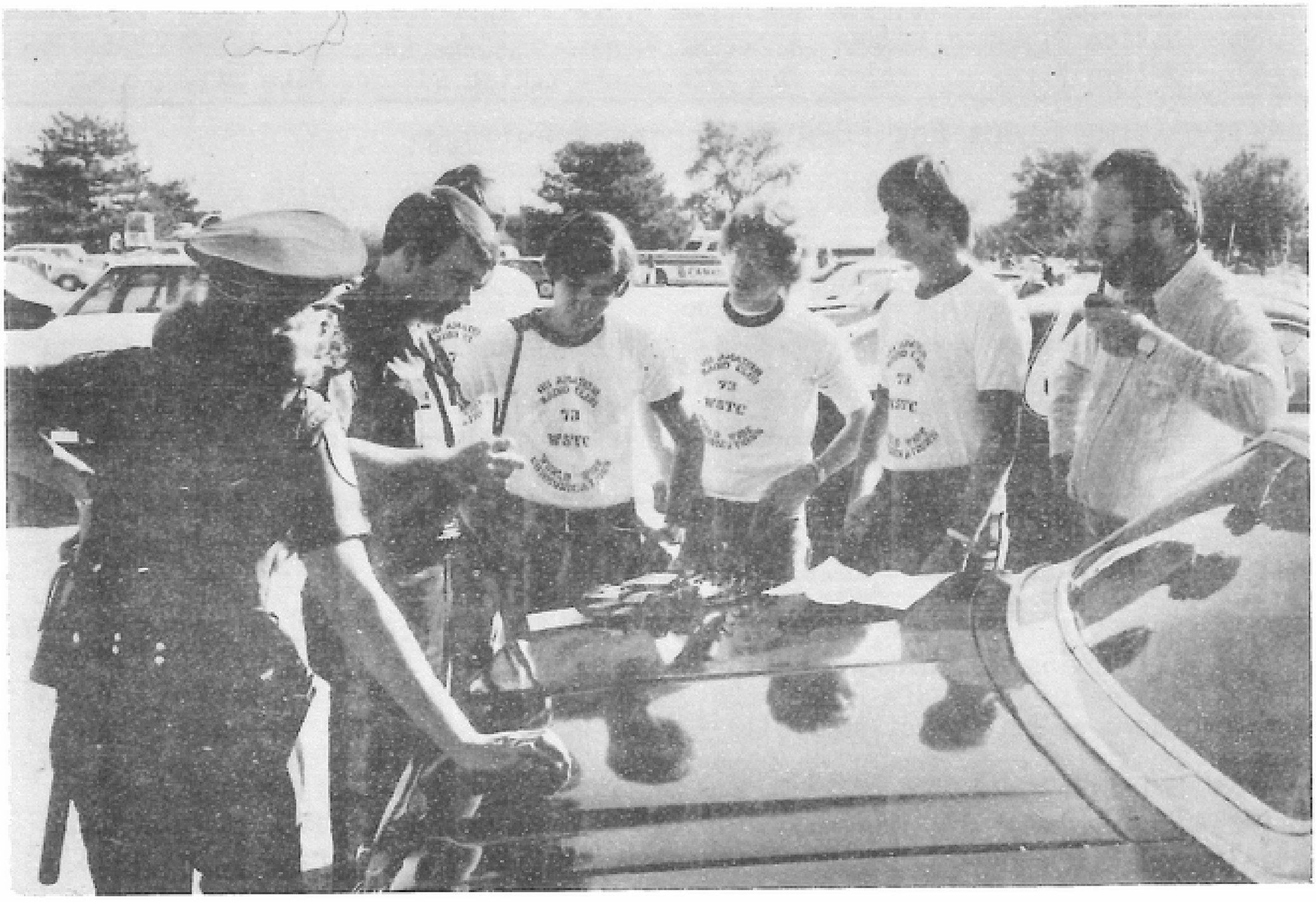
Central Oklahoma Radio Amateurs

COLLECTOR AND EMITTER

SINGLE COPY
25¢

AN INFORMATIVE MAGAZINE PUBLISHED MONTHLY BY AND FOR OKLAHOMA RADIO AMATEURS AND ANYONE INTERESTED IN LEARNING ABOUT IT

VOLUME 4 DECEMBER 1978 NUMBER 47



SOONER FOOTBALL GETS AMATEUR HELP

It has been a great football season at OU and it provided a great way for the OU Amateur Radio Club to provide a public service. I am speaking of the assistance the club has been providing the OU Police Department. This has been in the form of pedestrian and traffic control as well as surveillance of parking lots for theft and vandalism.

The club president, Jim Gardner, first presented the idea of the club helping out at the games to Sergeant Mauldin of the OU Police Department. He wisely agreed that it was a good idea and attended one of the club meetings to present the departments responsibilities and needs. It appeared to Sergeant Mauldin at this time that amateur radio in conjunction with conscientious operators could indeed be an asset. Jim had previously polled the club for volunteers to provide the needed manpower for each game and Sgt. Mauldin was given this information. also given was a demonstration of WR5AFW's autopatch capabilities--

(Continued on page 15)

Central Oklahoma Radio Amateurs

COLLECTOR AND EMITTER

Published monthly by CORA Inc 1020 Arthur Dr Okla City OK 73110
ADDRESS ALL COMMUNICATIONS TO:
CORA C&E, P. O. Box 15013, Okla City OK 73155

SECOND CLASS POSTAGE PAID AT OKLAHOMA CITY OK
Publication No. 116150

Managing Editor Joe Harding, WA5ZNF 737-1044
Subscription: CORA members $1.50 a year. All others $3.00 a year.

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.

President	Mark Northcutt	WD5DYI	842-1086
Vice President	Chuck Wilhite	K5NK	721-4926
Secretary	Nathan Kirby	KB5BF	364-7979
Treasurer	Ron Recer	WD5FRQ	751-5378

CLUB EDITORS

ACARC	Bill Oliver	K5KDR	329-6333	OCARC	Joe Buswell	K5JB	732-0676
BIARC	Edie Day	WB5YHG	691-1194	OKCAP	Henry Israel	N5IH	722-3848
ALTUS	Janice Simms	WB5WMN	477-0921	MORI	George Lee	WB5NMK	946-2754
OUARC	Nathan Kirby	KB5BF	364-7979	Contributing Editor, Mike Salem, N5MS			

PARTICIPATING CLUBS FOR CORA COLLECTOR & EMITTER:

AERONAUTICAL CENTER AMATEUR RADIO CLUB
Postal station 18, Okla Coty OK 73169
MEETS: 8:00PM First Friday each month
Flight Standards Bldg, FAA Aero Center

Pres	Robert Graham	WB5NSV	677-8685
V-P	Robert Runyon	AAØO	373-1818
Sec/Tr	Bill Oliver	K5KRD	329-6333
Assist	Paul Asplin	WA5HTL	685-6590

MID-OKLAHOMA REPEATOR
MEETS: 8:00 PM First Tuesday of month. Okla City EOC, 4600 N Eastern

Pres	Chuck Wilhite	K5NK	721-4926
V-P	Bill Atkins	N5AH	737-6984
Sec/Tr	Jim Jones	K5PR	634-5235

Dues: Sid Gerber, 829 Bouse, MWC 73110

OKLAHOMA UNIVERSITY AMATEUR RADIO CLUB
MEETS: 8:00 PM, 1st & 3rd Thursday
Rm 449, Carson Engineering Center.

Pres	James Gardner		321-8779
V-P	Dan Orr	WD5GKZ	325-6951
Sec	Mark Proting		329-1452
Treas	Nathan Kirby	KB5BF	364-7979

BICENTENNIAL AMATEUR RADIO CLUB [76'ers]
MEETS: 3rd Tuesday each month, 7:00 PM
Air National Guard, Will Rogers Airport

Pres	Mark Northcutt	WD5DYI	842-1086
V-P	Joe Ramage	WB5TDW	685-4814
Sec	Joe Couch	WD5BMP	
Treas	Don Duck	AE5N	

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	Ken Ford	WB5KHU	528-8770
V-P	Al Prince	WB5KCU	
Sec	Joe Buswell	K5JB	732-0676
Treas	Ellard Foster	W5KE	789-6702

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

Pres	Frank McCollom	N5FM	751-3577
V-P	Henry Israel	N5IH	722-3848
Sec/Tr	Hobe Burgan	WB5MLN	751-1646

CENTRAL OKLAHOMA RADIO AMATEURS
MEETS: 7:30 PM. Normally on last Tuesday, but see calendar. Red Cross Building, 10th & Hudson. (Alley)

ALTUS AREA AMATEUR RADIO ASSOCIATION
MEETS: 2nd Thursday, 7:30 PM
North Main Fire Station [CD]

Pres	Bob Bratton	N5AIP	782-3073
V-P			
Sec/Tr	Janice Simms	WB5WMN	477-0921

Vol. 4 December 1978 No. 47

ARNS Amateur Radio News Service

UNIVERSITY OF OKLAHOMA — W5TC — WR5AFW

Alpha Sigma Delta Radio Society — since 1931 — 146.28/88

ONE AUTUMN NIGHT IN NORMAN

The Physical Sciences Building, tallest on the University of Oklahoma campus, was enduring a typical Monday evening in the fall. Other than being the home of the mathematics department and housing numerous classes and offices, the Physical Sciences Building is one of the tallest buildings on the University of Oklahoma campus. With this distinction, it supports the O.U. Police Department repeater and the receiver for the WR5AFW 146.88 repeater. The WR5AFW 146.28 transmitter is on the Engineering Building. The Physical Sciences Building is windowless for the first 4 floors. The rest of the floors have windows but the darkness of the Monday evening of November 6, 1978 was like any other at a large university campus. Students were in the library completing last minute assignments. Others, who worked at factories and offices during the day were wearily setting through nite school classes waiting for the professor to explain some concept the studentread the night before yet still didn't understand. Others were hurrying home glad another night was coming to an end.

A still autumn evening had already fallen over the O.U. campus and the small town of Norman. Suddenly as if a giant light switch had been tripped, all lights and power in the large building went out. How much we take for granted. The presence of light in these large buildings. How terrifying can be the sudden absence of light. Not only did the lights go out at 8:22 P.M., but with power out in the building the police and amateur repeaters both went uncharacteristically silent. Were people trapped in elevators? Would panic take over? The O.U. police quickly arrived on the scene to take charge and to see that the answers were favorable.

With power out, the O.U. police were without communications. It happened that Kenny Hutchison WB5RXZ was in the building. Kenny, a 15 year old Norman resident who spends much of his free time in the computer room in the building offered to assist. The policeman on the scene, being familiar with the capabilities of the O.U. Amateur Radio Club quickly agreed. The problem was the amateur repeater was also down. In times like this amateurs must remain calm and figure out a way to make things work anyway.

Kenny called Nathan Kirby KB5BF, at home and asked him to come up on 146.52 simplex. Because of the height on Nathan's Ringo, working 52 direct was no problem. The O.U. police needed communication with their headquarters. Nathan, keeping in touch with Kenny on 52 direct dialed the O.U. police department. Nathan kept the O.U. police department on the phone and instantly relayed instructions and status reports from the police on the scene to O.U. police headquarters.

When power was restored at 9:28 P.M., happily no injuries had occurred. Some students were even delighted they could sleep "undetected" in class during the black out.

On a still autumn evening in Norman, Oklahoma Amateur Radio proved once again its usefulness, even to that segment of society called the University of Oklahoma. The O.U. police department certainly believes hams on campus are useful and can benefit the whole campus in such emergencies. (Both Kenny, WB5RXZ, and Nathan, KB5BF, are members of the O.U. Amateur Radio Club.)

LISE BICKHAM GIVEN HONORS

Lise Bickham, daughter of Jack Bickham WB5TZZ, was recently honored as the rotary student of the month. Lise has a 3.86 grade point

average at Norman High School. She is a member of the National Honor Society and Editor-in-Chief of "Passing Times", the Norman High School newspaper. She is a reporter for the French club at NHS. Lise had an article recently published in the Christian Science Monitor. During her junior year, she received the American Legion Award After all this, Lise still finds time to work for the Norman Transcript and Zales Jewelers during her spare time. [Our children are delightful individuals unto themselves. We have them only as a trust for so few years. Our children are individuals yet they are always a precious part of our lives. I know the Bickham's are proud and we in the Norman area are proud for them. (Jack, WB5TZZ, is a professor of journalism at O.U. and has done an extremely competent job as the emergency coordinator for the Norman area.)] [Ed.]

JACK GANT, W5GM, TO VISIT NORMAN AMATEUR RADIO CHRISTMAS DINNER

What: A fun filled end of year roast beef Christmas dinner for Norman Hams, Oklahoma City Hams, and especially their XYL's. Door prizes will be given and Jack Gant, ARRL West Gulf Region Director, will be guest speaker.

Where: Holiday Inn in Norman. The Inn is located at the Main Street exit of Interstate 35.

When: Friday, December 8, 1978; social hour 6:00 p.m. - 7:00 p.m.
Dinner 7:00 p.m. - 8:00 p.m.

Price: $4.76 per person (everything included)

Contact: Joe Green KA5AXQ, by December 1, 1978. if you will come. His home phone is 364-4301. The Holiday Inn must be notified one week ahead. Send checks to Joe Green, KA5AXQ, 209 Woodside, Norman, Oklahoma 73071.

NOVICE CLASS UPDATE

The Novice class, being presented by the O.U. ARC is still in progress. The class size has dwindled to those who are really serious about becoming hams. Perhaps this is good perhaps bad but it is a fact of amateur radio that many who start novice classes drop out. The main reason for drop outs, other than poor teaching, is people do not want to put out the work necessary to learn the code and radio theory. The instructors have done well in the class. Each has come prepared and has given his best shot. The instructors seem to like the idea of teaching one subject for one night and then being done with it. I actually believe this method improves the quality of instruction since the same instructor does not have to teach week after week. The instructors "Peak Out" for one night and then are done with teaching in that particular course. The students benefit by a "Fired Up" instructor each week and the students meet a variety of hams. (The novice class schedule was published last issue.) We use the ARRL novice course. This course while adequate for printed visuals and weekly topic organization, is disorganized in its individual modules. It invites "Reading" the lesson which invites a disaster when it comes to teaching. The course needs a good outline type lesson plan for each module. Instructors could then use the lesson plan for each module. Instructors could then use the lesson plan to keep the subject organized, but not be tempted to read to the class. I've asked my instructors to ignore the details of each module and to concentrate on communicating the essence of the lesson to the students by using their own methods. It has worked well, and each instructor has enjoyed teaching. *Nathan Kirby, KB5BF*

Club
NEWS

WSLOW
The Elmer Goulder Memorial Station

The November meeting of the Oklahoma Central Amateur Radio Club was called to order Friday the 17th at 8:02 pm at the American Red Cross Center, Downtown OKC by President Ken, WB5KHU, with 16 members and guests present.

A failure in communications resulted in the loss of the scheduled program so suggestions were requested from the floor...

Tom, W5OZE, reported successful surgery to remove his own r.f. interference from his "twisted pair" thru two attempts by 'Ma Bell' and her "staff." He said he gained a foot-longer cord for his troubles (and, we must assume, a happier Juanita without his radio signals on her telephone).

Bob, W5HXL, reported new CORA officers elected last month are

President, Mark Northcutt, WD5DYI
Vice-President, Chuck Wilhite K5NK
Secretary, Nathan Kirby KB5BF
Treasurer, Ron Recer WD5FRQ

and reminded us that the next CORA meeting will be 28 Nov, as this issue is mailed, hope to see you there, if not this month then 26 December.

For Ham Holiday '79, CORA discussed meeting places (agreed on Lincoln Plaza) and details for same, such as, 30 rooms will be set aside upstairs for commercial exhibitors to be together in one area; the flea market will be in the same exhibition hall as this year, one day only, all day, Saturday; the Prize committee was appropriated $750.00 to work with; the OU club has the Programs Committee, the 76ers, notably Kay, WD5DYJ, has Registrations; Autopatch has facilities, MORI has Prizes, Aeronautical Center has Ladies Programs, and we have "Pre-Publicity." So, if you have any ideas or wishes to publicize "HH79" see your committee chairman, or volunteer to chair the committee yourself.

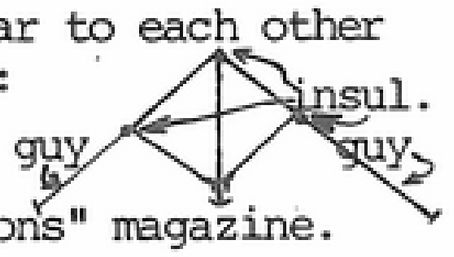
As time permits (and weather contributes) our diesel generator WILL BE FIXED!

The Annual Little River/Lake Thunderbird Camp-Out, Cook-Out: Weiner-Roast and QSO was held last Saturday evening, 18 Nov., in Oklahoma City on/in Charlie's, WA5JGU's, covered, enclosed, carpeted, Franklin-heated patio. (Well done!, Charles and Marie!) (and Bob and Ellard, etc.) A good CW was had by all - including "Purple Passion " without the 190 passion and Root Beer ice creams courtesy of Randy, WB5CNM, and YL, Brenda, WD5BXT. Can Winter be furrrr behind?

In addition, Charlie showed-and-told how he has finished Marie's metal detector and adjusted it to discriminate between jewelry and the"good" stuff like pop-tops and pull-tabs.

What can YOU make with a chain of pull-tabs?

Carl, W5JJ, presented a program on a "180-degree phase-feed semi-quad" antenna that looks like " + " from the top with a simple pole in the center but like a pair of tents from the sides. It places two full wave quads perpendicular to each other on the same supporting pole and rotated 45 degrees from horizontal: Carl advises that all the specifics as to insulators, guy wires, coax, feed lines, four-pole-single-throw-rotary switch, transformer, etc., can be found in October '78 issue "Radio Communications" magazine.



Next meeting night will be our Christmas Celebration, upstairs of the Red Cross Center, downtown, 15 December. You are asked to bring a "Dessert" and celebrate Christmas together.

Meeting adjourned for coffee and doughnuts in the ham shack at 8:55 pm.

Remember OSU - 7, ou62.

Jim Buswell
Gentleman Jim

FOR SALE: Collins PM-2 AC supply, $90. Genave GTX-2, 2 meter xcvr, max output 30 watts, 8 channels of chrystals- Ken, WB5ECJ, 751-4917.

This letter is in reply to one I sent to him concerning his article "The Lady Saw Red" on page 184 of the October 1978 issue of 73 Magazine. In it he has a beautiful satire on the asinine practice of "hams" (not amateurs of radio) using radiotelegraph abbreviations and lingo while on radiotelephone.

Kenly, N. C. 27542
October 29, 1978

Mr. Carl C. Drumeller, W5JJ
5824 N. W. 58 Street
Warr Acres, Oklahoma 73122

Dear Carl:

Your kind remarks relative to my article in 73 were received with a great deal of pleasure. Now I know that there is at least one someone else in amateur radio who appreciates the English language. All other comment to date has been considerably less favorable.

I can't help but recall Winston Churchill's statement that "the most magnificent accomplishment by the mind of man is the English language." This is not a verbatim quote but is the exact meaning that he conveyed.

My experience in amateur radio has been short. My first license was as a Novice in 1972 which I allowed to lapse after two years. In November 1976 I got another Novice license which was upgraded in April 1977. I still did not get on the air until September 1977.

During the time that I have been on two meters (only) I have been appalled by amateurs who cry loudly that better public relations are needed while these same people continue to speak in riddles. There are thousands of scanners now in use in my state and we have no idea how many listeners are tuned to the amateur frequencies. Certainly those who do get nothing from Q signals and the terms that amateurs have adopted for themselves. This would seem to make us look sillier than the ten-four, good buddy group that amateurs constantly deride.

I am all in favor of cleaning up our own bailiwick first. This is not in defense of the CB group. I have never been one of them and never will be. It is simply that it seems logical to speak in understandable language if we want them to understand us and support our claim to the frequencies we use and enjoy.

Thanks again

Yours truly,

James C. Grady

WB4ZVZ Jimbo

BALUNEY, OR HOW TO LEARN LITTLE OR NOTHING AND ENJOY IT

THE PURPOSE OF THIS ARTICLE IS NOT TO SET FORTH ARGUEMENTS ON WHETHER OR NOT TO USE A BALUN ON A HIGH FREQUENCY ANTENNA BUT TO DESCRIBE SOME UNSCIENTIFIC EXPERIMENTS WITH BROADBAND FERRITE BALUNS. BRIEFLY REVIEWING THE FUNCTIONS OF A BALUN AND WHAT IT IS SUPPOSED TO DO WILL MAKE IT A LITTLE EASIER TO DESCRIBE THE EXPERIMENTS.

THE WORD "BALUN" IS A CONTRACTION OF THE WORDS "BALANCED" AND "UNBALANCED". A BALUN IS A TRANSFORMER WHICH CONNECTS A CIRCUIT IN WHICH THE VOLTAGES ARE BALANCED WITH RESPECT TO GROUND TO A CIRCUIT IN WHICH VOLTAGES ARE UNBALANCED WITH RESPECT TO GROUND. FOR EXAMPLE, SEE FIGURE 1. THE 240 VOLTS IS LIKE ONE WOULD FIND COMING INTO A HOUSE TO SUPPLY RANGE, DRYER, AIR CONDITIONER, ETC. EACH LEG OF THE 240V LINE HAS A VOLTAGE AT ANY INSTANT EQUAL TO THE VOLTAGE ON THE OTHER LEG BUT OPPOSITE IN POLARITY (LIKE A TEETER-TOTTER). EITHER LEG, IF OBSERVED WITH AN OSCILLOSCOPE AND MEASURED WITHRESPECT TO GROUND WOULD BE UNBALANCED, THE VOLTAGE SWINGING POSITIVE AND NEGATIVE ON THE HOT LEG AND STAYING AT ZERO ON THE GROUND LEG. THIS IS THE WAY THE 120 VOLTS IS DERIVED IN HOUSE WIRING. THE 240 VOLTS IS BALANCED, THE 120 VOLTS IS UNBALANCED.

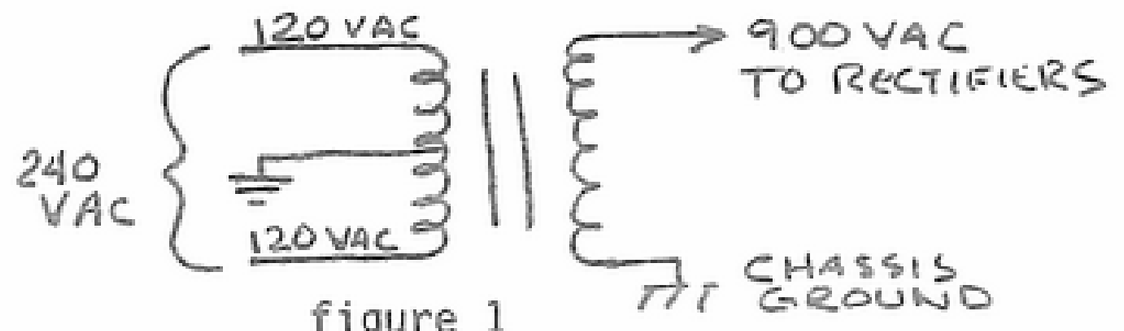


figure 1

IF A TRANSFORMER WAS CONNECTED AS SHOWN IN FIGURE 1, TO OBTAIN AN AC VOLTAGE FOR THE HIGH VOLTAGE POWER SUPPLY IN YOUR LINEAR AMPLIFIER, IT WOULD BE CONNECTED IN A BALUN CONFIGURATION. THE INPUT VOLTAGE IS BALANCED AND THE OUTPUT VOLTAGE IS UNBALANCED.

AN ANTENNA OF THE DIPOLE TYPE IS A BALANCED ANTENNA. THE INSTANTANEOUS VOLTAGE ON THE TWO HALVES IS OPPOSITE IN POLARITY AND EQUAL IN MAGNITUDE. IN ACTUAL PRACTICE, IT PROBABLY SELDOM IS PERFECTLY BALANCED BECAUSE OF EFFECT OF SURROUNDINGS BUT IT IS CLOSE ENOUGH FOR THE ROUGH EXPERIMENTS I WAS CONDUCTING. IF THIS TYPE OF ANTENNA WAS BEING CONSTRUCTED BY A THEORIST, HE WOULD CONNECT A BALANCED TRANSMISSION LINE LIKE TWIN LEAD OR OPEN WIRE FEEDLINE AND WORRY ABOUT HOW TO GET IT INTO THE HOUSE AND CONNECTED TO THE EQUIPMENT AND KEEP IT BALANCED. ON THE OTHER HAND, MOST RADIO OPERATORS HAVE FOUND IT MUCH EASIER TO RUN COAX CABLE FROM ANTENNA TO RIG. IT CAN BE TAPED TO THE TOWER, DRAPED OVER THE GUTTER, SNAKED THROUGH THE ATTIC, AND POKED THROUGH THE WALL OR CEILING WITH LITTLE CONCERN ABOUT EFFECT OF NEARBY METALLIC OBJECTS.

THE REASON WE SHOW LITTLE CONCERN FOR ROUTING OF THE COAX IS BECAUSE IT IS AN UNBALANCED TRANSMISSION LINE. THE SHIELD BRAID IS ASSUMED TO BE AT GROUND POTENTIAL. HERE IS WHERE ALL MANNER OF DISPUTE AND DISCUSSION START. RF, BEING UNLIKE DC OR LOW FREQUENCY AC, DOES NOT REMEMBER VERY WELL WHAT "GROUND" POTENTIAL IS. A PIECE OF WIRE 32 FEET LONG CAN BE AT GROUND POTENTIAL AT ONE END AND HAVE HUGE VOLTAGE ON THE OTHER END WHEN BEING USED AS AN ANTENNA FOR FORTY METERS. COAX DOES THE SAME THING. IF THE SHIELD OF COAX CONNECTED TO ANTENNA WIRE IS AT 70 VOLTS (APPROX. 100 WATTS) WITH RESPECT TO THE CENTER CONDUCTOR WHICH IS CONNECTED TO THE OTHER ANTENNA WIRE, THE VOLTAGE WITH RESPECT TO GROUND WILL BE ONE HALF OF THAT, OR 35 VOLTS IF THE ANTENNA IS BALANCED. THE VOLTAGE ON THE SHIELD 32 FEET AWAY ON 40 METERS CAN BE ANYTHING FROM GROUND POTENTIAL TO SEVERAL THOUSAND VOLTS, DEPENDING ON THE TOTAL LENGTH OF COAX AND WHAT ELSE IT IS CAPACITIVELY AND DIRECTLY CONNECTED TO, AND WHERE.

PROPONENTS OF BALUNS SAY, "SEE I TOLD YOU SO!" OPPONENTS OF BALUNS SAY "SEE I TOLD YOU SO!" AND THEY CARRY ON FROM NOW ON. ONE EFFECT THAT CAN BE SEEN AS A RESULT OF NOT USING A BALUN IS THAT A PORTION OF THE COAX SHIELD WILL BECOME A PART OF THE RADIATING SYSTEM AND THE PATTERN GETS PRETTY DIFFICULT TO PREDICT. WITH THE HF DIPOLE THIS IS NO BIG DEAL BECAUSE THE PATTERN IS HELTER-SKELTER ANYWAY BUT ON A HIGH DOLLAR YAGI, DESIGNED TO PUT MAXIMUM SIGNAL IN ONE DIRECTION, RADIATION FROM THE COAX SHOULD NOT BE TOLERATED. IT CAN MESS UP THE DESIGN. IT IS NOT NECESSARY TO USE AN ACCESSORY BALUN TO BREAK UP COAX RADIATION ANYWAY. A FEW TURNS OF COAX IN A TIGHT LOOP NEAR THE ANTENNA WILL DO JUST AS WELL, PERFORMING A BALUN FUNCTION AS I WILL SHOW LATER.

NOW WE GET TO THE POINT OF THE ARTICLE. I RAN ACROSS A REPRINT OF ANARTICLE IN

APRIL 1969 QST BY W2IMU, DESCRIBING VARIOUS BROADBAND BALUN TRANSFORMERS USING FERRITE TOROIDS. THE ONE HE RECOMMENDED WAS DIFFERENT THAN ANY I HAD MADE. THE ONES I HAD PREVIOUSLY MADE WERE EASY TO UNDERSTAND BECAUSE THEY WERE LIKE AUTO-TRANSFORMERS. SEE FIGURE 2.

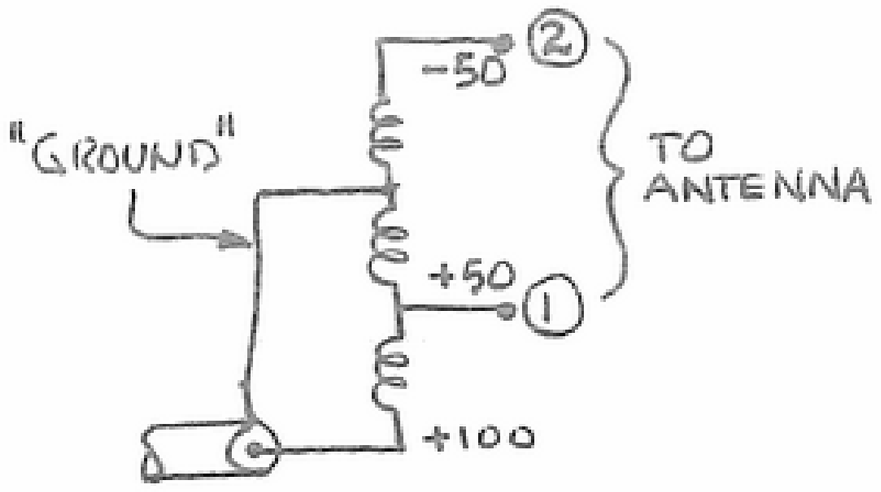
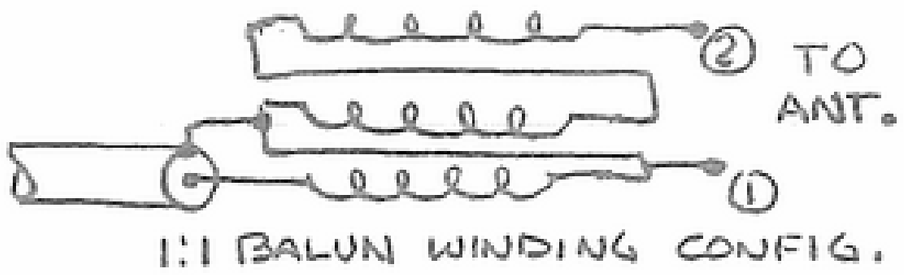


figure 2



1:1 BALUN WINDING CONFIG.

figure 3

ASSUMING AT ONE INSTANT, THE CENTER OF THE COAX IS AT POSITIVE 100 VOLTS, AT THE SAME INSTANT THE ANTENNA TERMINAL (1) IS AT +50 VOLTS. IF THE GROUND TERMINAL IS AT ZERO, THE ANTENNA TERMINAL(2) IS AT -50 VOLTS. THE TOTAL VOLTAGE AT THE ANTENNA IS 100 VOLTS, BALANCED WITH RESPECT TO GROUND. FIGURE 2 SHOWS HOW THE WINDINGS ARE ARRANGED, TRIFILAR, ON THE TOROID FORM.

THE BALUN DESCRIBED BY W2IMU WAS A LITTLE DIFFERENT SO I THOUGHT I OUGHT TO CHECK IT OUT TO FURTHER MY OWN UNDERSTANDING OF THE SUBJECT, BESIDES I NEEDED A NEW CENTER INSULATOR FOR MY PORTIBLE ANTENNA ANYWAY.

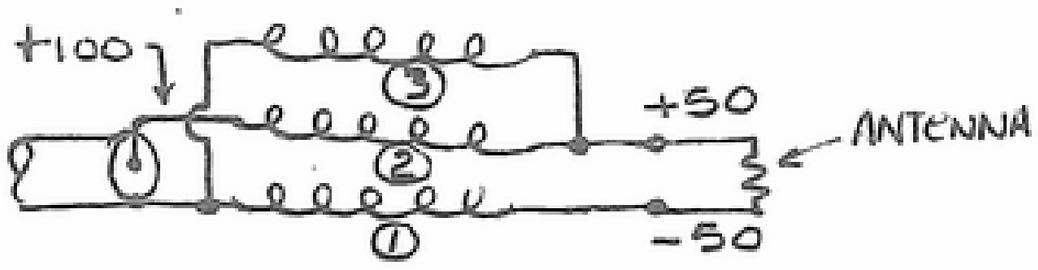


figure 4

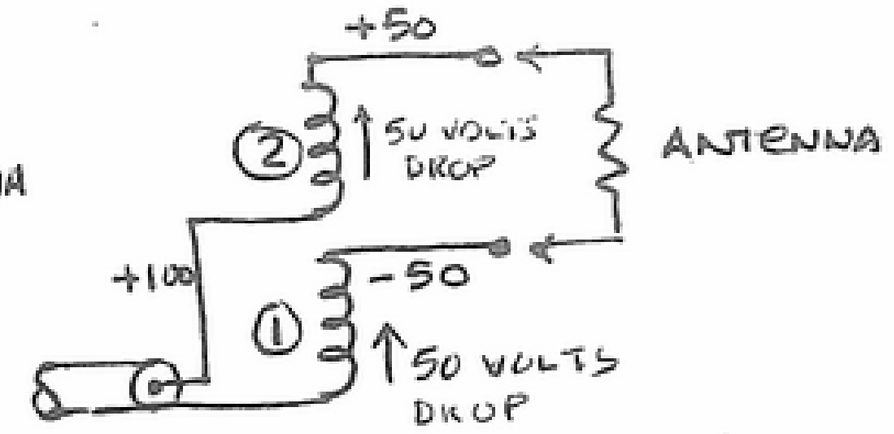


figure 5

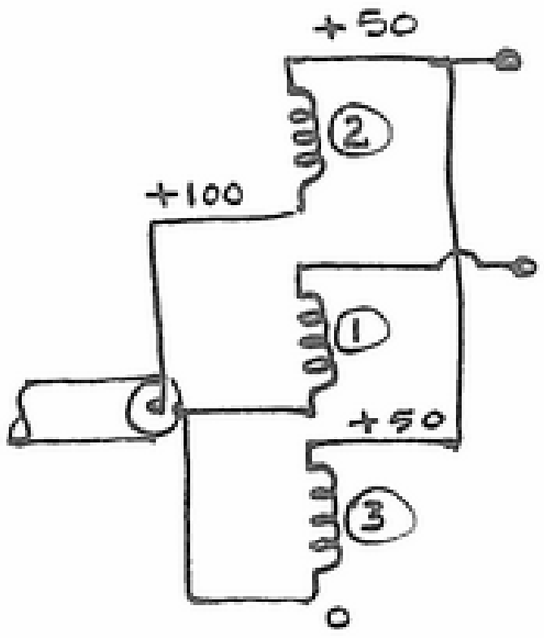


figure 6

FIGURE 4 SHOWS THE CONFIGURATION OF W2IMU'S 1:1 BALUN. FIGURE 5 SHOWS MY INTERPRETATION OF HOW IT WORKS. IT TOOK THREE CUPS OF COFFEE AND FIVE CIGARETTES TO FIGURE THIS ONE SO GET READY FOR A REALLY FLAKEY EXPLANATION. REARRANGING THE WINDINGS AS SHOWN IN FIGURE 5 ALLOWS US TO ASSIGN POLARITY TO THE TURNS AND MAKE SOME VOLTAGE ASSUMPTIONS. TURN 3 WAS NOT INCLUDED AT THIS POINT BECAUSE IT IS CONFUSING AND IS ONLY SUPPOSED TO EXTEND THE LOWER FREQUENCY RANGE BY CREATING A MAGNETIZING FLUX. (I NEVER DID FIGURE THAT ONE OUT, LOOKS LIKE IT IS WOUND TURNS BUCKING.)

FOLLOW ME THROUGH THE ANALYSIS. ASSUME WE HAVE AN INSTANTANEOUS +100 VOLTS ON THE COAX CENTER CONDUCTOR AND ZERO ON THE SHIELD. FOR THE BALUN TO BE ONE TO ONE, THE ANTENNA MUST HAVE 100 VOLTS ON IT, AND IF BALANCED, -50 ON ONE TERMINAL AND +50 ON THE OTHER. ASSIGN +50 VOLTS ON THE MORE POSITIVE END AND THE COIL (2). IT MUST HAVE 50 VOLTS LESS THAN THE COAX CENTER CONDUCTOR. WITH THE WIRING SENSE AS SHOWN, TURN 1 WILL HAVE -50 VOLTS ON THE END CONNECTED TO THE ANTENNA. ALL CONDITIONS ARE SATISFIED.

AT THIS POINT WE HAVE A BALUN SIMILAR TO THE COIL OF COAX AT THE ANTENNA DESCRIBED EARLIER. THE ADDITION OF THE THIRD COIL, HOWEVER, CREATES AN INTERESTING SITUATION. SEE FIGURE 6, DRAWN WITHOUT THE ANTENNA CONNECTED. WITH 100 VOLTS ON THE COAX CENTER CONDUCTOR, THE TOP OF TURN TWO IS AT +50 VOLTS. THE TOP OF TURN THREE WOULD HAVE TO BE THE SAME. THE MAGNETIC FLUX THINKS IT SHOULD BE -50 VOLTS THOUGH. THE TURNS ARE WOUND VOLTAGE BUCKING AND IT LOOKS LIKE THE THING WOULD ONLY AVOID EXPLOSION BY HAVING ZERO POWER FACTOR, OR VERY LITTLE LOSS RESISTANCE BECAUSE CIRCULATING CURRENTS WOULD BE QUITE HIGH. SO THE PROOF IS IN THE PUDDING, HOME BREW THAT IS.

I CONSTRUCTED TWO BALUNS, ONE OF EACH DESIGN, AND MOUNTED THEM ON PIECES OF PLASTIC WITH WING NUTS FOR ANTENNA WIRE ATTACHMENT AND SO-239'S FOR COAX ATTACHMENT MAKING THE WHOLE THING QUICK TO CHANGE. (I ALSO THEREBY SOLVED THE PROBLEM OF HOW TO HANDLE THE ANTENNA WIRES UPON TAKING THE ANTENNA DOWN AND NOT HAVE TO UNTANGLE THE MESS NEXT TIME IT IS TO BE PUT UP.)

SINCE I ONLY DISTRUSTED THE SECOND DESIGN, I ONLY BENCH CHECKED IT, AND AS I SUSPECTED, IT WAS FLAKEY! WITH 50 OHM RESISTOR INSTALLED IN PLACE OF AN ANTENNA, A WATTMETER WAS USED TO MEASURE SWR. IT COMPUTED TO BE 1.7:1, AHA!, JUST AS I THOUGHT. IF I HAD BEEN A TRUE SCIENTIST, I WOULD HAVE TESTED THE ORIGINAL DESIGN AND PROBABLY FOUND IT TO BE FLAKEY ALSO, BUT SUCH IS THE LOT OF THE HALF BAKED EXPERIMENTER. I WAS PRETTY SHORT ON TIME SO I PACKED THEM BOTH AWAY WITH MY GEAR AND TROTTED (ACTUALLY DROVE) OFF TO COLORADO FOR THE WINTER FOLIAGE TOUR.

ONCE SETTLED DOWN IN THE CABIN, I PROCEEDED TO RUN MY ON-THE-AIR EXPERIMENTS WITH THE TWO BALUNS. I CONSTRUCTED A 15 METER ANTENNA BECAUSE IT COULD BE DRAPED FROM THE RAFTERS INSIDE THE CABIN AND I WOULDN'T HAVE TO STRAY TOO FAR FROM THE FIRE.

AFTER CAREFUL PRUNING TO RESONANCE, BOTH BALUNS EXHIBITED NEARLY 2 TO 1 SWR. OH MY! MORE VARIABLES TO SCREW UP MY EXPERIMENTS. THE FEEDPOINT IMPEDANCE OF THE ANTENNA STRETCHED TAUT WAS NOT 50 OHMS, PROBABLY HIGHER. BY SUSPENDING THE CENTER INSULATOR, I FOUND THAT WITH ABOUT 120 DEGREES BETWEEN THE LEGS, WITH ENDS EITHER HIGHER OR LOWER THAN CENTER, SWR COULD BE BROUGHT DOWN TO 1:1 AT RESONANCE. INCIDENTALLY, WHEN THE DIPOLE IS ANYTHING OTHER THAN A STRAIGHT LINE, THE RESONANT FREQUENCY GOES DOWN. FILE THAT AWAY IN YOUR LITTLE BOOK OF TRIVIA.

CONCLUSION: I GUESS W2IMU KNEW WHAT HE WAS DOING. EITHER BALUN PERFORMED AS IT WAS SUPPOSED TO. AT LEAST, I COULDN'T DETECT ANY UNUSUAL VOLTAGES ON THE EQUIPMENT OTHER THAN WHAT ONE MIGHT EXPECT WITH AN ANTENNA 15 FEET OVER ONES HEAD RADIATING 300 WATTS. FOR COMPARISON, I MADE SEVERAL CONTACTS WITH THE 40 METER ANTENNA OUTSIDE (WITH A LITTLE HELP FROM THE MATCHBOX, ANOTHER WONDERFUL PIECE OF EQUIPMENT). THE TWO ANTENNAS WERE SWITCHED BACK AND FORTH AND ON MAJORITY OF CONTACTS, THE OUTDOOR ONE HAD A PERCEPTABLE EDGE. ON MANY THERE WAS NO DIFFERENCE AND ON A COUPLE OF CONTACTS, THE INDOOR ANTENNA PERFORMED A LITTLE BETTER, PERHAPS DUE TO NULLS IN THE PATTERN OF THE 3/2 WAVELENGTH ANTENNA OUTSIDE.

WELL, SO MUCH FOR THIS MONTH'S EXPERIMENTS. I HOPE NEXT MONTH TO BE IN TOWN MORE THAN I WAS LAST MONTH SO MAYBE I WONT HAVE ANY EXCUSE FOR NOT HAVING MUCH FOR C&E, WHAT'S YOUR EXCUSE?

JOE, K5JB

JOE: PSC EXCUSE TYPOS - I WAS IN A Hell of A Hurry - K5JB

Mid-Oklahoma Repeator Inc.

A NON PROFIT ORGANIZATION
OF RADIO AMATEURS DEDICATED TO PUBLIC SERVICE

The November meeting was called to order by, John, K5QDR.

There were the usual introductions, and then the meeting was turned over to Abe, K7LDS, because he had to leave early.

The program consisted of movies of the *Confederate Air Force* shows. It was interesting to watch those old war birds flying around and cutting capers. It was especially interesting because the program was presented by a pilot.

The exhibitions of precision flying were spectacular - especially since they were ancient planes from World War II, etc. They were new before a large part of the audience was born. I understand that these planes have been completely overhauled and rebuilt to their original flying abilities. It takes a special kind of pilot to fly those machines, since it is understood that some of them were very tricky to fly. They are a part of U.S. history that is well worth preserving.

There was spectacular precision flying by the "Blue Angels" that takes your breath away to watch. I was privileged to watch them some years back at a Tinker AFB open house show, when our son was stationed there with a weather squadron. The YF and I, as his guests, really enjoyed the show. By the way, Abe described some of the defense methods that instructors use against students "freezing" on the controls. It sounds a mite rough, but its got to be done if boyh men don't wind up in the "worl beyond".
Thanks, Abe, for a very fine show, those pictures were interesting!

John qouted the new FCC rules and announced that the AUTOPATCH portion of 07/67 repeater, WR5APF, would be on ONLY during the hours of 7:00 AM to 8:00 PM. (Three control operator s are available during those hours.) If you need the AUTOPATCH at other hours call for a control operator and if one is monitoring at that time he can turn it on for you. Seems that a few abuse a privilege and make it hard on the majority that try to do right. Well, none can say that there wasn't plenty of warning - different ones have been saying, verbally and in magazine articles that the FCC would do something, if abuses were not stopped - they did! We got off lucky,maybe,at that - they could have stoped the autopatches cold.

For what it's worth, my opinion is that there was not nearly as much abuse, locally, as there was back East. Seems like I read something about Eastern abuses in one of the magazines. Not saying, though, that every one of us locals has a halo, unless he has it wired on.

Request was again made for people to check sirens in their neighborhoods - seems like "Mr. Murphy" likes to tinker with them. Anyway, they don't always act right. Maybe so, bad business, if an emergency occurs and they are not heard.

Christmas party will be held at Furr's Cafeteria, NW 63rd & McArthur, Dec 4, Monday, at 7:30 PM. The club approved the purchase of some equipment - come to the club meetings if you want to find out about its purpose.

The new officers were introduced. See the list on page 2 under MORI. Their phone number is there if you need them.

An appeal was made for more volunteers to help assemble the C & E - the last time, the four that showed up were not enough - it is assembled at the Planet Office Bldg, Room 104, Midwest City. (Continued)

The club was "thanked" for the "NO_SHOWS" after that time, could a note of sarcasm be detected?

Rueben, WD6FKE, talked about the autopatch, and possible changes in the FCC or a replacement in supervision. All members are requested to write their congressman about the autopatch advantages and possibilities in case of accidents or other emergencies - which, happen often enough and might cost lives or property damage if not promptly reported, if a ham happened along to see it first. The advantage of the autopatch is that an emergency can be reported directly, instead of in a relay. It would be awful, if you couldn't raise anybody on frequency when you needed him, wouldn't it? (See last months C&E, Ed.) Of course the legitimate use of the patch is real nice too. Other suggestions to the congressman might occur to you, too.

After adjournment for coffee and doughnuts, we returned to the room for the flea-market auction. Some of us bought some equipment at very reasonable prices. Maybe we can at least use parts of these, or maybe, the whole thing - at future dates. Wayne, WA5AOB, identified the equipment and Jim, WA5LKS, did a very good job of auctioneering - he's no novice at that.

MEETING ADJOURNED George, WB5NMK

FOR SALE: Wilson 1402 Handi-Talkie, TT pad, belt clip, carry case, remote speaker mike, full of crystals. $275. Brand new, Mark II w/charger. $250. Howard Thompson, W5UVI, home 348-1475, work 528-2381.

FOR SALE: Heathkit HW-16 Transceiver, and HG-10B VFO. Both complete with manuals. $140.00 Call Larry, WD5DFK, 677-0002

AERONAUTICAL CENTER AMATEUR RADIO CLUB, INC.

W5PAA

RANDOM WORDS FROM THE PRESIDENT

We had a good attendance at our regular November meeting at the Aeronautical Center Amateur Radio Club. The scheduled program for that meeting was a display presented by the new Heath Co. store in our area. However, due to circumstances beyond their control, they were unable to make it. Thanks to some help from Bob Pace, WA5CJG, and a very understanding membership, we managed to stir some very interesting discussion, and everyone seemed to enjoy themselves.

As was announced at our November meeting, our regular December meeting will be replaced by a Christmas Dinner as follows:

Christmas Dinner, ACARC
FURR's Cafeteria
N.W. 63rd & MacArthur
December 1, 1978 7:00PM

If you arn't already aware of it, the .25-.85 repeater autopatch is now operational. This is an open autopatch so please feel free to make use of it. The access codes for this machine are * in # out (star in - pound out). Again thanks to Bob Pace, WA5CJG, for his fine efforts with this machine.

As many of you are aware, the ACARC and the Okla. Central Club have been co-sponsoring Amateur Radio classes at the Red Cross downtown. Well, I would like to report to you now that our current novice class is now complete, and we now have seven new Novices in our area. As this was my first teaching experience, I am quite proud of the new area novices, and wish to congratulate them all.

Gill Gilbertson, W5RB, is continuing his class of general and advanced class sudy through the month of December. Good luck to Gill, and his students.

As we have been saying for some months now our club intends to use its new computer to address the future issues of the C & E. Well, we are trying! The programming is complete, and many of the names and addresses have been loaded. However, this is a very slow process because initially this must be a manual load. I want to take this opportunity to thank Bill Rogers, WA5RAQ, for donating his time to help load this information into the computer. Thanks Bill.

That's all for now. Merry Christmas to all.

Merry Christmas, Bob Graham, WB5NSV

MINUTES OF THE ACARC MEETING NOV 3, 1978

The meeting began at 8:01. There were 39 members and guests present. A round of self introductions was followed by several announcements. Lee Forest is back home now from the hospital. Bob Pace WA5CJG, had the repeater ID board and autopatch to show. It will be up tomorrow. The new repeater autopatch ruling was discussed. A list was passed around for members to sign if they intend to attend the Christmas dinner. The new Heathkit store was to provide the program for the evening--however, they cancelled out at the last minute. So our talented club president, Bob Graham, WB5NSV, whipped up a fast program on a frequency doubler. He also showed a (PLL) circuit that could be used as a tachometer.
Meeting adjourned at 9:15PM.

Respectfully submitted Bill Oliver, K5KDR

FOR TRADE: HAVE 4 FREQ, 4 WATT, UHF HT-220, CARRIER SQ. WITH 444.2 & 444.1. WANT TO TRADE FOR SIMILAR RADIO EXCEPT WITH PL. CALL GLEN, K5LDL, 1-262-5375, AFTER 4 PM (EL RENO)
WANTED: VHF HT-220, 4 OR 6 FREQ. PREFER 5 WATT AND TT PAD. GLEN, K5LDL, EL RENO, CALL 1-262-5375 AFTER 4 PM.

SOONER FOOTBALL GETS AMATEUR HELP (Continued) - - which further convinced him the club is a serious, capable group of communicators able to provide worthwhile public service.

On the mornings of the games while the band is practicing the national anthem in Owen stadium the volunteers assemble for their assignments given by Sgt. Mauldin. These include: aiding pedestrians, running traffic signals, getting stalled cars going and in general whatever is needed to keep the people and traffic moving in an orderly fashion.

The club at this time establishes a net control, W5TC monitoring .28/.88 and .52 simplex. The pre and post-game activities of the club as far as communications go usually consists of aiding hams trying to grt to the game and using the autopatch to report any accidents or traffic problems to the OU PD. During the game teams of club members patrol on foot tha various parking areas. They report back to net control via HT either through the repeater or on simplex, depending upon the individuals capabilities. Any information needing to get to the OU PD is relayed by the net control via autopatch to the department communications center. So far no incidents have arisen and the simple presence of conscientious hams with excellent communications abilities (and a HT plainly displayed, Ed.) may be the reason.

Sgt. Mauldin, his superiors and subordinates have voiced appreciation and approval of the clubs efforts. Unfortunately the football season is over for OU, at least at Norman. However, the OU Amateur Radio Club and amateur radio in general scored a touchdown this season by providing a public service when needed and in a professional manner. But of course you know that's what we are here for.

RC Cable, WA6TLK

THE BIG SIGNAL NEWS

OKLAHOMA CITY AUTOPATCH ASSOCIATION, INC.

There are no highlights of the November meeting to report since once again the meeting falls one day after the paste-up. So we will take parts of hr report. This way everyone will be up to date.

RUSSIA'S "RS" SATELLITES ARE UP and operating after a successful launch Oct. 26. There are two amateur satellites and one COSMOS. Beacon signals have been heard from both satellites at about 29.400 MHz.

AMATEURS WHO HOLD OTHER FCC LICENSES should be cautious when renewing that other license. Though it's not only permitted—— but highly recommended——that amateurs include a photocopy of their license rather than the original with an application, it's a citable offense for licensees in other services to do so. Part 13.70 of the rules calls it "fraudulently making a license," and doing so is worth a "pink Ticket"

J28AY REPORTS he's now active on all bands, principally CW, and is available almost daily on the low end of 20 meters. 80 and 40 meter frequencies are 3504 and 7004.

FROM THE WEST COAST DX BULLETIN
CALENDAR OF EVENTS

NAVASSA	NOW!!!!!
BOUVET	NEXT MONTH****AROUND CHRISTMAS TIME
SERRANA BANK	THREE DAYS IN JANUARY*****Jan 18-21st
PETER ISLAND	MAYBE AFTER THE FIRST OF THE YEAR
JAMAICA	W6QL/6Y5 FOR A COUPLE OF WEEKS**A YASNE EFFORT
601FG-SOMALIA	AFTER THE FIRST OF THE YEAR POSSIBILITY
BEATA ISLAND	HI8s GOING WITH NEW PREFIX IN JANUARY
SPANISH PHONE TEST	DECEMBER 2/3rd
ARRL 160mtr TEST	DECEMBER 1/3rd
INDIAN DX TEST	STARTS 1200Z DECEMBER 2nd FOR TWENTY-FOUR HOURS

****

Be Sure to contact Karen WD5HBX for your input to the C&E

FOR SALE

HEATHKIT SB-400 TRANSMITTER and SB-300 RECEIVER, with SPEAKER, MANUALS, and CONNECTING CABLES. CONTACT Ron, WD5FRQ. 751-5378

FOR SALE: Ameco 2 & 6 meter, CW/phone transmitter. VHF-1 Heathkit Seneca, 2 & 6 meter receiver. Hutch, K5SUD, phone 677-5272.

FOR SALE: Polycom 6 meter transceiver. Fred, K5HFN, phone 737-8784.

FOR SALE: Swan Cygnet 260, 10-80 meter base. Built in mobile power supply. $240.00. D-104 mic, wired for same, $25.00.
Doug Strange, WD5BUI, 439-8848, 439-5619 after 8:00 PM.

FOR SALE: Army surplus steel secretary desk w/typewriter well. 4x5' desk when typewriter lowered. 14" x 6' steel shelf for ewuipment. Would cost $100 now. Price $50. Bill Peterson, WB5NXO, 524-7415.

FOR SALE: Late Drake "C" line with MS-4 - AC-4, $1100.00. Turner desk mike, $20.00. Shure desk mike, $25.00. Like new 4BTV Hustler vertical, $75.00. 1-Tempo One w/ PS. $330.00. Larry Dillard, (405) 685-4065, OKC.

ALTUS AREA AMATEUR RADIO ASSOCIATION

President - Bob Bratton, WD5BBW

Sec/Tres. - Janice Simms, WB5WMN

The ALTUS AREA AMATEUR RADIO ASSOCIATION met Thursday, November 9, at the Friendship Inn.

After a welcome by the President, Bob Bratton, N5AIP, all of those in attendance were introduced. Thirty-six were present. We extend a special welcone to our visitors and to two new members: Vernon Spencer, AB5Q and Stephen Defibaugh, KA5CRC.

The Nominations Committee presented their suggested candidates for yje 1979 year - Presidential candidates are: Jerry Bryan and Steve Norris. Secretary-Treasurer candidates aer: Steve Schenkel and Chuck Smith. Members of the committee included: Dwight Dennis, Chuck Smith, Steve Norris and Dave Horn. Election of officers will be held at the December 14 meeting.

Steve Norris gave a brief rundown on the local ratings from this years Field Day.

The program was turned over to Marshall Williams, K5MB,from Oklahoma City. (MB stands for Moon Bounce.) Marshall has worked all but three states (Delaware, Massachusets and New Jersey) for WAS on 2-meter moon bounce. Marshall spoke on various modes of 2-meter SSB and CW. - including Tropo, Meteor Scatter, Aurora and Moon Bounce. He interlaced his presentation with several tapes demonstrating each mode. After a brief break he continued with a discussion of the various hardware items needed for operating in the above modes.

We thank Marshall for taking time to come and make a presentation.

Next meeting will be DECEMBER 14, (ELECTION NIGHT), 7:30 PM

Janice Simms, WB5WMN
Secretary/Treasurer

* * * * * * *

S O M E T H O U G H T S F R O M Y O U R S C M

Texoma has come and gone. Another big one. Lots of people and a lot going on. Somehow, I get the feeling that this gathering has gotten a long ways away from the original concept, that I remember. Am I right or wrong?

Looks like the next state meeting will probably be a January meeting of the Oklahoma Pepeater Society at a date and place to be announced. And then comes Lawton.

Your SCM and XYL wish to thank each and every one of the wonderful amateurs of Oklahoma for the flowers, cards and other expressions of best wishes during our recent hospitalizations. I can report that we are on the mend and will be out amongst you as good as ever.

Holiday season is upon us. Are you prepared to help with the load of holiday traffic? Then in January, will come the annual S E T exercise. Then before you know it, spring and storm season will be here. Have you gotten your information on "*OPERATION SKYWARN*" yet? If not, contact your EC or SEC and get ready to help in this operation.

Seasons greetings to all of you from Leonard & Dora.

Leonard, WA5FSN

CORA COllector & Emitter

TEXHAMA HAMARAMA DEPARTMENT

I must admit (a little sheepishly) that I have never had the opportunity to attend the Texoma Hamarama in all the years that I have lived in the Oklahoma City-Norman area. This nifty hamfest occurs the last weekend of October each year, just about the time that the Big Eight Football race is coming down to the wire. There always seems to be a home game for OU or OSU that weekend or at least an out of town game just down the road that provides minimum inconvenience in traveling. And that is what happened this year. OU had a home game with Kansas State. Now, I'll admit that I wasn't exactly worried over whether or not OU would prevail over K-State, but a home game is a home game and considering the schedule this year, some football is better than no football. So when Joe K5JB and Larry WB5POW planned a flight down to Texoma on Sunday morning, it seemed like a perfect opportunity to accommodate the hamfest and the football game in the same weekend. On saturday as I was preparing to go to the game, I heard Larry, John WD5IDF, and Stan WB5UIY flying over Norman heading for Texoma on the first day. I asked Larry to bring back all particulars on the return flight and relay them to me. I talked to him and Stan during the ho hum fourth quarter on their return flight. I checked with JB and we decided to plan on leaving about 7 a.m. the next morning at Max Westheimer International Airport. The landing strip at Texoma was certainly convenient, a mere stone's throw (or convenience car) from the lodge.

Ugh, I was up bright and early the next morning (maybe early, but not so bright). I chatted with Larry and Joe as they drove down to Norman. Out to the airport and a quick check around the 172 and we were off. Thank goodness, neither of these guys are a "kick the tire, light the fire and go type pilot." I decided to forego my usual preflight dramamine cocktail (two dramamines and a glass of milk) and took the Sunday paper instead for reading material. The flight was uneventful and JB got a little instrument instruction on the way down. One pass at the airstrip and we were down and taxied up to the parking area just as the courtesy car arrived to pick us up.

This area is a very nice part of the state. The isolation from the major cities means that one is able to concentrate on the equipment and eyeball QSO's. We flew out and over the lake on taking off later just to see it. It certainly is nice. I enjoyed seeing most of the usual exhibitors from this area of the country. One fellow from Columbia, Missouri was selling CMOS and TTL and other components at very reasonable prices. I loaded up on some of the goodies available and ran up enough to put it on my plastic money. A quick check through what was left of the flea market turned up only a few items of interest. The best buy was a Motorola service manual for a repeater station for just $1.50 (best buy of all since I borrowed the money from Larry). I strolled back inside and had a great chat with Leonard WA5FSN, P.K. WA5DGL, and my good friend Bert Gunn W5FU, longtime retired from Radio, Inc., in Tulsa. I remember traveling to Tulsa back in the seventh and eighth grade to Radio Inc., to oooh and ahh over all the equipment in their ham store. Business with Radio Inc., was a pleasure. I remember Bert letting me take a radio on credit and I began to send them a $5 or $10 check each month to pay for it. I got a letter from the credit manager who ask me why my 30 day charge was past due since I hadn't paid the full sum yet. I wrote back and told them I didn't know I had to pay it all in full, but would sure try. I never heard anymore from them and later, in Tulsa, I stopped by and asked the credit manager what hoppened? He told me that he and Bert had talked about it and decided that I could make whatever payment I could each month. You don't find people who do business like that any more. Not only did I pay it off, but I also bought a considerable amount of equipment and parts from them until leaving for college. I was a good customer at Radio Inc., but never a big one. Also, I never got one of those terrific calendars they use to pass out. Maybe it was just as well, I

don't think that my mother would have let it in the house. My father would probably have looked at it though.

The hamfest began to break up about the time that we loaded up the plane for the return flight. JB and Larry decided to fly to Chickasha and eat at some fancy restaurant within walking distance of the airport. Ugh. turbulence this time and I was completely unarmed, having been caught with my Dramamine down. Oh well, I'll just chagrin and bear it. The situation was not eased when the wind changed twice during landing attempts and we had to make a couple of passes to get the plane on the ground. Upon landing, we found the restaurant closed on Sundays. I waited awhile to get the old land legs back and climbed back into the airplain (your basic 172) for the short 15 minute ride back to Norman. I must be getting better about flying. The trip didn't hurt the old appetite as JB, Larry and myself went over to Lindsey street and tied on a couple of Boomerang Burgers along with some onion rights for our post flight debriefing and final fuel stop.

It was a good trip. Total airtime for the Cessna was slightly more than 3 hours including the fiddling around at Chickasha. I need to pull out the football schedule for next year and see if the hamfest falls on a home game. Sure would like to make the Saturday flea market next year.

Micheal Salem N5MS

INFORMATION CENTRAL --THE NATIONAL TECHNICAL INFORMATION SERVICE

When you need information, a readymade source is not always available. That is why I got a little excited the other day when I turned up a Federal technical information service that provides up to date technical information.

The National Technical Information Service of the U.S. Department of Commerce is the central source for the public sale of U.S. and foreign government sponsored research, developmental and engineering reports and analysis's prepared by national and local governmental agencies, their contractors or grantees, or by Special Technology Groups. NTIS also is the central source for Federally generated machine processable data files and manages the Federal Software Exchange Center.

NTIS ships about 20,000 information products daily as one of the world's leading processors of specialty information. It supplies its customers with about four million documents and microforms annually. About 105,000 titles are stocked in multiple copies. Current lists of best selling reports describe those most in demand. NTIS sells technical reports and other information products of specialized interest under provisions of Title 15 United States Code Section 1151-7. These laws, which establish a clearinghouse for scientific, technical, and engineering information, also directs the NTIS to recover its costs from the sales of its products and services. Timely and continuous reporting to subscribers is ensured by agreements between the NTIS and federal research sponsoring organizations and Special Technology Groups.

Customers may quickly locate many summaries of interest from among some 500,000 federally sponsored research reports completed and published from 1964 to date, using the agencies on-line computer search service or the more than 1,000 published searches already in stock. About 70,000 new technical summaries and reports are added annually. Copies of the whole research reports, on which the summaries are based, are sold by NTIS in paper or microfilm form. Certain government files and lists are available on computer tape.

What is the difference between the NTIS and the Government Printing Office, or the Superintendent of Documents? The Government Printing Office (GPO) is the Federal printer. It is part of the Legislative Branch of the U.S. Government. Its customers are the Congress and the Federal agencies. Its products are produced in-house on short schedules or contracted out for longer term. GPO costs are paid by direct appropriation or reimbursed by its customers direct appropriations. The Superintendent of Documents (SupDoc) is the sales arm of the GPO. It sells only what the GPO prints, some 20,000 titles. Its customers interests are generally the same as those of the popular periodical and book buying public. New and stock catolog items are announced and sold through the monthly Catolog and 19 regional bookstores. SupDoc sales are limited to what GPO prints. The NTIS is a central permanent source of specialized (i.e. business, economic, scientific, social) information of varied origins. NTIS information is alway available, single copies of any of its million titles are printed to order when not in stock. Its customers are most business men and professionals accustomed to locating and applying special information to problem solving.

There is a variety of information available from the NTIS. I found that they offer the Data files from the Federal Communications Commission in microfilm and computer magnetic tape. The microfiche files are generally sold only as entire sets of 48X microfiche sheets. These whole sets are sold on demand or on a yearly subscription basis. A demand order results in a customer getting the demand sale product plus semi-annual or quarterly updates.

What is available from the FCC? The Amateur Master file is available in microfiche which consists of 60 sheets of 48X microfiche for just $17.00. Ever wonder where those people who print the call book get their information? Well, they just buy the computer tape of the master list and manipulate the data to print the now familiar callbook (I'll bet). Another selection is the Frequency Master File (Frequency Sequency; Quarterly Update) for just $65.00. I was fascinated with the possibility of owning a frequency list kept current by the FCC, especially if they could be separated by states. Unfortunately, such custom searches add a few bucks to the cost of the material. For those of you affluent enough to own a computer, you can buy the FCC files on magnetic tape, but only as a whole file. You can also get a custom search of the Citizen Band Master file by state if you are so inclined. Prices for the microfiche is $.28 each fiche. You can telephone (703) 557-4763 for file sizes and detailed prices.

The NTIS does not send out regular mailings to interested parties because of the large number of selections that they have available. They do circulate a general catolog which generally describes the data bases and publications available and how to institute special searches for information. They also have several technical summaries and special newsletter for various topics. Information and a copy of the current general catolog can be obtained by writing: National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22191. The present general catalog is 5-A for North America.

Micheal Salem N5MS

SATELLITE GROUND STATIONS--HOMEBREW SATELLITE EAVESDROPPING PROGRAM BIG HIT AT SCARS MEETING IN NORMAN

Everybody should have their own satellite ground station. Well, maybe not everybody, but certainly anybody who is interested in investigating one of the more interesting portions of the electromagnetic spectrum. This is the conclusion after attending a program sponsored by SCARS (South Canadian Amateur Radio Society) at the Red Cross in Norman on November 18. The program date interfered with some pregrame festivities scheduled for the football game, but anybody who didn't take advantage of the opportunity to hear Bob Cooper W5KHT talk about his homebrew satellite receiving station was on the losing end, just like OSU and Nebraska. Bob is the editor of CATJ, the national cable television journal and moderator of Satellite Magazine, a regular program broadcast on one of the satellite common carrier channels for people in the satellite industry with news and information about the satellite communications business. Even if you may never contemplate the construction and installation of a satellite receiving station as Bob had done, the program was well organized and a very good introduction to microwaves and the hardware (literally) necessary to construct a simple microwave receiver and station.

Satellite Communications--Satellite City around the Equator

What is the communications service that we are talking about? Amateurs should have some familiarity with satellite communications systems. OSCAR is a common term bandied about in amateur circles. From the first passive repeater placed in outer space (Echo I and its progeny) to the Oscar transmitting Morse Code to the present state of the art repeater translators in recent Oscars, the advantage and adventure of satellites has always been odvious. There are several satellites placed in orbit around the equator by firms such as RCA and others that carry wideband video and audio signals and repeat them after reception from a ground station. These satellites have been placed in what is referred to as geostationary orbit. That is, their position with respect to any point within its view does not change as the earth and the satellite rotate. At a distance of approximately 22, 400 miles above the earth, the period of rotation of the satellite around the earth is equal to the period of rotation of the earth. It takes the satellite 24 hours to revolve around the earth. Once the satellites forward speed has been stabilized, the satellite will appear to stay in a fixed position. This means that access to the satellite is available 24 hours a day to any point within its view. The first such synchronous satellite was Syncom which orbited in 1961. Presently, there are some 30 satellites in geosynchrous orbit spread some 4^{o} degrees apart in the sky. Of these 30, only 5 are visible from the southwestern states of Oklahoma, Texas, and Arkansas, etc. Three more are visible from Oklahoma with specialized hardware and equipment. The satellites are in orbit over the equator, so from Oklahoma, we must look south about 38^{o} to 39^{o} above the horizon to sight them. The 4^{o} spacing figure was arrived at on the basis of being able to isolate with directional antennas each satellite from the other.

Who uses these satellite channels? Lots of people do and have. The availability of national and international wideband audio and video channels attracts a wide variety of customers, including the national TV networks, cable television programming services, and even one fellow whom Bob said wanted to send a message to God. It is on these channels that network programming travels between studios or to affiliates. Much of the material includes many uncensored and not for broadcast items. Satellite usuage is increasing as cable television companies proliferate and tap the satellites for programming material. The person who owns a satellite receiving station will find an incredible variety of programming available just by swinging his antenna (dish) and tuning in the satellite

The Satellites and the Frequencies

All of the satellite channels discussed by Bob are microwave. The uplink frequencies are located in the 6,000 Gigahertz (6.0 Ghz) range while the downlink (output) from the satellite centers around 4.0 Ghz. Most of the satellites can carry 12 different channels 40 Mhz wide. (RCA has a new satellite that can cram 24 channels in the same spectrum as the 12 channel satellites by offsetting the odd channels by 20 Mhz from the even channels and transmitting in a vertical polarization mode while the even channels are transmitted in a horizontal polarization mode. RCA claims the offset and polarization add up to about 30 db of isolation between channels, but Bob indicated the actual isolation is more along 23 to 24 db.)

Each satellite weighs about 2,000 pounds and contains huge solar panel arrays that fold out after the satellite has been placed in orbit. The 2,000 lbs represents the maximum satellite payload capable of being placed in orbit today. Each satellite takes the uplink signals and translates them to the downlink frequency. So far, this is very similiar to the way that Oscar VII works. However, the satellite then breaks the translated uplink signals down into the 12 channels using hybrid networks that separate and isolate each channel. From the hybrid network, each channel then goes to a separate 5 watt maximum peak power transmitter representing about a 7 dbw output signal. The video signals are wideband FM video with a peak deviation of 10.75 Mhz representing a maximum bandwidth of 22 Mhz. Guardbands make up the 40 Mhz wide channel. The audio is placed on a 6.2 or 6.8 Mhz subcarrier depending upon which satellite you are following. The signal is preemphasized at the transmitter and also processed with a 30 Hz energy dispersal waveform which spreads the signal across the entire bandwidth to increase the signal to noise ratio.

The path loss from the satellite to the receiving station is approximately 196 db and remains relatively constant over long periods of time. Bob indicated that he detected only a maximum variation of .4db of the signal strength over a period of several months. This could be easily understood since most of the path is through space. The satellite will encounter most of its loss is the first 5 to 10 miles of the atmosphere. Bob indicated that a heavy fog seemed to give the greatest variation of loss. The satellite uses a gain antenna of approximately 29 db to create a +36 dbw transmitted signal when you take into account the 7 dbw transmitter output (dbw is the db ratio compared to a 1 watt output). Subtracting this 36 dbw from the 196 db loss leaves a considerable amount of loss to be made up by the receiver. Bob's experimentation indicated that a 6 foot dish is the minimum that you can use (along with a very expensive Gallium Arsenide preamp mounted at the antenna) and win the battle of signal to noise. An 8 foot dish will get you above the noise, but with a very tight margin. A 10 foot dish is a good compromize for good quality and lets you build the receiver preamp out of bipolar transistors which are considerably less expensive than the GaAs Fets previously mentioned (still not cheap, however, approximately $40.00 apiece from some sources). A 12 foot dish should provide optimum coverage and effective compromise on the preamp. Bob has both a six foot dish and 20 foot dish in his installation. He indicated that a minimum antenna gain of 40 db at the receiver is needed regardless of the preamp used. This would represent a total of 196 - (40 + 36) = 120 dbw effective path loss. In dealing with such a small signal, you can see why the systems engineers make every effort to improve the reception by the use of wide band fm and signal processing techniques.

Each satellite costs about 25-30 million dollars to produce which is really not too bad when you consider what it costs to make house calls for repair. Add in another 15 million dollars for launch expenses and you easily have an investment of between 40 to 50 million for each system. The satellites are equipped with tiny hydrazine rockets that guide them into orbit and keep them

stabilized within their target area. While it is true that the satellite exists in a weightless condition, there are still many other forces that affect it some 22,500 miles out in out space. Remember that the value of the satellite is that it occupies it little niche in outer space with consistency and doesn't move around. There are very tiny forces that act upon the bird while circling the earth. For example, the solar panels that provide power to run the transmitters present a large surface area to the sun which in turn puts a solar pressure consisting of particles emitted by the sun that moves the satellite. In addition, the gravitational field varies from point to point in space. The force of gravity is greater over land masses than over the water. Magnetic storm impinge upon the satellite and affect its position. The position of the satellite must be controlled to an accuracy of 1/20 of 1 degree. At 22,500 miles out in space, this corresponds to an area 70 miles North and South and 70 miles East and West in which the bird must stay. This has a great bearing on the antenna used for receiving since the typical 3 db beam width of a 40 db gain antenna is about .8 to .9 of one degree. This position is controlled by the minature hydrazine rockets on the satellite which may be fired for as little as 50 milliseconds. The rockets themselves typically are about 1/100 lb thrust. The rocket fuel has a limited supply and of course, in the harsh environment of space, batteries and components break down. A satellite has a limited life expectancy of about 10 to 12 years. When the fuel level has reached 10% of full, the last of the fuel is expended to drive the satellite out into space and away from the earth.

What would happen if the satellite were left alone and allowed to drift? Well, experiments indicate that the satellite would eventually drift until it reached a point about 104° West longitude which corresponds to a gravity field center and stop. Rather than create a satellite graveyard at this point, the satellites are driven into space.

As previously indicated a minimum of 40 db of antenna receive gain is needed to receive decent signals. Odviously a dish is the only practical solution since it would be virtually impossible to properly phase and stack 4.0 Ghz yagis to achieve the gain. The surface of the parabolic structure must be constructed to a tolerance of $\pm$ .20 inch to properly achieve the needed gain. Various mechanical designs have been tested by builders of these systems which include the use of wood, metal, and other materials in a variety of structures. At the apex of the dish antenna is mounted the receiving horn with a small isolator and preamplifier. The signal we are dealing with is so weak that the preamp must be mounted right at the antenna. As indicated, if you use a six foot dish, you will be marginal with a GaAs Fet preamp and a minimum of 40-50 db gain. The larger the dish, the greater possibility that you will be able to use bipolar transistors at approximately $40.00 apiece instead of the approximate $550.00 apiece for GaAs FETS.

The Receiver

How complicated is the receiver? If you follow the accompanying block diagram, you may think it really is, but actually, some of the blocks may not represent much circuitry at a 4.0 Ghz center receive frequency. In figure 1, you see the ground station uplink to the satellite in the frequency range of 6.7 to 7.2 Ghz. This corresponds to 12 channels approximately 40 Mhz wide with all the necessary guard bands. As previously indicated the satellite translates the entire frequency range down to the 3.7 to 4.2 Ghz band, then separates the band into 12 separate transmit frequencies using hybrid networks to isolate and separate the channels. By the use of the hybrid networks, the users are able to avoid many of the problems associated with broadband frequency translation. In this way, the output power becomes independent of the satellite input receive signal. This way no single channel uplink can grab all the transmitter power output, a common problem with the more recent Oscar translators. Considering that you are talking about ground stations using 60 foot dishes and multiple kilowatt

Satellite Uplink and Ground Receiver Diagram

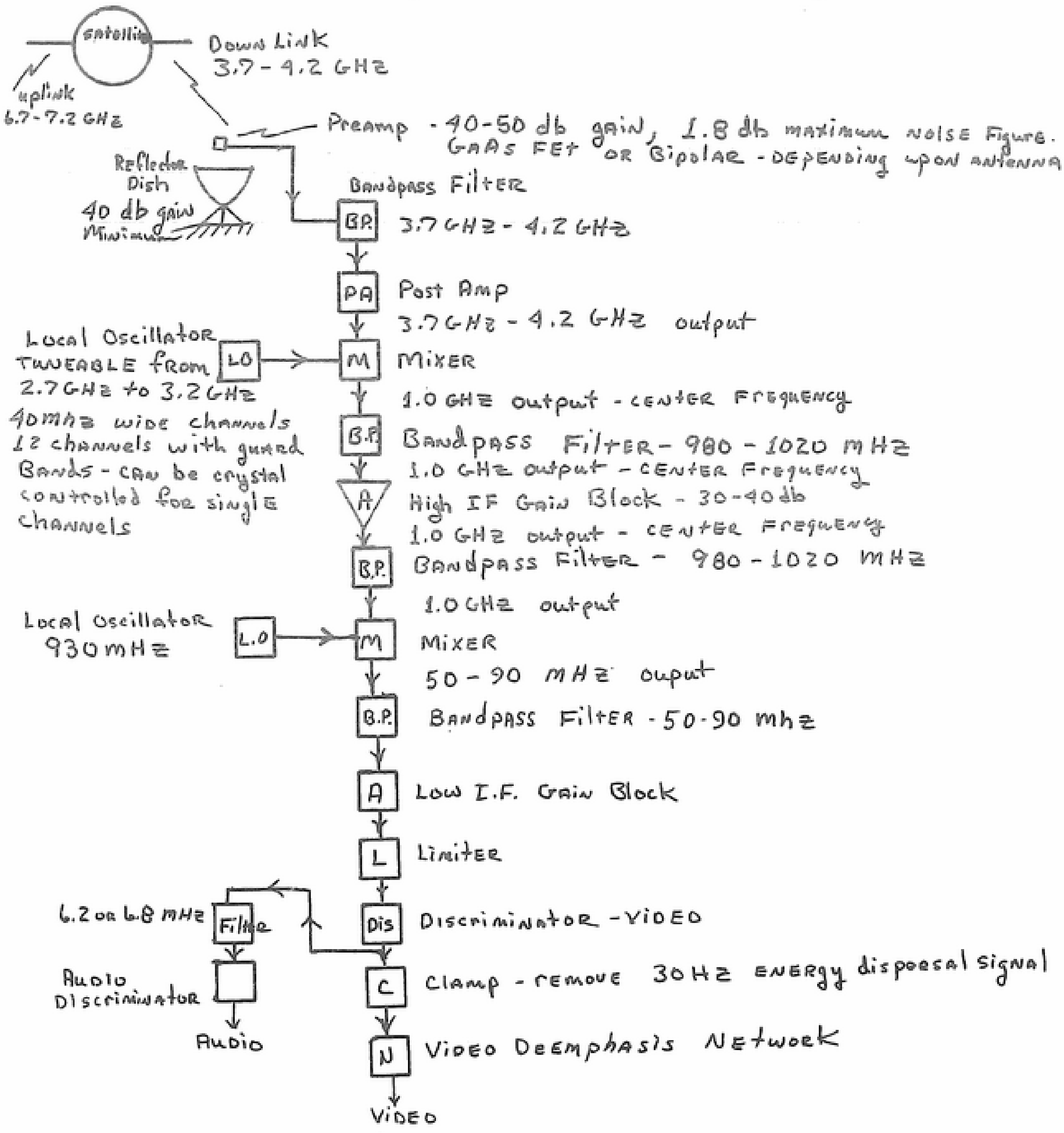


FIGURE 1. Block Diagram of a Microwave Satellite Receiver with conversions and frequency bands.

transmitters, the possibility of large signals arriving at the satellite is a very practical reality. Amateurs, of course, do not have the Oscar translators set out in bands or channels and cannot use the hybrid configuration to prevent output power transmitter capture by strong signals.

The receiver is a simple double conversion circuit right out of the 1930's except that it works at the 4.0 Ghz band. The uplink to the satellite spans a frequency range of 6.7 to 7.2 Ghz (corresponding to 12 channels of 40 Mhz wide with guard bands). This band is translated downward to the range of 3.7 to 4.2 Ghz. Using a center frequency of 4.0 Ghz, we will show the various mixing products and results in the frequency.

The receiving antenna is a dish of various diameters as previously discussed. Mounted right at the apex of the parabola is a preamp operating at the downlink frequency. The preamp looks at the dish with a pattern that sees the edges of the dish about 10 db down. Here you are talking about 40-50 db gain in a preamp

with a noise figure of minimum of 1.8 db. At this point we have gone a long way to recovering that 196 db path loss with a minimum 40 db gain antenna and 40-50 db gain preamp. Only 100 db to go! Actually, we have made up some of the loss with the +37 db transmitter output and antenna gain. After the preamp is a bandpass filter covering the received signal range of 3.7 to 4.2 Ghz. Then another amplifier for more gain going into the mixer. The first conversion uses a local oscillator which is tunable from 2.7 to 3.2 Ghz which corresponds to a first high I. F. frequency of 1.0 Ghz. Here is where the various channels can be separated either by using a crystal controlled LO or tuneable. For the amateur, a tuneable LO would be more useful since you are interested in looking at all the channels offered by the satellite. From the first mixer and through another band pass filter, the signal goes through the first High I. F. gain block of another 30-40 db and then through another bandpass filter. The second conversion occurs next and uses a local oscillator frequency of 930 Mhz to produce a mixer output of 50-90 Mhz corresponding to the channel frequency width. The signal passes through another bandpass filter and then the low I. F. gain block. Since we are dealing with a FM receiver and detector, next is a limiter to clip off all amplitude variations and then the signal is fed to the discriminator for video detection. The output of the video is then fed into a clamp to remove the 30 Hz energy dispersal signal and through a video deemphasis to remove the preemphasis added at the transmitter. At last, the video signal emerges. Audio is recovered by taking the output from the video discriminator and running it through a 6.2 or 6.8 Mhz filter to extract the audio subcarrier and then on to another discriminator and audio recovery.

Pretty simple, huh? Actually, yes it is. Bob said that some of the more complicated receiver systems use AGC (about 20 db worth), but considering the fact that the path loss has never varied more than .4 db at his location, he can't understand why. In addition, why AGC a signal that rarely changes in level and then clip it in the limiter? Good questions, but the answer may lie in providing reliability of service under conditions in which their may be a change in the parameters of the receiving station or satellite location. Ground control may not alway be able to maintain that 70 mile square box the bird is suppose to stay in, but Bob is probably right that adding AGC is a classic case of over engineering.

The Legal Requirements

There are legal limitations to establishing your own satellite ground receiving station. Anybody can set up any receiver they want, right? Wrong. Receiving stations of this type must be licensed by the FCC. Why just a receiver? Well, we are pretty lucky in this country. We generally don't have to license receivers but such is not the case in other countries. Television viewers in the United Kingdom and Canada have paid licensing fees for television receivers for years. The FCC and the Congress here in the U.S. has just never required it. That doesn't mean that the FCC doesn't have the right to insist that even a receiving station must have a license. Under the law, if you intercept a transmitted signal that is not intended for you, you are bound under the law to tune away and not listen. Although much of what is transmitted through the satellites ultimately winds up on the broadcast networks, there is much material that is sent that is intended for specific recipients only and never authorized for release to the general public. And that is the crux of the matter, whether or not you are an intended recipient of the transmitted signal. If you are (such as an authorized and licensed ground receiving station for a cable company or television network), then you are permitted to intercept the transmission for what ever use you may have for it. If you are not authorized to receive the signal, then you must tune away. The expectation of privacy of the companies that use the satellites is that people will not listen in on something they are not suppose to.

This much misunderstood facet of the law comes from the United States Statutes, more specifically Title 47, Telegraphs, Telephones, and Radiotelegraphs. This is the famous Section 605 of the Communications Act of 1934, which provides:

> 605. Unauthorized publication or use of communications. --- No person receiving or assisting in receiving, or transmitting, or assisting in transmitting, any interstate or goreign communications by wire or radio shall divulge or publish the existence, contents, substance, purport, effect, or meaning thereof, except through authorized channels of transmission or reception, to any person other than the addressee, his agent, or attorney, or to a person employed or authorized to forward such communication to its distination, or to proper accounting or distributing officers of the various communicating centers over which the communication may be passed, or to the master of a ship under whom he is serving, or in response to a subpena issued by a court of competent jurisdiction, or on demand of other lawful authority; and no person not being authorized by the sender shall intercept any communication and divulge or publish the existence, contents, substance, purport, effect, or meaning of such intercepted communication to any person; and no person not being entitled thereto shall receive or assist in receiving any interstate or foreign communication by wire or radio and use the same or any information therein contained for his own benefit or for the benefit of another not entitled thereto; and no person having received such intercepted communication or having become acquainted with the contents, substance, purport, effect, or meaning of the same or any part thereof, knowing that such information was so obtained, shall divulge or publish the existence, contents, substance, purport, effect, or meaning of the same or any part thereof, or use the same or any information therein contained for his own benefit or for the benefit of another not entitled thereto: Provided, That this section shall not apply to the receiving, divulging, publishing, or utilizing the contents of any radio communication broadcast, or transmitted by amateurs or others for the use of the general public, or relating to ships in distress.

Do not confuse the ability of the Congress to make such a law with their ability to enforce it. There are odvious problems with enforcement. Still, however, a person who uses the radio for communication (other than broadcast or amateur) has a reasonable expectation of privacy for that use authorized by the law. And by their use of radio or wire, they do not waive their common law right of privacy to protect what is sent.

You do not have a right to receive a satellite transmission merely because it is sent over the radio waves. And if you intercept a transmission not intended for you and use it or divulge it, you could be punished criminally under section 501 of the Act as well as have a civil suit instituted against you for damage in the amount of the benefit you received or licensing fee. Put that in your Bearcat and think about it.

What is needed to listen? First, a license from the FCC. Normal cable tv licenses to monitor the satellites are complicated and very expensive, costing about $1200 to pay a company to assist you in preparation and filing. Bob indicates that the Commission has a experimenters type license which can be obtained quite easily by filling out a four page application and requesting the license for the purpose of experimentation with receiver and antennas for the purpose of advancing the state of the art. This license is good for one year and can be renewed. You even get call letters for your receiving station (Bob is WF92). I suppose that this is one instance where bootleggers don't bother anyone except the Commission.

Just because you have a license doesn't mean that you are authorized to receive and use the television signals. You should make arrangements with the various services using the satellite to pay whatever licensing fees they require for the use of the material they put on the satellite. For example, Home Box Office (a pay TV service featuring first run movies) charges $60.00 a year for their service. Another popular movie station from Atlanta, WTCG charges a $5.00 one time fee. Odviously, some of the TV networks won't appreciate you eavesdropping on their leased feed channels and probably won't license you.

The Sting

What does all this exotica cost to complete? You can spend any amount of money you want. There are several commercial companies that will set you up with your own ground station for a cost in the range of 40K or so dollars. Bob told the story of a friend of his who visited some people in Palm Springs after the TV Guide article on his setup appeared. He merely mentioned that his company built ground stations and went back home with 10 checks for systems.

Aside from that, the amateur is a good scrounger who with a little luck ought to be able to build something like this for about $1500 or so. Dishes can be built from wire mesh spread over a wood frame. By using a large enough dish, some of the expensive preamp equipment can be simplified to bipolar transistors instead of GaAs Fet preamps. Avantek makes a simple mixer for the first conversion for just $95, a real bargain when you consider it is tunable by using a control voltage. High and Low I.F. gain blocks are available quite reasonable. One person in California is providing kits or modules to put together a whole receiver quite reasonable in cost(Between $1150 to $1200 in cost). This is not bad when you consider that the parts individually can be quite expensive).

For those who want to explore the possibility of building such a system or just find a bundle of fascinating information about this service, Bob has put together a collection of information, including two issues of CATJ, the publication he edits, to take care of the literally thousands of requests he has received for information since he was the subject of a CBS news report and article in TV Guide. He has a chart that outlines the various channels available and what is on them and what satellites are presently in orbit. The information is available by sending a check for $10.00 to:

CATJ
Suite 106
4209 N.W. 23rd
Oklahoma City, Oklahoma 73107

Bob estimates that there is quite a bit of experimentation already going on in the microwave region by amateurs and other enthusiasts. Recent issues of ham radio magazine also detail activities in the microwave region. The advent of the new Gunnplexer systems from Microwave Associates, while not applicable to the type of service described above are also an easy way to get into this interesting field. Let's get those ground stations up and working.

Micheal Salem N5MS

SECOND CLASS POSTAGE PAID
AT OKLAHOMA CITY OK

Publication No. 116150

POSTMASTER: Send Form 3579 to:
CORA C&E Box 15013
Oklahoma City OK 73155

DECEMBER HAM HAPPENINGS

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					ACARC CHRISTMAS DINNER! 1	2
3	MORI CHRISTMAS DINNER! 4	5	6	OU CLUB MTG. 7	OU & SCARS DINNER - 6 pm JACK GANT - SPKR HOLIDAY INN, NORMAN. 8	9
10	11	76ers CHRISTMAS DINNER! 12	13	ALTUS CLUB MTG. 14	OCARC(VHF) CHRISTMAS DESSERT! 15 RED CROSS	16
17	EDIT C.&E. 18	AUTOPATCH CLUB MTG. 19	20	OU CLUB MTG. 21	76ers MAIL C.&E. 22	23
24 HO-HO-HO... / NEW YEAR EVE 31	CHRISTMAS 25 DAY	CORA? 26	27	28	29	30

See page 2 and/or individual club sections for details