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Official Publication Of
PALO ALTO AMATEUR RADIO ASSOCIATION
(PAARA)

W6OTX
Palo Alto Amateur
Radio Ass'n

Affiliated
Clubs

K6YQT
Menlo Park C-D
Radio Club

ORGANIZED FOR
PUBLIC SERVICE, SCIENTIFIC, EDUCATIONAL AND
SOCIAL BENEFITS TO AMATEUR RADIO OPERATORS
(A non-profit organization; Incorporated 1956)

NEXT PLANNED FUNCTION

Date: Friday 4 February 1972

Place: Menlo Park Recreation Building, Civic Cntr.

Program: LIDAR - The detection, evaluation and
mapping of air pollution by use of Laser
beams. Robert J. Allen, Engineer with
Stanford Research Institute will explain
and demonstrate use of this advanced
technique of air pollution resolution.

Vol. XVI
No. 2
February 72

OFFICERS

ADMINISTRATIVE

PAARA

Pres. : Fred Canham, W6QWF
 V Pres: Andy Korsak, VE3FZK
 Secty : Les Vickery, W6AKR
 Treas : Vance Wardlow, W6FLE

APPOINTMENTS
 (To be made by President)

BOARD OF DIRECTORS

Chmn : Fred Canham, W6QWF
 Secty : Les Vickery, W6AKR
 Member: Hal Moore, W6DEF
 " Vance Wardlow W6FLE
 " Ed Fairbanks, W6AIN
 " Gerry Laxson, W6OPA
 " Bob Allen, W6WQD
 " Andy Korsak VE3FZK

MENLO PARK C-D RADIO CLUB

Pres: Fred Canham, W6QWF Vice Pres: Glen Baker, W6UOK
 Secty/Treas: Vance Wardlow, W6FLE
 Property Custodian: Bob Allen, W6WQD (Trustee K6YQT)
 Asst Property Custodian: Glen Baker, W6UOK.
 RADIO OFFICER: Bob Allen

Editor: Vance Wardlow, W6FLE-Ph: 854 0803, PO Box 911, MP
 POLICY: Membership includes subscription to PAARAGRAPHS.
 Subscription rate \$1 per year. Non-subscribers will be
 dropped as new names are added to mailing list. For your
 APPLICATION FOR MEMBERSHIP send \$4 to PAARA, PO Box 911
 Menlo Park, Ca. 94025. For information Phone 854 0803.

SUPPORT YOUR CLUB

GET INVOLVED

PAY YOUR DUES

PARTICIPATE

BECOME A PARTICIPATOR

FUTURE PROGRAMS

Wednesday 9 Feb: PAARA Board of Dir. Trailer SRI.

Friday 3 March: AMATEUR TV - Bob Allen and Andy Korsak
 will discuss and demonstrate the ATV they have
 developed for PAARA from equipment donated by
 Ken Kerwin, K6UXD. Menlo Park Recreation Bldg.

Friday 7 April: AMATEUR ANTENNAS - their design and use.
 Fred Dietrich will give us a run-down.

SIMULATED EMERGENCY TEST

By the time you read this the SET will have come and gone. Unlike real emergencies (thankfully) our simulated emergency goes by without leaving death and destruction in its' wake.

For the past several days our PARTICIPATORS have been busilly preparing for all the forseeable breakdowns and emergencies we might encounter at any time of a real disaster. Our new RADIO OFFICER, Bob Allen has set up all circuits and facilities on a chart to have every possible area covered. He has prepared instructions for the mobile stations and divided the Menlo Park-Atherton area into subareas in which various communication facilities will operate.

Andy Korsak gathered together a very efficient gang of PARTICIPATORS. Paul Thekan, Steve Montoya and John Cameron gave Andy a hand in getting installed a 6 meter antenna on the mast on top of the Steam Building next to the trailer. Tried it out and it works fine.

Andy Anderson broke out his several 6 meter rigs and had a real fine test session with the gang at the trailer.

3 Between Fred Canham and Ed Fairbanks they got the emergency power supply, stored in the trailer, all overhauled. Fred worked over the engine while Ed got the generator in first class shape. They double checked the power cables and made sure they would plug in to the various sockets.

Jerry Starkey bore a hand in making phone contacts and lining up PARTICIPATORS in manning the various operating positions.

Hal Moore got his annual letter out to the AREC members. As emergency coordinator Hal is covering a lot of territory. He knows of and prepares for all the many things that have happened in the past. He prepared that fine newspaper writeup you may have read in the Redwood City Tribune or Menlo-Atherton Recorder.

Andy and his gang picked up the BIG emergency generator from Oliver Sweningsons place and brought it to the trailer location. With the frustrated help of Fred and Ed they got it going and all tested out.

Glen Baker was prepared to provide a trailer for the BIG generator but wasn't called upon. He is all prepared to do a lot of mobiling!

PERFORMANCE REPORT NEXT MONTH

CIVIL DEFENSE

The City of Menlo Park is in the process of up-dating the City's Civil Defense Plan. An annex to that plan is the RACES organization and plan for action in the event of a disaster.

The Mayor of Menlo Park, Ira Bonde, recently appointed Robert J. Allen, W6WQD, to the position of RADIO OFFICER for the Menlo Park-Atherton area. As you know Bob was the President of the Menlo Park C-D Club until the recent elections, Fred Canham, W6QWF is the current President. Bob prepared the RACES annex for Mayor Bonde who then forwarded it together with the appointment papers on Bob to the FCC for confirmation.

Bob and Vance Wardlow represented the Club in a meeting of City officials and Don Allen of the San Mateo County Area. Subject of the meeting was the layout and preparation of the Menlo Park Emergency Operating Center(basement of the Administration Building).

A second meeting was held to solidify those plans. This meeting was attended by Andy Korsak and Vance Wardlow. A tentative location and plan was agreed upon for RACES

4 communications center. The City Engineering Department is proceeding with investigation of the possibilities of providing coax transmission lines from the EOC to the Police Station tower on which the RACES antennas are to be installed.

Bob Allen prepared a scale layout of the trailer as a planning document for the new EOC. In the master plan the trailer is indicated as an alternate control center for RACES operations. Bob also prepared a suggested layout and construction details for the operating positions to be installed in the RACES EOC.

The City is proceeding with plans to establish the EOC as a practical operable unit of the San Mateo County Civil Defense organization. Funds for some portions are now available and additional funds will be included in the budget of the City for the coming year.

Brad Kerwin, Personnel Officer for Menlo Park is coordinating actions on the EOC. He is very well prepared for such coordination since he had such experience in the Air Force prior to coming to Menlo Park. Brad understands the need for emergency communications and RACES function.

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CLUBS MEET 7 January 1972

Meeting at the Veterans Memorial Building in Redwood City the new officers of each Club were introduced.

A tentative plan which had been prepared beforehand by Fred Canham, Andy Korsak, Gene Sussli and Vance Wardlow was presented to the members for comment. There was some question of the date for the Auction. The date was finalized for 13 October. With a few minor corrections the plan was accepted.

The speaker of the evening, Bob Cunningham, Civil Defense Training Officer for San Mateo County, was introduced. He proceeded to outline the communication facilities available within the County and their interconnection with those of the State. Bob explained the utilization of the various frequencies available and the procedures and results of operating the relay station.

Bob pointed out that preparation for war is a small function of the present day Civil Defense Network. The main thrust is to prepare for emergencies such as floods, earthquakes and similar disastrous events.

Bob had a very fine movie showing the terrible damage

suffered along the Gulf coast due to hurricane Camille. The film followed the hurricane into the Appalachian mountains and into Georgia. The damage and displacement of persons was almost unbelievable! The role of the Civil Defense communications Network was illustrated.

It was a most convincing documentary that IT CAN HAPPEN HERE. And that there is IN FACT a real need for the C-D communications network.

Bob then showed a series of slides. They were of the various installations throughout San Mateo County. Frank Miller assisted in the explanation of the function and makeup of each installation. Altogether it was real impressive and revealing to those of us not acquainted with the extent of the C-D network.

Bob further explained the tie-in between the various communications systems in the County ie Micro-wave; hospitals; contractors; police; fire and RACES.

It was a fine, instructive and interesting meeting. It was well attended and everyone learned something.

Thanks Bob, Frank and Al for a fine presentation.

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1 Tri-Band Beam-10, 15, 20 w/tower and rotor \$100.00
1 10 M Beam, mast, rotor \$50.00
1 Collins KWS-1 & 75 A with 3 filters. Both in exlnt condition \$700.00
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1 Gen Elec scope Mod ST13
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1 Reflected power bridge
1 Grid dipper
1 1-KW Dummy load
1 RME-69 Receiver w/speaker. BC221 AJ Freq meter
TS 174 U " "
Prop Pitch Motor
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Palo Alto: 327 5363

More Manuals next month →

WANTED

I have a Servo Corp of A. receiver, 50 to 200Mhz Mod R5200-A2. Need wiring diagram.
Jerry Starkey 964 6584
WA6LIJ

Transmitter, Heath DX-100 160 thru 10M, 180W, CW & AM with manual \$ 65.00

Receiver, National NC303 160 thru 10M plus 1½, 2&6M with converters. SSB, AM, CW with manual \$175.00

Converter, Ameco CN144 2M w/power supply PS-1 and instructions \$30.00

Receiver NC 173, general coverage, 0.53 to 31Mhz plus 48 to 56 Mhz W/man. \$65.00

Preselector RME DB23 Ham band 80-10 \$20.00
Call Ray W6JOV 591 1995

WANTED

Hugo Romander has a GSD100 & GSD101. Needs an old TV transformer also plate Xfmr with 1800V secondary @ 300 to 400 mils. Get in touch with Irv W6HHN . . 327 5363

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Heathkit Sig. Tracer Mod IT-12
Heathkit Cap Test Mod CT-1
Heathkit Lab. No3
Heathkit scope Mod H0-10
Jerry WA6LIJ 964 6584

It may be of interest to members of other Clubs that Bob Cunningham, Public Education & Training Officer for the C-D organization of San Mateo County is available and will be happy to present a discussion of the C-D set-up in San Mateo County. You can call Bob on 369 1441 ex 2483.

You fellers with an anchor problem for your masts may want to read a good solution in the October '71 QST page 57. If interested in this method, contact Ed Fairbanks, W6AIN on 322 0319, He has access to surplus 5 gal. cans.

PAARA Club members may be interested to know we now have most interesting visit in the latest CALLBOOK Magazine. Vance keeps it at home to help prepare his mailing list. Anyone may borrow it or get info by calling Vance on 854 0803.

NOTICE TO NON-SUBSCRIBERS AND NON-MEMBERS

Each issue of PAARAGRAPHS costs PAARA \$29.00 to get it into your hands.

The Club needs YOUR SUPPORT in this venture as well as in the many projects now underway.

PAY YOUR DUES-SEND IN \$4.00

MORE FOR SALE

Ranger 11, 160-6M . . .	\$70.00
Hammarlund HQ110A . . .	\$140.00
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National NC-120 . . .	\$25.00
Call Vance, W6FLE on 854 0803	

OUR PARAPEDITIC PALS

Irv Wolfe, W6HNN reports that he and his lovely XYL had a Mexico recently. They made the circuit through Cuernavaca, Guanajuato and Guadalajara. Irv says his 1 year study of the language really paid off. He saw only TV skyhooks while looking for local Hams. Reports he is ready to give anyone advice on "Mexican Holidays"- especially on beer.

Hal Moore W6DEF, and his beautiful XYL continue to make occasional trips to Japan to teach there. Both enjoy it very much.

PUBLIC SERVICE

Amateur Radio exists because it qualifies as a Public SERVICE.

Throughout our history, we amateurs have established a reputation for public service communications which is of the greatest importance to our continued occupation of frequencies. At first this service was rendered spontaneously and on an individual basis. As time progressed, the need for and value of organization became evident, resulting in the establishment of organized trunk lines and net systems and later the Amateur Radio Emergency Corps (AREC) and the National Traffic System (NTS).

Today there exists in amateur radio a very complete and very tight volunteer organization of amateur operators for public service called The Amateur Radio Public Service Corps (ARPSC). Sponsored by ARRL, this corps includes the combined activities and facilities of the AREC, as it has developed since 1949, and recognizes the Radio Amateur Civil Emergency Service (RACES) and independently-organized amateur facilities as integral parts of the Amateur Service's public service effort.

The AREC is in effect the "emergency" division of ARPSC and consists of licensed amateurs who have voluntarily registered their qualifications and equipment for communication duty in the public service when disaster strikes. The AREC was conceived, established and is sponsored by ARRL. However participants need not be members of ARRL to be eligible for membership in AREC.

To prepare for the ultimate disaster, enemy attack upon or invasion of the continental United States, the Federal Government recognized the potential value of amateur radio communications. To best utilize this national asset of trained radio operators there was established a national organization entitled The Radio Amateur Civil Emergency Service (RACES). This government sponsored organization and the AREC are coordinated and by mutual cooperation

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OSCILLOSCOPES

TRANSMITTERS

RECEIVERS

TEST EQUIPMENT

IC'S

TELETYPEWRITERS

POWER CONTROL PANELS

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PUBLIC SERVICE (Cont'd)

are designed to be mutually supportive. Thus members of AREC through peacetime training and experience become able & capable of immediate transition to the parallel RACES organization in the event of ultimate disaster when all amateur and other radio transmissions would be prohibited. AREC members and other qualified amateurs may become members of RACES through qualification as experienced operators and as acceptable security risks.

SIMULATED EMERGENCY TEST

There exists of course every possible degree of lesser disaster than the ultimate. Therefore it is essential to plan and prepare for such emergencies. Through cooperation and coordination between ARRL and RACES there is held an annual SIMULATED EMERGENCY TEST. (SET).

The SET is planned and organized to encourage each community throughout the United States to envisage a potential emergency which may logically occur in their community and test the communications facilities available to assist in such an emergency. The AREC and RACES organizations are thus given the opportunity to test their capability to meet the needs of the community as a public service.

In every SET amateur radio operators are provided with the opportunity to test their ability to conform to the basic PRINCIPLES OF EMERGENCY COMMUNICATIONS. These principles may very briefly be stated as follows:

1. KEEP THE QRM DOWN - Listen, don't transmit.
2. AVOID SPREADING RUMORS - Send FACTS only.
3. AUTHENTICATE ALL MESSAGES - each must be WRITTEN.
4. BE EFFICIENT - avoid hysteria, do not overdo.
5. SELECT THE MODE AND BAND TO DO THE JOB - as an experienced communicator you must know the best band for the time of day. USE IT - none other.

BECOME A PARTICIPATOR TO THE BENEFIT OF YOUR COMMUNITY

PAARA BofD MEETG 12 Jan 1972

Members of the Board met in the trailer at SRI. Those present were: Fred Canham, Andy Korsak, Ed Fairbanks, Hal Moore & Vance Wardlow. Members attending were:

Paul Thekan & Steve Montoya.

Discussion of Powder Puff Derby: Communications Station will be set up at the San Carlos Airport. 2M link will be setup to mobile guest cars and to Villa Chartiers.

Hal will search out Clubs on the air route to whom we may refer phone patches. The station will use Freds Drake & Gene Reynolds Linear. PAARA Gonset & MP C-D gonset for the 2Mcircuit. Will plan on 3 mobiles.

Fred gives report of CCRC meeting. FARS dinner is on 29 Jan.: SPARKS auction is on 11 Feb. at Philco, 7 PM.

Treasurer gave report of finances.

Hal gave an outline of the SET expectations. He pointed out that Bob Allen, our RADIO officer, is responsible for Club plans and organization. Hal will contact various of the City officials for msgs which count 5 points. Circuit and nets for mobile and fixed station were discussed.

Motion was made, seconded & passed to support SET to the

amount of \$25 to help pay for AREC letters. Passed. Check in amount of \$25 made to Hal Moore.

Ed Fairbanks moves that a budget be prepared for the year 1972 for PAARA. Secnded and passed. Vance Wardlow will prepare.

9:30 PM meeting adjourned.

* * * * *

DUES

The following have paid the 1972 dues. If you are not listed send a check for \$4 to PAARA, PO Box 911, Menlo Park: Bob Allen W6WQD

Bob Baum W6BFH

Ed Camp

Fred Canham W6QWF

John Cameron

Loren Cahn WA6ENC

Paul Churchill W6QBY

Jack Cline K6JK

Fred Diedrich W6MOH

Milt Donovan W6MFN

Al Doty W6GAQ

Ed Fairbanks W6AIN

George Flammer WB6RAL

Ralph Franks NC

Andy Korsak VE3FZK

Gerry Laxson WA6OPA

Steve Montoya WN6DQT

Hal Moore W6DEF

Larry Rice W6IQT

Lucky Rogers WA6JXO

Jesse Sadler W2UZF/6

Dan Shearer & Son W6SME/WA6MMY

Jerry Starkey WA6LIJ Les

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15
TECH NICAL TOPICS de VE3FZK /W6

TWO-METER PROJECT

Bob Baum, W6BFH, borrowed my master p.c. board negative for the 2-meter transmitter designed by Cliff Buttschardt, W6HDO, and he is planning on making a copy of that design. I still have to get back to mine when I have time and finish tuning it up. Once the SET is over I hope to get some time to get back to the phase-lock loop receiver I got distracted away from by the ham TV project I started for the club. My plan is to go back to an earlier breadboard version I had working quite well and see if I can come up with a reproducible p.c. board without trying to get fancy with squelch and all sorts of other goodies I was attempting to cram into the first effort.

I see that Hal Moore, W6DEF, gave up on me ever coming up with a final design, as he just bought a Commcraft AM-FM transceiver and he had his first QSO for it with me on 2 tonight.

W6OTX/TV PROJECT

We have made considerable progress on the ham TV project for the club since last month. I finally finished building the camera control unit, and so the W6OTX camera now has a composite video, sync, and blanking output ready for modulating a transmitter. In fact, Elmer Shapiro, WA6MPC, got the ART26 "radar jammer" working, which we borrowed from Jim Talt, and one night a couple of weeks back we fired up on 420 inside my lab at SRI and sent a picture across the lab to a TV receiver with a borrowed 420 converter from Wayne Ryder, W6URH. But it was a lousy picture at the receiving end, and it seems we can't get the ART26 tuned up properly. Seems like we need some assistance from Talt or Bill Jackson, W6OWQ, who both used the thing, at one time or another, with success.

Bjorn Forsberg, the SM?/W6 who lent us a commercial camera to tryout a while back, is planning to build us a half KW amplifier for 420. We are debating on how we should modulate, since it may be desirable to cut one video sideband to get extra "oomph" at the desired frequencies (All

TV receivers pick up only one sideband of the video carrier plus some low frequency components of the other one).

We did not quite make it with an on-the-air TV station for the coming meeting, so Bob Allen and I decided to postpone the announced talk on TV and demonstration till March or April. Meanwhile, we will try to finish copying the W6URH converter and getting a decent W6OTX/TV signal on the air. Once we have our ARRL bulletin station on the air, you guy are going to have to copy our converter circuit and start tuning in to us. We will give those networks some competition! Some of you may have UHF tuners that can be padded down or already slide down to 430 or thereabout (the bottom end of the UHF-TV band is at 480 or so). You'll also need a decent UHF antenna, and better yet, on a rotor. So if you don't already have a good UHF antenna, I can tell you where you can pick them up, for wholesale price. Just call me at 326-6200, ext. 2853 or 854-2759 nights, or check in at 145.49 Mondays at 7:30 or write to Box 911, Menlo Park, 94025. Just think, you can kill two birds with one stone -- if you get a good UHF antenna you can also watch backed out 49'er games, etc.

COLOR TV CAMERA PROJECT

Now that I have a good black and white camera going, I'm taking off on a new tangent - a color camera. This would be quite a unique item -- we would be a rare club with a color TV signal on the air! I am trying out an idea I got at work, which modifies the RCA patent developed at Stanford Research Institute (where I work) for a single-vidicon color camera. My idea should make it easier for a ham to build a color camera. The SRI developed scheme would require building a typical NTSC color encoder, whereas my proposed scheme (if it works) would encode in NTSC style directly on the video output of the camera.

The SRI scheme (and mine) requires colored "gratings" to encode color. I just shot a roll of Kodachrome, exposing through color filters and diffraction gratings, and my first efforts resulted in colored gratings that are over-exposed by red light or under-exposed by blue light. I have to run

off a new set of trial exposures before I get some that ~~wil~~ will work.

THEORY OF THE SINGLE VIDICON COLOR CAMERA

The idea behind the RCA-SRI scheme is as follows: In order to encode color with a single camera pickup tube, you have to have some means of distinguishing electronically between different colors of light coming into the camera. To a photo sensitive pickup, all light "looks" the same, except that the intensity of output may depend on the color content, but there is no way of telling whether a signal is weak because of its color or because it's just weak! So, there has to be some way of encoding. Well, the way this is done is by passing red light through strips at one angle, say 45° , relative to the horizontal sweep, by using a red colored grating oriented at 45° . Suppose green light gets modulated by a green-white grating oriented at 60° , and blue light by another grating at 75° . If these gratings have the same spacings, the result will be that any red light in the picture will produce modulation of the video intensity at some frequency f_R (due to crossing of the grating lines by the horizontal sweep). Similarly, due to the different angle for green lines, presence of green light will result in a modulation at another frequency, etc. So to get information about the color content of light in the picture, all you have to do is pick off the subcarriers produced at f_R , f_G , and f_B , with filters that separate these subcarriers, but are not so narrow that you lose too much resolution of the color differences in a picture. Optimum values are around 1 MHz bandwidth for the filters and so the subcarriers should be arranged to be at about 3, 4, and 5 MHz. This would correspond to about 200 lines in the colored gratings.

BUILD YOUR OWN DOT AND COLOR BAR GENERATOR FOR UNDER \$50

Want to adjust convergence on your color TV and save a lot on service bills? Then build your own integrated circuit color pattern generator, for under \$50 (all new parts). A p.c. board is available for \$3.00. See RADIO-ELECTRONICS JAN. 1970, p.44 for details. A simpler circuit for \$15 appeared in the Jan 72 issue.

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19.11.2
SAN CARLOS BUGLE

FIRST LINE OF BUSINESS FOR THE BUGLE IS TO GIVE AN UP TO DATE REPORT ON OUR EVER CONTINUING FIGHT AGAINST THE EXTERMINATION OF THE POPULARITY OF AMATEUR RADIO. JACK MCENNENNEY WB6LII AND JACK PIERCE WA6CCH LOOK LIKE THEY ARE COMING THROUGH WITH ANOTHER BUNCH OF NEW NOVICES, THEY HAVE 7 PEOPLE FROM THE LAST CLASS THROUGH THE CODE AND STUDYING THE THEORY NOW WHILE AWAITING THEIR TEST PAPERS.

THE SAN CARLOS CLUB HAS INITIATED A NEW POLICY TO ALL STUDENTS COMPLETING THE CODE CLASS, THEY WILL BE GIVEN 6 MONTHS FREE MEMBERSHIP imi 6 FREE MONTHS.....

THE SECOND OF IMPORTANCE IS A LITTLE INFO FOR ALL OF YOU BIG DX MEN. WE OF THE SCCDARC WERE PRIVILAGED TO HAVE RUSS FORBES WB6GFJ THE CHAIRMAN OF THE ARRL W6QSL BUREAU, RUN BY THE NORTHERN CALIFORNIA DX CLUB INC.

QUESTION: HAVE YOU WORKED A COUPLE OF RARE ONES LATELY, LIKE IN THE LAST 6 MONTHS??? DO YOU . WONDER WHY THAT GUY HASN'T SENT YOU A CARD YET...ANSWER: DO YOU ALWAYS HAVE AN ENVELOPE ON FILE AT THE W6QSL BUREAU?...NATURALLY YOU DO.. WELL THIS COULD BE YOUR PROBLEM. IF YOU DON'T, AND YOU GET ONE OF THEIR PERIODIC NOTICES, RUN, YES, RUN DOWN TO YOUR NEAR BY STATIONERY STORE, AND BUY 3or4 NO. 35 imi NO. 35 MINILA ENVELOPES. IF YOUR STATIONER DOES NOT SAY THE NOMENCLATURE ASK FOR AN 5X7 $\frac{1}{2}$ INCH MANILA ENVELOPE, THESE ARE PREFERRED BECAUSE THEY CAN HOLD MORE THAN ONE OR TWO CARDS, AND THESE ENVELOPES ARE ALMOST "POST OFFICE PROOF". HI HI FILL THEM OUT AS ILLUSTRATED BELOW.....

YOUR CALL		PLACE ENOUGH POSTAGE FOR 1 OUNCE THEN PLACE INSIDE LOOSE STAMPS ENOUGH FOR 3 MORE OZ. ONE OZ.=8CENTS.....
YOUR CALL ADDRESS CITY, STATE ZIP		

SEND YOUR ENVELOPES TO ARRL QSL BUREAU-N.C.D.X.C.

P.O. BOX 11

LOS ALIOS, CALIFORNIA

94022

TNX FOR LISTENING..#73 $\frac{1}{2}$ AND CUL

MIKE BACH WB6FFC

Mike Bach

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