourned for coffee and doughnuts at 9:15

JW, WA5KFT    sec.

FOR SALE OR TRADE: Heath SB-200, 1 kw ~~CHV~~ 1200 W PEP, \$250, or

Best Offer. Don, WA5TAW    Phone 733-3044.



The April meeting of the Oklahoma City Autopatch Association featured an outstanding program by Hobe Burgan, WB5MLN. A film produced by the ARRL was shown to guests and members. Roy Neal, W6DUC, better known to most of us on NBC news was the star of the movie. The movie is available from the ARRL to show prospective amateurs what amateur radio is all about.

Our thanks goes to Deeds for use of his ten gallon hat in which door prize tickets were collected. The door prizes were won by Gordon Johnston, WD5BXW, a sack full of miscellaneous crystals; Sam Perry, W5HAZ, a WRL attenuator; Robert Price, guest, a code oscillator; Frank McCollom, WB5JBL, a two meter preamp.

The weather net has been on the inactive side which is good. The record number of check-ins is appreciated for those nets that have been called. When checking into the net give only your call. Net control will ask for your location when he wants locations. When asked for your location give it as follows. Delta one six (not D sixteen)

#### REPORT ON OKLA. CITIES ONLY SIX METER REPEATER

More and more we are getting activity on our local 6 meter repeater. We are getting about 80 watts to the antenna and have had very little trouble with the old tube equipment - For those of you wishing to dig out the old six meter FM gear the input frequency is 52.680 mhz and the output is 52.525 mhz (which is also the national calling frequency. Transients who come through town are able to converse with locals simplex while copying the locals through the repeater. There must be an awful lot of six meter repeaters in the USA on 52.525 mhz because when the band is open, you can hear repeater C.W. ID's while talking to people in other parts of the country. Also a lot of local activity on six meter side band. A year or so ago a group of six meter nuts got together and formed SMIRK (Six Meter International Radio Klub) and assigned Smirk numbers to anyone contacting six members and reporting same to SMIRK Headquarters. This has done wonders to increase six meter activity for those trying to get as many numbers in their log as they can. Certificates are given for 100 contacts. The last I heard some 1,800 numbers had been issued. You may not care for number chasing for certificates but if ever we have to prove six meters is being used, at least we can prove 1,800 amateurs have talked to six other amateurs on six meters.

Now if you would like to get on six meter side band and get to know some six meter nuts (and they are a pretty loyal lot to their favorite band), then join the Oklahoma six meter SMIRK net each Monday nite, 2000 local time on 50.150. The net control is passed around so each gets a chance to work as the control if he wants to. Also band openings should be hitting soon and 50.110 seems to be the National call frequency for SSB. On Monday nite 4-11-77, at the time this is being written 14 people from Oklahoma ranging from WA5RBI-Bob, Enid; to WA5EEZ-Bob, Tuttle; and K5GBN-Johnnie, Calumet to K5CM-Connie, Muskogee and Wa5PKC- Jim, Lake Eufala checking in. Also five Texas stations checked into the net.

CU on 6

Frank WB5JBL

Spring vacation for the Oklahoma City area schools sent many of our members and their families on vacation. Our president WA5ETV, Gary, took his family to the Washington D. C. area where they visited many of the historic sites and national monuments. Vice - president K5GL, Guy, and family headed southeast to the crystal clear warm waters of the Caribbean. Besides taking my xyl and three daughters I took a new Atlas 210X.

Operating K5GL/KV4 and KP4 for 9 days I made over two-hundred contacts. The most unique contact was with Gary, WA5ETV when by chance he walked into the amateur station at the Smithsonian Institute and heard K5GL/KV4 coming out of the speaker. Gary showed the operator in charge his amateur license and proceeded to work K5GL/KV4 on the 15 meter band. Signals were outstanding - S9 plus. It is truly a small world.

Daily contacts were also made with J, K5JL on 14,240. Twenty meters was the only consistent and dependable band. Fifteen meters was open into the east coast and Europe everyday but never into the central or western states. Not one signal was detected on the ten meter band. Ten is by far the best portable or mobil band but the sun spots were against us on this trip.

The antenna for the Atlas was one-hundred feet of insulated wire with a mini-matchbox for loading. You can use as much wire as you desire depending on what space you have available and what band you desire to work. Palm trees are abundant and high but normally are not the correct distance so two-hundred feet of nylon line is a must have item. The mini-matchbox is the SST-1 made in California (\$29.95 prepaid) . I found that it would load anything on any band. This of course can be a problem in that just because something called an antenna takes a load does not mean that it will radiate the RF. The SST-1 also has a power rating of 200 watts.

I must say that in my twenty-six years of being a ham - operating portable with the little Atlas from the Virgin Islands is one of my most memorable experiences. The Atlas is so small that it will get lost in the corner of a suit case. By the way - I am not the Atlas dealer but do recommend you have one with you on your next trip.

FOR SALE :: Standard SCR146A, a deluxe hand held with touch tone pad, ten channel model, complete with battery charger and many accessories. \$300.00, K5JL, J, 787-9545

FOR SALE :: SB 110 Transciever, 6 meter SSB, CW, with power supply and deluxe speaker. \$350.00  
Large two meter antenna. 80 element collinear with KLM baluns, phasing lines, and KLM power divider. Complete with supporting structure. This is a once in a lifetime opportunity to be a big gun on 2. only \$275.00, K5MB, Marshall, 787-9545

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TRADE-INS ARE ALWAYS WELCOME. ALL MAKES OF AMATEUR EQUIPMENT REPAIRED. A COURTEOUS INVITATION IS EXTENDED TO "ALL" TO VISIT OUR NEW AMATEUR STORE IN THE REDING SHOPPING CENTER. A PUBLIC ADDRESS AMPLIFIER IS AVAILABLE TO LOAN AT NO COST. ASK ABOUT THE CODE CLASS NOW BEING CONDUCTED AT THIS STORE INCLUDING THEORY FOR AMATEUR EXAMINATIONS

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(405) 634-8844

YAESU  
Kenwood

Wilson 2 Meter Handy Talkies

Wilson & Sonar  
Business Band



OKLAHOMA AREA REPEATERS - FROM THE STILLWATER CONFERENCE - SOME ACTIVE, SOME NOT. TRY THEM AND SEE.

Continued on page 21

FREQUENCY	AREA	TOWN	COMMENTS	FREQUENCY	AREA	TOWN	COMMENTS
146. 01/61	N Border	Coffeyville KS		146. 34/94	Central	Oklahoma City OK	WR5AJP
	South	Lawton OK	WR5AMC		N East	Tulsa OK	WR5AHN
	Central	Calumet OK	WR5ABW		N Central	Enid OK	WR5ABW
146. 04/64	S East	Poteau	Cavalina Mt.		N Border	Wichita KS	WR0ABK
	S West	Granite		NE Border	NE Border	Pittsburgh KS	WR0ADZ
146. 07/67	Central	Oklahoma City OK	WR5ADF		E Border	Ft. Smith AR	WR5ADQ
146. 10/70	Central	Oklahoma City OK	RTTY-Dallas link		E Border	Little Rock AR	WR5ADI
	N East	Tulsa OK	WR5AHP	146. 37/97	N East	Ponca City OK	WR5ADD
146. 13/73	West	Woodward OK			S Central	Ardmore OK	WR5AEU
	Central	Stillwater OK	WR5AFS		Central	Oklahoma City OK	WR5AKP
	NE Border	Pittsburg KS	WR0ABO	146.40	Interlocking & Simplex		
	S West	Duncan OK		.43	"	"	
	E Border	Little Rock AR	WR5AFM	.46	"	"	
146. 16/76	Central	Oklahoma City OK	WR5ADZ	.49	"	"	
	N East	Bartlesville OK	WR5ADO	.52	National Simplex Channel		
	W Central	Elk City OK	WR5ADT	.55	"	"	
	S West	Granfield OK	WR5AMC	.58	"	"	
	N Border	Winfield KS	WR0ABZ				
	E Border	Fayetteville AR	WR5AFB	147. 63/03	Central	Edmond OK	WR5AHG
146. 19/79	S West	Altus OK	WR5ANX		E Central	Ada OK	
	East	Mena AR	WR5AEM		S Border	Gainsville TX	
146. 22/82	N East	Miami OK	WR5AHY	147. 66/06	N East	Pryor OK	WR5ATN
	N East	Tulsa OK	WR5AHP		Central	Byars OK	
	Central	Oklahoma City OK	WR5ACB		Panhandle	Beaver OK	
	N Border	Wichita KS	WR0ABU	147. 69/09	N East	Tulsa OK	
146. 25/85	E Central	Muskogee OK	WR5AFY	147. 75/15	N East	Grove OK	K5PJR
	W Central	Mangum OK		147. 78/18	Lowell-Chanute KS		
	Central	Oklahoma City OK	WR5FAA	147. 81/21	Central	Oklahoma City OK	WR5ACB
146. 28/88	N East	Tulsa OK	WR5AHQ	147. 84/24	NE Border	Pittsburgh KS	
	Central	Norman OK	WR5AFW		Central	El Reno OK	
	S Central	Lawton OK	WR5ARC	147. 87/27	N East	Tulsa OK	WB5PZD
	E Border	Hot Springs AR	WR5AHM		Central	Stillwater OK	WR5ASW
146. 31/91	N East	Bixby OK		147. 90/30	N East	Tulsa	WA5UTF
	NE Border	Springfield MO		147. 93/33	E Central	Muskogee OK	K5ETH
	Central	Kingfisher OK		96/36	N East	Chelsea-Vinita OK	WR5ARZ
	E Central	Shawnee OK	WR5AOQ	99/39	NE Border	Joplin MO	

## OKLAHOMA REPEATER SOCIETY--REVISITED

The minutes of the meeting of the newly formed Oklahoma Repeater Society that appear elsewhere in this issue of C&E outline the events that happened during formation of Oklahoma's newest radio conference. Now the question that many amateurs must be asking is "Why?" In this time of various organizations that support various repeaters and other activities, why do we need yet another organization which the Oklahoma amateur is asked to join? Why doesn't my membership in my local club suffice to provide me representation at the regional level? The answer, while not overly complicated, lies in the extreme popularity of VHF-FM, the current FCC attitude toward amateurs, and the need for amateurs to begin to consider the true meaning of self-regulation.

The Oklahoma Repeater Society springs phoenixlike from the ashes of the Mid-States VHF Conference. This precursor organization began (and continued) as a loose confederation of repeater operators who, during the early days of VHF-FM development, felt a need to exchange information concerning repeater operation and frequency coordination. Coordination rapidly became the primary function and the meetings, conducted semiannually, were loosely organized. For some reason, the period of greatest growth for VHF-FM also was the period of decline for the Mid-States Conference. However, the need for such an organization has not declined. So why did it go away? An analysis of the difficulties experienced with the Mid-States Conference might show that, in part, its demise was predicated on the geographical area it intended to serve. The Conference included trustees and operators for repeaters from Kansas, Oklahoma, Arkansas and Texas. The sheer logistics of organizing meetings between these geographically diverse groups altered the ability of the group to effectively organize. Couple this with a loose organization and it could be seen that maintenance of such a group was extremely difficult. By concentrating on a smaller geographical area (the State of Oklahoma), the Oklahoma Repeater Society hopes to strengthen the ties between the users of the VHF-FM portions of our bands.

Further, Oklahoma repeater operators have long admired the organization of the Texas VHF-FM Society and the sheer clout that it carries with the FCC with its comments during Rulemaking. There can be no doubt that demonstration to the Commission of the concern of amateurs of this area would strengthen input effectiveness of this region. Oklahoma repeater operators and users have their own particular problems and approaches to solutions. There is no reason why this experience should be denied to the Commission and others around the country. This is especially critical in light of recent FCC decisions in regard to deregulation. The Commission, faced with the impossible task of controlling the Personal Radio Service (CB), finds that its enforcement procedures cannot be stretched across all the services that it regulates. The logical extension is to reduce enforcement where, historically and factually, it is not needed. Amateurs now face greater responsibilities in light of the Commission's decision to force us to shoulder our own enforcement. There can be no doubt that a statewide conference of concerned operators and users carries clout, not only with the regulators, but also with the regulated. The Oklahoma Repeater Society should, however, not be viewed as any type of "Watchdog" or "enforcer", but as a deliberative body where difficulties can be considered and solutions or compromises produced. Self-generated policy statements can form the cornerstone for proper development of the VHF Bands. The chief example in this regard, comes from the Texas VHF-FM Society in the form of the so-called "Texas Plan" for repeater placement within the 146-147 Mhz band with channels every 60 khz and 600 Khz spacing. It is just this type of orderly development and innovative thought that is needed as our VHF and UHF band experience a population increase. As

repeaters proliferate, consideration must be given to the use of split channels, inverted splits, and alternative bands. It is a hard fact of life that repeater interest will increase as amateurs desire to put up their own short range repeaters for local personal coverage. The fact is that every VHF FM channel in the Dallas-Fort Worth area is in use and split channels are filling rapidly. The number of repeaters in the Oklahoma City area being operated by small clubs or individuals also gives witness to this rapid increase of interest. Vast amounts of control circuitry and equipment are no longer required to get a system up and running. FCC licensing procedures also have been simplified and easily put the repeater station license within the grasp of the average amateur. Repeaters will be bought, sold, changed in frequency and operated in much the same manner as HF equipment. The effect will be the similar to the trade in low band gear with only a few exceptions. The repeater, inherently by its nature, will affect more amateurs proportionately than any other type of station. Individual ownership of repeaters is an experiment that should not be denied to the average amateur. Organization now will insure proper development in the future.

The Mid-States organization was a conference of repeater operators. The average amateur is a "consumer" of repeater services and as such forms an important link in a repeaters operation. It was the consensus of the group meeting in Stilwater to follow the suggestion proposed by W5GM and allow membership in the Oklahoma Repeater Society to any interested dues paying member. With this in mind (in terms of sheer numbers), the decisions made by the group would carry the weight of the many members. Further, the group must have input from these "consumers" if its decisions are to be truly informed. The organization must maintain its flexibility and have an inherent ability to move quickly in response to inquiries. Semiannually meetings are in the offing (scheduled at hamfests, if possible) for the general membership.

What must be the cornerstone of such an organization? Service and interest should be initially suggested. The average amateur should take to heart the responsibilities given to him by the Commission and acknowledge the heritage that we possess for regulation, responsibility and innovation. Further, as new amateurs join our ranks, it is up to us to infect them with the same sense of concern that should characterize amateurs as a whole. Nothing has been finalized about the group, not even the name. Input is needed. For those who would like to assist or otherwise provide input to the new organization, please contact any member of the steering committee. Committee members are now examining examples of potential constitutions and bylaws. By the establishment of the Oklahoma Repeater Society, it is hoped that we anticipate the need and service of such an organization to the amateur community both now and in future years.

Micheal Salem WA5EPK  
Joe Buswell WA5TRS

CENTRAL OKLAHOMA RADIO AMATEURS, INCORPORATED

AMENDED CONSTITUTION

ARTICLE 1 - NAME The name of this organization shall be the Central Oklahoma Radio Amateurs, Incorporated, a non-profit organization hereafter referred to as CORA.

ARTICLE 2 - PURPOSE The purpose of CORA is to coordinate group activities in the public interest between the amateur radio societies in central Oklahoma. These activities consist of a state-wide meeting of amateur radio operators; better use of communications skills in support of The American Red Cross, Civil Defense and the American Radio Relay League; and to seek solutions to problems facing amateur radio licensees throughout the state.

ARTICLE 3 - MEMBERSHIP Membership in CORA shall be as follows:

a. SUPPORTING - Each of the several constituted amateur radio societies in the central Oklahoma area, indorsing the purposes stated in Article 2 above, and providing financial or other support to this organization shall be a SUPPORTING member of CORA.

b. ASSOCIATE - By virtue of an individual's membership in a supporting member central Oklahoma amateur radio society, he shall be an ASSOCIATE member of CORA.

c. DIRECTORS OF CORA - A Board of Directors shall be established as follows:

1. Each SUPPORTING member of CORA shall duly appoint or elect three Directors to serve on the Board of Directors of CORA for a term of one year, beginning in September of each year. Each Director shall have one vote.

2. The immediate past President of CORA shall serve as an advisory member of the Board of Directors for a period of one year. He shall have a vote.

ARTICLE 4 - OFFICERS AND THEIR DUTIES The Officers of CORA shall be the President, Vice President, the Secretary, and the Treasurer. The Directors of CORA, at the annual September meeting, shall nominate and elect the above officers to serve for a term of one year. Nominees for the above offices are to be only from the members of the CORA Board of Directors. They shall be elected by a majority vote and shall hold office for a period of one year. There is no restriction on the re-election of any individual to an office he has held in the previous year, so long as he remains a Director of CORA.

a. The President shall call and preside at all meetings and represent the organization in all official matters. He shall appoint all committees that may be necessary in the administration of the organization's business.

b. The Vice President shall take over the duties of the President in the President's absence. He shall have all the authority of the President when acting in the presidential capacity. He shall assist the President in performing all activities of the organization.

c. The Secretary shall keep a written record of the minutes of each meeting of CORA and originate correspondence as directed by the President.

d. The Treasurer shall receive and disburse all funds intrusted to CORA and keep an accurate record of such, shall be personally responsible for all funds intrusted to him and shall give an accounting of the disposition of all funds at each meeting of the organization.

## ARTICLE 5 - FINANCIAL MATTERS

a. CORA will receive financial support from each financial supporting amateur radio society as approved by each individual society. Funds for a specific activity shall be requested by the President from financial supporting societies upon approval of the Director Membership.

b. Upon final completion of a specific project or activity by CORA, the financial supporting societies will be repaid their financial support if possible. Any liability for loss shall not exceed the amount allocated for that activity.

c. A complete accounting of the financial matters of any CORA activity or project will be made available to the financial supporting societies when funds are returned.

ARTICLE 6 - EXPENDITURE OF FUNDS The President shall authorize any expenditure of funds up to an amount of \$25.00. Expenditures of funds above \$25.00 require the majority concurrence of CORA's Officers and Board of Directors in attendance.

ARTICLE 7 - VOTING All matters of CORA shall be decided by a majority of the Director Members present at any meeting.


ARTICLE 8 - MEETINGS Meetings of CORA shall be called by the President as may be necessary to conduct activities meeting the several objectives stated in Article 2 above. Advance notice of meetings, including time, date and location, shall be given all Director Members.

ARTICLE 9 - CHANGE OF CONSTITUTION This Constitution may be amended by a majority vote of the Director Members present at any regular meeting, provided Director Members have received thirty days advance notice of the proposed change.

Approved and adopted this 28th day of May, 1976.

# The Zany News Frequency

By JOE WASENE

So really Zany this month -  
not enough hours in these  
days - may daylight savings  
and will help. 

## KLM MULTI ELEVEN SPURIOUS EMISSION

A recent interference hunt by Mac, K2GKK, turned up a KLM Multi Eleven that was locking up one of the repeaters with emission on the repeater input frequency while the receiver was tuned to the output frequency.

Dennis, WB5ISN, reported a similar incident which had happened some time ago with another rig of the same type.

Owners of KLM Multi Eleven's should be aware that if the spot function is tuned on and the rig is in repeater mode, sufficient signal may be radiated 600 kHz offset from the receive frequency to create interference to a repeater. In simplex mode, the user would be aware of the carrier's presence but in repeat, the repeater may be aware and not the owner of the rig!

It might be well for owners of these rigs, and possibly other similar rigs to replace the spot switch with a spring loaded momentary on switch to prevent accidental transmission of spurious emission.

Reported by Mac, K2GKK

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" 4	-	-	65.92	72.40	74.44	84.24	95.48	-	-
" 6	-	-	-	75.24	79.28	87.40	98.80	-	-
" 8	-	-	-	-	82.52	90.64	101.88	118.08	-
" 10	-	-	-	-	85.84	93.92	105.12	121.36	140.72
" 12	-	-	-	-	88.96	98.80	108.44	124.60	143.92
" 14	-	-	-	-	-	101.88	113.32	127.88	147.20
" 16	-	-	-	-	-	105.12	116.52	131.20	150.60
" 18	-	-	-	-	-	106.76	119.80	134.24	153.88
" 20	-	-	-	-	-	-	121.36	137.56	156.92
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15	16	76 <sup>ers</sup> 17	18	19	VHF 20	21
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