



MONITORING TIMES

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January, 1986

The Impending Disaster of HR3378 and S1167...

YOUR RIGHT TO LISTEN MAY BE OUTLAWED!



...Unless You Write Your Legislators...NOW!

A special report
with editorial commentary
by Bob Grove

The ready availability of wide-spectrum radio receiving equipment is under careful scrutiny by government officials in Washington and elsewhere. A recent attempt by the cellular lobby to manipulate the California legislature into banning listening to 800 MHz cellular radio was narrowly defeated after the wording was changed to prevent malicious intent in monitoring--really nothing more than a restatement of Section 605 (now 705) of the 1934 Communications Act.

A similar proposal to ban scanner monitoring in Pennsylvania was soundly defeated over a year ago.

Now there appears to be a concerted thrust by the cellular telephone industry to prohibit cellular telephone monitoring; it has been formally introduced in Washington as the Electronic Communications Privacy Act of 1985 (H.R.3378) and a companion Senate bill (S.1667). It has wide sweeping implications for other monitoring as well.

Introduced to the House

of Representatives September 19, 1985, by the Honorable Robert W. Kastenmeier (D-WI), Chairman of the House Subcommittee on Courts, Civil Liberties and the Administration of Justice, H.R. 3378 has had at least two hearings and is scheduled to resume this month.

The stated intent of the bill is, in its broadest interpretation, to protect the privacy of U.S. citizens from intrusion by wiretaps, bugs, tracking devices, and other means and restricting such devices and techniques to legitimate authorization by law enforcement agencies requiring court orders.

Unfortunately, the ramifications of the present wording of the proposal have stunning significance to the long standing rights of U.S. citizens to monitor the radio spectrum.

Of the seven major features of the bill, two pertain directly to the recreational listener. First, protection is provided against interception of any conceivable electronic communication on any frequency (with certain exceptions noted below); secondly, it creates criminal and civil penalties for

violators.

Philip J. Quigley is President of PacTel Mobile Companies, a cellular mobile telephone organization, and a director of the Cellular Telecommunications Industry Association, the dominant lobby for the bill. Defeated in an abortive attempt to throttle the citizens of his home state of California with a similar monitoring prohibition bill just a few weeks earlier, Quigley concluded his testimony in support of the new bill on September 26, 1985, with the following extracted comments:

"Of course, even if H.R.3378 is enacted, there will still be some people who will flout the law and intentionally listen in on private conversations transmitted via the radio spectrum. Today, these people can use scanning receivers--popularly known as 'scanners'--to eavesdrop on cellular conversations...

"One way to close this loophole would be to limit the frequencies that scanners can receive...There is no reason why scanning equipment should be designed to receive frequencies that have been reserved for private communications...an appropriate technical modification in the FCC's rules governing scanners is a necessary adjunct to this privacy legislation."

A GRIM REMINDER

As observed by S.C.A.N. (Scanner Association of North America):

"...among the first actions of despotic governments has been to restrict the ability of citizens to find out what was going on around them. The Nazis confiscated all radios except those which could receive only broadcasts generated by the 'authorities' and violators were severely punished. And a similar situation exists even now in the USSR

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and certain other totalitarian states."

The Supreme Court of the United States held in 1974 that "It is now well established that the Constitution protects the right to receive information..."

It has been well established in several precedent court cases that a user of a radio system can have no reasonable expectation of privacy. H.R.3378 appears to

☞ Please turn to page 4

S.C.A.N. MAGAZINE MERGES WITH POPCOM

An MT Exclusive by Bob Grove

Bob Hanson, president of the Scanner Association of North America (S.C.A.N.), has announced that his publication will now be included within the pages of Popular Communications Magazine.

Hanson cites the enormous costs of publishing a slick magazine as the prime mover in deciding to combine the efforts of the two magazines.

While Popular Communications is a commercial

venture of CQ Magazine, a prominent amateur radio periodical, S.C.A.N. will remain a not-for-profit corporation, issuing occasional bulletins and newsletters to its members. An increase in dues entitles members to receive Popular Communications with the S.C.A.N. insert.

Popular Communications advertisers are now being advised of an increase in rates (approximately 25%) due to the combined circulation, claimed to be near 100,000.

MONITORING TIMES

Bob Grove.....Editor
Judy Grove.....Publisher & Advertising Manager
Rachel Baughn....Production
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Viewpoint

MORE VIEWS ON MT

I have enjoyed corresponding with you and the MT family over the last few years. And your business certainly knows how to treat a customer.

But I have grown tired of Monitoring Times. Looking back, it has really changed. I realize you cannot please all of the people all of the time. But I find very few items interesting anymore. How about some constructive criticism?

"SWL World Watch" is mostly about DXing, not SW listening. It should be semi-detailed program listing. For example: Deutsche Welle, Monday broadcast:

- 0100 Newscast
- 0110 Microphone on Europe
- 0125 Germany Today
- 0130 Science Magazine

DX listings should be left to the DX programs and club bulletins who can report it faster and better. Included should be news items, i.e. Radio Marti, frequency changes, new stations, KCBI, etc. Nothing for DX sake. The above would take care of "English Language Broadcasts" which is quite useless.

Don Schimmel's "Utility Intrigue" should concentrate on voice, not so much on CW and RTTY. Note this does parallel your recent poll.

Start limiting "Computer Corner/Bits" to the monitoring hobby. It has gotten off base more than once. If not enough can be written a month, print it quarterly.

"Signals from Space" seems to get longer every issue, yet how many people have the equipment to listen it? More importantly, how many MT readers?

Put Hank Bennett on the editorial page. He rarely talks about shortwave; in

fact, modern broadcasting is seldom alluded to. This history of radio is becoming boring because of Hank and all the other historians you print. If I need to, I will go to the library for history.

Finally, "Tune In Canada" and "Listeners Log" are too locally orientated, thus important to none or few people. This should be left to each individual's local scanner club or scanner supplier. On the other hand, scanner reviews, Orbiter freqs., "VHF Skip Report," and big events or places like stock car races, Disneyland, Inaugural events, are or can be interesting to many people. Believe me, I am not being prejudiced because Nebraska listings have not come up. I have the local frequencies if I want them; but I don't even own a scanner.

Taking into account this is but one person's opinions, things will probably not change much.

Richard Baumgart
Columbus, Nebraska
We always invite constructive criticism from our readers and Richard Baumgart's views are well taken. While the content of MT varies from month to month, the overall informational base has remained quite constant since its inception: to provide the broadest base of reception information on the radio spectrum available.

Certainly, interests change, both on the part of listeners and of our writers. Nonetheless, we encourage input from our readers so that we continue to stay on target...Bob)

>>><<<

Thank you for producing a very interesting publication. I really enjoy the depth and diversity of your articles and columns and the friendly attitude throughout. You might like to know that I pass my back issues around to my fellow listeners so they see what they are missing and may subscribe.

I am wondering if you could/would supply me with an address for A.C.E. (Association of Clandestine

Enthusiasts) as they sound like they have some interesting views and information. Thank you.

John Zander
Janesville, MN
(A.C.E. specializes in pirate and clandestine radio and a sample of their publication is available for \$1 by writing P.O. Box 452, Moorehead, MN 56560...Ed)

>>><<<

I really enjoyed Visit to HCJB November MT issue. I'm a member of Andex, HCJB DX Club. It was good to read about and see people I listen to often. The article by Ed Soomre was excellent.

Karl A. Holt
Delhi, NY

>>><<<

I'm somewhat concerned about Jean Baker's article "Plane Talk" not appearing in December's edition of MT. According to November's edition there was mention that she would have an article in December. I do sincerely hope that the paper will continue to publish her articles on the aero band? Fact of the matter it was her articles that attracted me to Monitoring Times. Please tell me that her articles will be forthcoming in January.

I beat you to the draw by sending my subscription before MT arrived here and was glad for the additional pages. Keep-em-coming. Your paper is the best and most informative.

Jim Chandonnet
Manchester, NH
(By all means, Jean will continue to write her excellent column which is one of the most popular in MT. By her own choice, she generally provides her fine work on alternate months.)

>>><<<

(Enclosed is our) new 1986 (advertising) contract for Monitoring Times. Your publication STILL continues to "outdraw" every other commercial ad placed. We regularly run about 12-15 ads per month and you are still on top.

(Company's name withheld)

SINKING SHIPS

I now would like to write re the letter from the gentleman who withheld his name by request. I personally feel that the professionals who work in the area of communications, secret or otherwise, such as this gentleman apparently does, should not take the interest and efforts of non-professional communications monitors as efforts that "sink ships by way of loose lips" --particularly after listening to various communications for several years and recently reading a book by

an English woman who told of her adventures in the British military during the Second World War as a monitor of German aircraft communications.

She discusses at great length in her book the amount of information the Allies were able to gather just by listening to enemy pilots talking unnecessarily over their radios. She also talked about the unnecessary loss of life experienced by the Allies when their pilots and radio operators committed the same errors of talking too much and too often on their radios.

I had the opportunity last summer to climb through an old B-17 bomber of WW II vintage that spent a day or two at the local airport. I talked with a man who had been a radio operator on B-17's during the war. He told me about the several racks in the radio shack and that each was used to hold a separate radio and that each radio was tuned to a specific frequency, and that these radios were checked at the beginning of each mission.

I have to think the sounds of all those transmitters tuning up was in itself a tip off to the enemy that something was about to happen, and a sure sign that the fighters should be prepared to defend the fatherland.

The point of my comments is quite simple. I should think that the professionals should be glad that we hobbyists are out here listening and discussing with publications such as MT what we are hearing. That should tell them where they need to tighten up their loose lips and help them prevent the sinking of ships.

And one other thing. Have the "professionals" ever given any thought to how useful us hobbyists might be in times of national emergencies? I think we



NEED TECHNICAL HELP?

We are always pleased to offer assistance to our readers who need more information about our products and services. All we ask is that you include a self-addressed stamped envelope to help offset the cost of return postage. Please add \$1.50 for article reprints.

If you would like to speak with Bob Grove directly, call 1-704-837-9200 Monday through Friday, 8am-5pm.

VIEWPOINT cont'd

could be very useful monitoring both them and us and advising the professionals who is maintaining communications security and who is getting sloppy.

I, for one, am a utility monitor because I don't mind patiently waiting for that one sloppy operator because he is the one who tells me what all the other transmissions have been about.

Also if you read the books, you come to a realization that a good deal of the success of ULTRA in WW II was due in part at least to the carelessness of German code clerks who fell into patterns or did dumb things on the air. I doubt that there were any private citizens in Germany or any equivalent of MT there to draw sloppy German radio operator procedures to the "professionals" attention.

Zel Eaton

Kirksville, MO

A GRATEFUL NEW HAM

It is with very great pleasure that I am sending my check for the renewal of Monitoring Times. When I first subscribed, it was the name of the publication that drew my attention. After reading the first issue, it was not what I thought it might be, but the reading was interesting. Well before long, I became interested in monitoring. So much so that I am the proud owner of a MX-5000 and a MX-7000.

When I'd be traveling I would often take reading material; it helped pass the time and a chance to catch up on my reading. Monitoring Times was always one of my choices to take with me. Well I started reading the many interesting articles and found amateur radio most intriguing. Some months back I began to study for the Novice Class license, passed it and have been studying for the General Class license. The one that has been helping said that I am ready for the next test.

So if all goes well, I should pass the test, receive the General license, I'll start to be a ham. I owe it all to Monitoring Times. I sincerely thank you for my new hobby. Many thanks to you, keep up your fine publication.

Ted William Genese
Mt. Vernon, NY

R. MOSCOW: PROPAGANDA OR NOT?

I enjoy MT, but must you and other contributors take the false and hateful stand that Radio Moscow is a "blatant propaganda" (to quote one) service?

As a longtime, devoted, and regular listener to RM, I've always found them straightforward, factual, compassionate and fair. Not so VOA (an arm of the CIA) and Radio Marti (an arm of VOA)!

In the interest of Peace, Love, and Truth, clean up your act!

Malcolm Nichols
Franklin, TN

(Editor's note: Propaganda, simply defined, is the systematic propagation of a set of views or allegations. One session of listening to Radio Moscow--or VOA for that matter--and the bias is obvious. Propaganda does not necessarily imply falsehoods. Divergent views are, in fact healthy. It is unfortunate that the USSR imposes strict limitations upon its residents by jamming dissident broadcasts; VOA does not do that.)

SWL'ING IN YOUR CAR

This letter is inspired by a letter from R.L. Adams, Charlotte, NC (Viewpoint, December 1985). Blaupunkt, a German manufacturer of auto radios, has for many years produced auto radios with the short wave broadcast bands included. Frequently the older models, such as were found in the early model (6VDC) Volkswagen can be found in auto wrecker establishments. These radios were frequently found in other autos of the 1950's also.

Several other USA manufacturers produce similar radios for the "Detroit Fat Boy" series of luxury autos in the 1940's and 1950's. Delco radios with SWBC capability, I believe, were available in Cadillacs, Buicks and so forth.

Converters for adapting auto BC sets to SW receivers were also available in the 50's and 60's! Gonset and Morrow had a corner on the market. Gonset produced a 3 to 30 MHz (continuous listening) unit. Look around at ham swap meets or advertise in ham publications for these items. I have picked up Gonsets for as little as a buck.

Look in the 1940-1960 ARRL handbooks under mobile operations section: construction articles for auto converters were plentiful.

Roll your own using present technology and components. I would think a transistorized crystal controlled converter could be built (to hang in line with the BC antenna cable) in a size about the volume of a pack of cigarette. If a transistorized auto radio is

...of worms, viruses and bombs

The November 4, 1985, issue of Time Magazine (p.94) presented a fascinating insight into the perverse world of the malignant computer hacker. Highlights follow:

A "logic bomb," a spurious injection of computer software, was written into the computer at the Los Angeles department of water and power. At a prearranged time, the command froze the utility's internal file, shutting down the facility. The culprit has yet to be caught.

Using a home computer and telephone modem, a young saboteur loaded a "trapdoor" into the prestigious Sloan-Kettering Cancer Center, allowing him to gain access to the computer's private files no matter how often the passwords were changed. His computer simply collected users' previous passwords as they came in and entered those to break in. That culprit was caught.

An engineer logged on to a Long Island computer bulleting board and selected a free program called "EGA-BTR"; his computer screen suddenly went blank and a message flashed, "Arf, arf! Got you!", whereby the vicious program erased some

900 files that were in the engineer's machine.

A more benign bug causes the computer screen to blank out, replaced by the message, "I want a cookie!". The program refuses to function until the user types in "cookie."

A vernacular has evolved around these pesky programs. A "worm" deletes part of the computer's memory, leaving an information hole, thus causing the program to operate improperly or abort entirely. A "virus" instructs the computer to call up and copy its own files, turning its records into a confused mess.

Investigators report that frequently the perpetrators of these disruptive programs are disaffected programmers and engineers who resent the years of dedication they have invested going unappreciated.

Regardless of the motivation, considerable risk is at stake when a computerized system safeguards the security of aircraft in flight, life support systems in hospitals and other vulnerable applications.

Thanks for the Clippings!

I wish I had the time and space to print the names of all the MT subscribers who thoughtfully send me news clippings which they feel might be of interest to me and to other MT readers.

Let me assure you that they are all read carefully and many ideas are worked into article or editorials and sometimes the entire article is presented along with a credit line to the source.

In any case, thanks for all your help; it is greatly appreciated.

20 Meter Beacon at U.N. Building?

MT reader Edward Campbell reports a 14.100 MHz beacon emanating from the U.N. building in New York City. He says that it starts at 100 watts, sequentially reducing in power by a factor of ten every minute for ten minutes. Following this series, the station at the receiving end does the same thing.

Ed says that this is one of six such units around the world. Anyone out there have further information on this interesting signal?

used (what else these days?) power can be derived from it. If not, a small 9V battery should suffice.

Another reader wrote concerning articles on interference. There exist several fine publications on this subject. For instance:

Interference Handbook by Wm. R. Nelson, RFI Investigator Southern Calif. Edison Co. Available from Radio Publications, Box 149 Whilton, CT 06897

RFI Notes by Wilbur Backman. Available from Bill Orr, Eimac Corp., San Bruno, CA

Service Technicians TV Handbook Service Technicians Audio Rectification Handbook (both free). Available from Consumer Electronics Group/Electronic Industries Ass'n, 2001 Eye Street, Washington, DC 20006.

For mobile (auto ignition) cures pamphlet write to Pacific Accessory Corp., 3613 West Mac Arthur #603, Santa Ana, CA 92704.

Causes and Cures for Engine Interference, Marine Technology, 2730 Temple Ave., Long Beach, CA 90806.

Mickey McDaniel
San Diego, CA

(Thanks, Mickey; for sharing this excellent information with fellow hobbyists.)

Check this

RIGHT TO LISTEN cont'd

have been hastily assembled with little information from the monitoring industry, an established American institution which has brought decades of recreational monitoring and awareness to millions of its citizens.

There are an estimated 7 million scanners and 19 million short wave radio receivers in the United States. To impose legislation on the inalienable American right to listen is not only unenforceable, but anathematic to the first and ninth amendments to the U.S. Constitution. Case law would seem to hold that those existing scanner and short wave receiver owners would be exempted or indemnified from the proposed legislation even if passed.

While the original intent of Kastenmeier's bill was an altruistic and well meaning attempt to thwart abuse by computer hackers and professionals and to prevent espionage and sabotage of data, the recent addition of cellular telephone proscriptions appears to be purely a commercial vantage, tricking legislators into endorsing a law with the sole purpose of misleading prospective customers into believing their wireless telephone calls will be private...a sales gimmick, nothing more.

Is such ill-conceived legislation enforceable? Certainly not, even though Senator Kastenmeier recently likened the scanner listener to the "Saturday night special" handgun owner, pointing out that there are many of them out there but they can be legislated against.

To restrict the freedom of all Americans because there is a possibility that some might abuse a privilege is hardly a compelling argument; nonetheless, it is the one used here to inflict the proposed bill.

DOES IT STAND A CHANCE OF PASSING?

Absolutely! At this writing, no dissident testimony has been allowed on Capitol Hill! Legislators are not obligated to hear opposing views if they feel that it does not represent their constituency.

By sitting back and pretending it can't happen here, we can virtually assure passage of the bill in one form or another. The commercial radiotelephone lobby is very strong, representing big bucks. And they have apparently bought quite a stronghold in the legislature.

But not all legislators are in support of the bill; some enlightened elected officials see the pitfalls in the proposed legislation.

Rep. Frederick Boucher (D-VA) recommends encryption on the part of the sender rather than criminal prosecution of passive listeners. He recognizes that countless scanner owners will be breaking the law by merely pushing buttons through forbidden frequency ranges and feels that criminal charges should be brought only against those who purposefully use the intercepted information for malicious purposes, just as resolved in the California bill.

Even some members of the cellular industry recognize the superiority of encryption over legislation. Martin Cooper, chairman of Cellular Business Systems, Inc. and former vice president of science and technology at Motorola, had this to say in the November 1985 edition of "Cellular Business":

"...digital transmission offers the greatest promise for future frequency conservation and cost reduction. There are some side benefits as well. Because signals are already in digital form, it is easy to encrypt them, and the privacy problem can be solved, once and for all."

Sadly, the proposed legislation has been endorsed by the American Civil Liberties Union, apparently unaware of the abridgement that its passage will impose upon traditional American rights. It is quite clear that the bill is being ramrodded through Congress without consideration of enlightened opposition.

Let's take a look at a few pitfalls which are being ignored by the legislators.

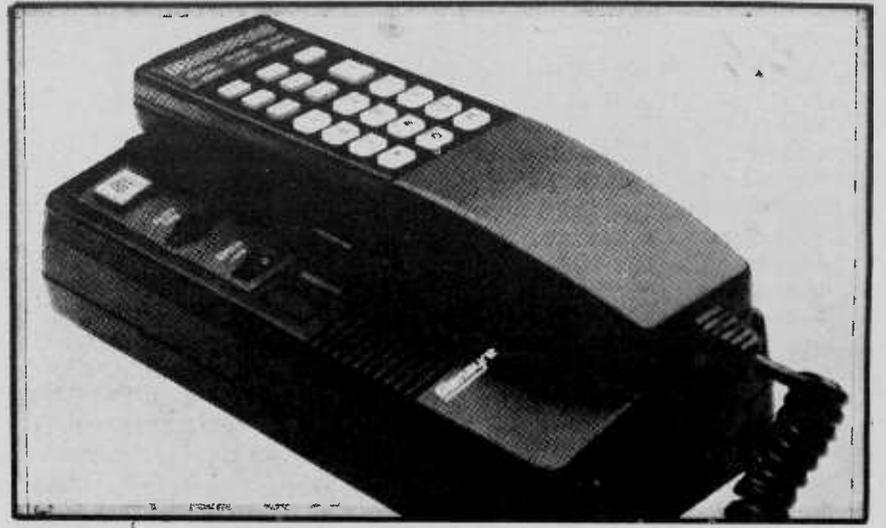
--It would be illegal for you to tune UHF-TV channels 72-83 on your TV set or VCR in metropolitan areas where these channels are used for cellular telephone.

--It would be unlawful for you to electronically listen for a surreptitious bug planted in your home, office or car.

--It would be unlawful for you to overhear an illicit drug deal transacted over a mobile telephone and, subsequently, to report the crime to authorities.

--Whether a licensed ham or a hobby scanner monitor, it would be illegal for you to listen to a ham radio frequency on which a telephone call is being made ("autopatch").

--All short wave utilities



DX'ing and scanner monitoring except listening to hams, CB operators and local law enforcement and fire departments would be illegal. No more listening in to ship to shore radio, aircraft, emergency medical teams, news teams, or other two way communications.

PENALTIES FOR PUBLIC SERVICE

Although the impending legislation allows the reporting of distress messages from ships, aircraft, vehicles, or persons, such life-threatening calls for assistance are far more likely to go unanswered because we are not allowed to tune those frequencies and channels. The spectre of a \$250,000 fine and a year in prison is hardly an inducement to listen.

Lives have been saved by hobby listeners overhearing and reporting pleas for help on private frequencies which would become illegal for them to scan under the pending legislation.

Court records are filled with testimony given by witnesses overhearing illicit dealings; precedent has already been established by the Supreme Court that information heard over the airwaves is admissible as evidence because there can be no reasonable expectation of privacy.

Foreign embassies on American soil, however, are excluded from the provision; they will be allowed to listen in to whatever they wish while the American citizen cannot, even though the 1934 Communications Act specifically states that no radio receiver can be licensed, restricted or banned.

News agencies, TV and radio broadcasters, news magazines and newspapers--all monitor the airwaves to keep abreast of events which affect our lives, providing objective news reporting. Without this insight much of our news consumption will be limited to sanitized releases from approved government sources just as is done in the Soviet Union

and other totalitarian states.

Much information is sent by radio transmissions which, if collected for malicious intent by a criminal mind who couldn't care less about the "Electronic Communications Privacy Act of 1985," could provide grist for the blackmail mill, unfair business advantage or even a breach of government security.

But the burden of privacy is clearly on the sender who elects to use a public resource, the airwaves, to conduct his business, not on the benign hobbyist who finds scanning the radio-frequencies a healthy and informative diversion from "The A-Team," or reruns of "The Dukes of Hazard" and "Gilligan's Island."

Intelligent men and women are naturally inquisitive. We have learned that if you wish to talk in private we take precautions to assure that we aren't overheard; we don't expect the listener to turn away from a loud and enticing voice.

The answer to the entire privacy dilemma has been clearly proposed by enlightened members of the technological community: encryption--scrambling. The techniques are well established and in place. Rather than unrealistically assume that legislation will prevent willful abuse of the airwaves, make the uninvited interception technically unfeasible.

Legislation against monitoring will have only one affect on those millions of scanner and short wave listeners of America: It will turn them unwittingly into criminals. Those high tech interceptors who are already criminals with intent to unscrupulously tap information for personal or political advantage are hardly likely to be intimidated by additional legislation reminding them that what they do is wrong.

The pending bill itself is rife with inconsistencies; while purporting to

Your Legislators in Congress

U.S. SENATE

Washington, DC 20510

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 Mark Andrews (R-ND)
 William Armstrong (R-CO)
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 Thad Cochran (R-MS)
 William S. Cohen (R-ME)
 Alan Cranston (D-CA)
 Alfonse M. D'Amato (R-NY)

RIGHT TO LISTEN cont'd

protect the privacy of users, it clearly excludes the privacy of "walkie-talkies." Whose walkie-talkies? The kid down the block or the Secret Service agent alongside the President? The ham with his handy-talky or the businessman with his walkie-talkie cellular telephone?

The proposed amendment also states, "It shall not be unlawful under this chapter for any person to engage in any conduct which is prohibited by section 633 of the Communications Act of 1934." It seems highly unlikely that the bill's authors really meant that.

While the bill pretends to address the "new technology" of cellular telephone, in fact, the prospective user of the cellular system knows no difference between this technology and that of other modes of mobile radiotelephone which have been in common use for decades. Users are made aware at the point of sale that their calls can be overheard, just as surely as the user of a pay telephone knows that he is sharing a public convenience.

We are in an age of high technology; the average American is conscious of his vulnerability to surveillance and eavesdropping. Legislation cautioning people with scanners to skip certain frequencies is hardly going to bring about sweeping reforms in mankind's innate curiosity. Passage of such a restrictive bill will only serve to secure one more misleading advertising gimmick for the sales departments of the mobile telephone giants who are ramrodding the bill through a misinformed legislature.

Now that big business has been invited to give testimony on its behalf, isn't it time that the American public be afforded the same courtesy?

John D. Danforth (R-MO)
 Dennis DeConcini (D-AZ)
 Jeremiah Denton (R-AL)
 Alan J. Dixon (D-IL)
 (Christopher J. Dodd (D-CT))
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CELLULAR TELEPHONE MONITORING

by Norman H. Schrein

With the advent of new scanners that can receive the 800 MHz and above bands, it is time to look into the cellular telephone systems. Many cities across the U.S. are beginning to have the new systems springing up, and eventually the entire nation will be covered. Is cellular that much different than the standard mobile telephone systems? The answer to that is "yes and no."

The "yes" applies to what you can hear on cellular. Nothing different there--the same conversations that are conducted on the other types of mobile telephone systems (or cordless telephones for that matter) will be heard on the cellular bands.

The "no" applies to how well you will hear the system. Because of the design of the system (the "cells") the caller can be automatically transferred from one cell to another as he moves about the city. You may be able to hear an entire conversation, but there are other times that the channel will seem to go off the air in the middle of a conversation. That is because the caller has been switched to another cell site. From my own experience you can hear the entire call about 50% of the time.

How does one go about researching the cellular frequencies in his area? Well you can begin as I did and perhaps you will have better luck. I began with a search scan. That came up with a dozen or so frequen-

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cies that appeared to be fairly active, but considering that there are 666 channels allocated across the country for cellular use, I figured that there were more to be heard and the "search" method was not the most useful for me.

My next step was to contact someone who sold cellular radios. Believe me, they do not know what frequencies are active in any one area. After all, the mobile units have all 666 frequencies and may use one, two or three in the course of a conversation.

Next I contacted Ameritech, the supplier of the cellular service in this area. In short, leaving out expletives, they were less than willing to cooperate. It seemed that I was getting nowhere.

I decided to contact the FCC Cellular Branch; after all, the FCC does license the cellular service, don't they? They certainly should have some information on who is assigned what channels in any one area. Talking to an entrenched bureaucrat takes some getting used to, but to sum up the issue, yes, the FCC does license the cellular service, and they do maintain the records of individual station licenses.

Will the FCC be putting the cellular radio service in the FCC microfiche? The answer to that is "no." Well, how does one determine the licensees and frequencies for any area? The answer I received to that is that they must come into the FCC's Washington, DC, office and look the information up themselves, or else use one of the services that do that type of thing for a fee.

I decided to try one of the services at least for the first time just to see what I would get. The bill was \$50.00, however, the information was worthwhile. I will be going to Washington myself in the near future to check out other cellular systems.

What I received was a copy of the station licenses for the two cellular systems I requested (Cincinnati and Dayton, OH). The licenses included the licensee's name, system call signs, cell transmitter locations, and several attachments of frequencies. In the Dayton area alone 315 frequencies are listed.

In the Dayton area the holder of the license is

CELLULAR PHONES cont'd

Cincinnati SMSA Limited Partnership out of Schaumburg, IL. The system call sign is KNKA-285. You would have to be familiar with the Dayton area to understand the five cell site locations, but suffice it to say they are evenly spread out over the area.

The frequencies in the license attachment are listed in groups of 45 and the 45 pairs are controlled by one data channel. Mobile units transmit exactly 45 MHz lower than the base output.

Let's take a look at one site located in Beaver-creek near Dayton. The control frequency for this group is channel number 340 with a frequency of 880.200 MHz. The chart of frequencies for this group is as follows (all are base output --mobiles operate 45 MHz lower; an * means I heard the frequency active):

Set 7	Set 14	Set 21
880.830*	881.040	881.250
881.460*	881.670	881.800
882.090*	882.300	882.510
882.720*	882.930	883.140
883.350*	883.560	883.770
883.980	884.190	884.400
884.610*	884.820	885.030
885.240*	885.450	885.660
885.870*	886.080	886.290
886.500*	886.710	886.920
887.130*	887.340	887.550
887.760	887.970	888.180
888.390	888.600	888.810
888.020	889.230	889.440
889.650	889.860	

Control freq is 880.200*

As you can see, the only active frequencies appear to be in set 7. My guess is that sets 14 and 21 are being saved for future use as the system expands; after all, the system in Dayton has only been in operation since last summer.

How did I determine what frequencies went with which site? That can be a relatively easy job. The control frequency is on all the time (it sounds like data). Simply drive up to the site with a mobile scanner and program in the control frequencies. Now remove the antenna. Which-ever control frequency you can hear without the antenna is the one for that site, and the frequencies associated with that control are the ones active at that site.

BUT IS IT LEGAL?

There was an attempt in the state of California via Senate Bill 1431 (Rosenthal) to make it not only illegal to manufacture equipment capable of receiving cellu-

lar frequencies, but also to own or sell such equipment or even listen to the cellular frequencies. That bill would have made television sets with 83 channels illegal, as the cellular phone services operate on the upper UHF channels!

Fortunately for radio audiences, that bill was modified, then signed into law. The basic reading of the law now is that it is OK to own, manufacture, sell and even listen to cellular telephone conversations in California as long as there is no malicious intent. I believe that it is a law that we can all live with. After all, it is pretty much a restatement of Section 605 of the Federal Communications Act.

But at the national level the cellular boys are at it again! This time it is H.R. 3378, entitled, "Electronic Communications Privacy Act of 1985." This bill has been introduced by the Honorable Robert W. Kastenmeier of Wisconsin. Other names associated with this bill are a Mr. Morrison of Connecticut, as well as Mr. Moorehead, Mr. Feighan, and Mrs. Schroeder (it is not stated on the bill where they are from).

I quote Mr. Kastenmeier from the Congressional Record of September 19, 1985: "...the bill extends the protection against interception from voice transmissions to virtually all electronic communications. Thus, legal protection will be extended to the digitized portion of telephone calls, the transmission of data over telephone lines, the transmission of video images by microwave, or any other conceivable mix of medium and message. The bill also provides several clear exceptions to the ban on interception so as to leave unaffected communications systems designed so that such communication is readily available to the public; for example, walkie talkies, police or fire communication systems, ship-to-shore radio, ham radio operators are not affected by the bill..."

Needless to say, this bill has some real problems. First of all, the term "walkie talkie" is really broad. There are walkies for all radio services, including cellular telephone. Does this mean if someone is making a cellular phone call using a handheld telephone, then it is OK for me to listen? How about cordless telephones...they all use walkie talkies.

I would bet that very few police chiefs ever

thought that their communications systems were "readily available to the public." However, it would seem to make sense that the cellular systems are readily available to the public. After all, as much as they advertise, anyone can own and use a cellular telephone. Doesn't that make cellular telephone more available to the public than police or fire communications?

Secondly, how is the bill going to be enforced? That is a question I placed to a legislative aide of Mr. Kastenmeier and I was told that it would be very difficult to enforce. Then why have a law that cannot be enforced? Can you see the neighborhood informer, complete with telescope, trying to catch the radio enthusiast who is at home listening to something other than what the government says is OK?

I was also told that they were trying to make the law for those of us who "don't remove the tag from our mattresses" because it says not to do so under penalty of law. I don't know about you, but that is the first thing I remove from my mattress!

I guess what this legal section boils down to is the fact that the cellular industry does not want to tell their customers that

their conversations are using radio and can be picked up by third parties. It is also quite evident that the cellular industry is too cheap to provide even the most inexpensive encryption devices on their systems to at least ensure some privacy. Instead, they wish to place the burden on the American public that enjoys radio monitoring.

The Scanner Association of North America organized a good letter-writing campaign in California, and it is certainly time for those of use who enjoy monitoring to let our representatives in Washington know how we fell. There is a companion bill in the Senate, S-1667, with the same name and similar wording, introduced by Senator Leahy (D-VT) and Sen. Mathias (R-MD). If you don't mind letting the U.S. Government tell you what you can or cannot listen to, then don't write; however, if you are like me and enjoy listening to all the spectrum (or at least want to have that right) then you had better let someone in Washington know quickly. Otherwise, the cellular industry, Mr. Kastenmeier, and Senators Leahy and Mathias, will let this one slip through.

Also, if you have not yet done so, tear that tag off your mattress!

MONITOR



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Camouflaged Speech

by D. K. deNeuf, WALSPM

Something just had to be done! In 1920 the only communication between Catalina Island, 30 miles off the California Coast and the Mainland, was a two-way radio public radiotelephone circuit operating on 638 kHz in one direction, and 750 kHz in the other--right smack in the middle of the broadcast band! Almost everybody--including the writer--listened in on the private telephone conversations. (These sometimes were quite "juicy" ones, especially those between members of the movie fraternity.)

Something was done--by Bell Labs which developed a "speech inversion" technique--they called it a "privacy system." This was one where the lower frequencies of speech transmission were translated into high frequencies--and vice-versa. It was quite effective in thwarting the efforts of the ordinary "broadcast listener" who suddenly found reception completely unintelligible (but some ingenious hams soon found how to re-invert the signal and they continued to enjoy eavesdropping).

Much more elaborate systems were subsequently developed by Bell Labs, and by the time WW2 started they were a boon to military radiotelephone operations. The nature of these systems were of course very highly classified for some years, but now you can read about most of them in Bell publications. I remember using one which employed a "split-band" technique wherein speech was divided into five small bands each of which could be shifted around individually in position, or even inverted. This one was mighty hard to crack. A later version permitted these sequences to be shifted around in various combinations several times a minute, and this combination really drove some enemy "intercept agencies" to the verge of insanity!

In the early part of WW2 in the Navy I was OIC at the international telephone center in New York, supervising those who were permitted to make overseas calls, and monitoring and taping them. We had one very amusing incident. Two Air Force officers, one overseas and the other in Dayton, somehow got hold of a couple of early "privacy units" and secretly installed them under their desks. They were

just not going to let anybody overhear their conversations--not even us.

Well, it so happened that ATT was still using the same kind of privacy equipment on this particular overseas radio circuit that these fellows always called up. We used to hear one of them say "OK Joe now over to Beta" and they'd shift over to their privacy units." When we informed them "Say, Sirs, did you know that this thing you are using puts your conversation out in clear on the radiocircuit?" They were shocked, to say the least, but they promptly scuttled their pet units. You see, their inverted speech was instantly re-inverted back to clear speech on the radio circuit by the ATT units!



by
Don Schimmel
516 Kingsley Rd SW
Vienna, VA 22180

* I sincerely regret that I was unable to follow through with my intention of providing readers with updated information on the postponed voyage of the GOD-SPEED. Due to circumstances beyond my control, it was necessary for me to be out of town at the time the Jamestown Foundation reached a decision on the date for resumption of the trip. Thus, I could not get the notification into the column in time for interested SWLers to be able to monitor the remainder of the journey.

* A type of CW cipher text which is not too often seen was on 13676 kHz on 7 November at 0140Z. The signal had a pronounced echo but was received at fair signal strength.

The groups were five characters and, after copying for about seven minutes, I scanned the text and noted that all the letters from A-Z, numbers 1-0 and five punctuation signs made up the characters being used. The punctuation signs were period, comma, question mark, dash, and slant.

During the time I

Frank Borsody, K4EC, learned to understand and to speak some of the early speech inverter "language." "OYANEEL PLAYOFFEN CRINKA-NOPE" was what "ILLINOIS TELEPHONE COMPANY" sounded like after passing through speech inversion. ATT had an exhibit at the 1933 Chicago World's Fair (near Frank's RCA exhibit) with one of these inverter units on demonstration. The ATT "Master of Ceremonies" would invite a member of the audience to come to the mike and let the rest of the audience be amused over the sound of his "Donald Duck" answers to questions. Big fun.

Frank, unrecognized, volunteered one day to participate and he spoke in "Invertese." The host was simply dumbfounded, hearing clear normal words flowing out of the loudspeaker system! The last laugh was Frank's!

copied the traffic I did not see any operator chatter nor any clue as to the identification of this activity. I have to admit that copying this type of text keeps you on your toes because you never know if the next character to be sent will be a letter, figure or punctuation sign.

* Gosh, my face is red. I mentioned a book in the October column, THE GUIDE TO MILITARY INSTALLATIONS, and I neglected to indicate publisher and price information. A number of readers wrote me asking for the details so here they are. The price is \$14.95 and the publisher is:

Stackpole Books
Cameron and Kelker Streets
Harrisburg, PA 17105

* A query came from reader Richard Phillips, Canada, who was interested in learning about the "band-saw/buzzsaw" sound that is heard frequently on HF. Richard, more than likely what you are referring to is Frequency Division Multiplex (FDM). The signal is composed of a quantity of narrow shift RTTY channels which are being transmitted simultaneously by one transmitter.

Multiplexing is based on frequency sharing; one type of FDM system consists of 18 FSK channels with 85 Hz shift and 170 Hz channel separation and can be demodulated with a Frederick 1202RA demodulator or with an INFO-TECH M-605 demodulator. The latter can be obtained from Universal Shortwave, EEB and other MT advertisers.

The Frederick demodulators are surplus items and as far as I know, only available from Electrovalue Industrial, Inc., P.O. Box 376-G, Morris Plains, NJ 07950. Both new and used models are available from Electrovalue.

Another form of FDM which is found on HF is where two separate channels of data are sent by a single transmitter utilizing four tightly spaced (about 400 Hz) frequencies. This is called Double Frequency Shift Keyed (DFS) and is also known by the popular term of "Twinplex."

Additional monitoring of the suspected Vietnamese communications network indicates the traffic has changed from cut numbers to 5-letter groups. A typical message looks like this: CQ1 CK D5 BT TEXT AR. The group count is sometimes sent with full numbers and at other times with a combination of full numbers and cut numbers.

Upon completion of the formal traffic the operators usually engage in exchanging operator chatter in the usual 2L, 3L, 4L cipher groups. During October the strongest signal was noted on 13247-13252 kHz and was active at approximately 1300 and 2200Z.

Two new frequencies were discovered for this type traffic at 1000Z with one station on 4193 kHz and the other station on 4204 kHz. Due to bad QRM it was not possible to establish that these two stations were talking to one another.

There was no doubt as to the general identification, however, because the 2L, 3L, 4L cipher groups were readily recognized. For other details on this activity see "Utility Intrigue," November 1985.

* I noted in the November issue of COMPUTER SHOPPER magazine a couple items of possible interest to readers who have a Commodore 64. The first one is a source of chips for the C-64 and a catalog is available for \$2.50. The firm is:

K.Boufal Consulting Service
244 Fitzwater Street
Philadelphia, PA 19147

The second one was a source for a replacement power supply for the C-64. The price was \$29.95 and here are the specs for comparison:

C-64 PS	5Vdc @ 1.2A
	9Vac @ .6A
MAXTRON PS	5Vdc @ 1.7A
	9Vac @ 1.0A

The supplier for the replacement power supply is:



UTILITY INTRIGUE cont'd

MAXTRON

1825A Durfee Ave., S.
El Monte, CA 91733

I do not know anything about either of these two suppliers but thought this information might possibly be helpful to some readers.

* I like to keep up to date with what is happening at the various SWL clubs and since it is not possible to join all of the clubs I have done the next best thing and subscribed to the ANARC Newsletter. This does keep me informed as to some of the activities of many of the clubs.

I am quite enthusiastic about the recent announcement that Bob Grove hopes to hold a SWL convention. I personally think this is a great idea and am, of course, somewhat prejudiced in saying I think a central east coast location would be the best. Not only is the northern Virginia/Maryland/Washington DC area an excellent one for transportation connections but it boasts of numerous fine hotel/motel accommodations and eating establishments.

In addition there are many well stocked electronic equipment and parts suppliers in the region. Also not to be overlooked are many opportunities for sightseeing in the nation's capital as well as the many historical sites in Maryland and Virginia.

Whatever your preference for a location, please send in a completed questionnaire to enable Grove Enterprises to plan an event which will be truly outstanding. I will now step down from my soap box. Bob, forgive me, please!

LEARNING MORSE CODE

I am often asked, "What is the best method of learning the Morse code?" Apparently many readers desire to expand their SW listening capabilities and, certainly, learning to copy CW signals does open up another great phase of the hobby. Numerous products on the market--tapes, records and computer programs--are designed to make learning the code a relatively easy matter.

I hesitate to single out any but I must comment favorably on "MORSE UNIVERSITY," put out by Advanced Electronic Applications (AEA). This training course is for use with the Commodore C-64 computer and I used it at Electronic Equipment Bank in Vienna, VA, where it is priced at \$39.95. It may also be

available from other MT advertisers.

Yes, it is somewhat expensive, but here is what you get in the package: a computer cartridge, warranty card, instruction book, pamphlet on Amateur Radio, HAM Radio License Application, ARRL book "Tune in the World with Ham Radio", and a current AEA catalog.

After plugging in the cartridge and turning on the C-64 and monitor, you have the option of choosing your display and border colors and then making a selection of a higher or lower pitched tone. You then go to the main menu and select one of five different routines.

The Learning routine teaches the individual characters of Morse code. The instruction book states that the average person, by putting in two 20-30 minute study sessions per day, can gain a 20 WPM capability after just four weeks of study.

A novel approach in this training course is that character elements (the dots and dashes) are sent at 20 WPM. By learning the individual characters at the high speed rate, the book claims the barrier at 10-12 WPM, encountered by so many students, is eliminated.

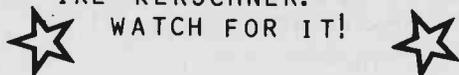
The characters are taught in a carefully selected order to keep confusion with previously learned characters at a minimum. Once you have learned the characters you can utilize the other modes of the Morse University program. The Proficiency routine helps you to improve your ability in copying the code while the Receiving Game routine combines video game playing with a practice session and is a pleasant way of recognizing the various Morse characters in a game pressure situation.

The program also contains a Sending Analysis which helps you improve your fist while the Morse Keyboard routine lets you make up code practice sessions based on material you choose as texts. I thought this method of learning Morse code was a very good one and I suspect it should appeal to many who might have thought they would not ever be able to learn the code.



COMING NEXT MONTH:

A NEW COLUMN ON THE BASICS OF RADIO MONITORING TO BE EDITED BY MT AUTHOR IKE KERSCHNER.



WATCH FOR IT!

LOGGED OCTOBER 1985

KHZ	DTOI	MODE/IDENTIFICATION/COMMENTS
2583	160140	CW/NO CALLS/5L GROUPS
4305	160158	CW/NO CALLS/5L GROUPS, FOSS PORTUGAL NAVY TRAFFIC.
4317	160149	CW/CQ DE ZSC(CAPE TOWN, SA)
6463	161220	CW/DE VIS (SIDNEY, AUSTRALIA)
6523	171718	USB VOICE/BARGE TFC ON UNIDEN RIVER
6605	152038	USB VOICE/NEW YORK RADIO, WX IN ENGLISH FOR EASTERN AND MIDEASTERN US CITIES
7542	211332	USB VOICE/EE/YL FOSS MARS STN, PASSING PERSONAL GREETING MESSAGES
7692	161212	CW/EYEG (RUSSIAN SHIP) DE CMU967 (SANTIAGO NAVAL RDO, CUBA)
8364	161034	CW/EAD3 (ARANJUEZ, SPAIN)
10562	192005	CW/NO CALLS/FRENCH PLAINTEXT TFC
10574	191805	CW/NO CALLS/5L GRFS, SPEC CHARACTERS AA IM OE OT
10898	171710	MCW/CONTINUOUS V'S, NO CALLSIGNS
11430	161208	FSK CW/DE NMR (COMMSTA SAN JUAN PR)
11539	211322	CW/"A/N" AERO BEACON, FOSS TOLEDO AIRPORT
12238	152146	LSB VOICE/DURAN THIS IS NOVA IAD/THIS POSSIBLE DEA ACTIVITY
12545	151642	CW/DE VRT (BERMUDA(HAMILTON))
13023	181200	CW/DE HEB (BERNE, SWITZERLAND)
13039	212348	CW/KLC (GALVESTON, TX) SENDING GULF WX REPORT FOLLOWED BY TRAFFIC LIST
13046	181202	CW/DE PZN (PARAMARIBO, SURINAME)
13062	211600	CW/UQEW (RUSSIAN SHIP) DE CLA (HAVANA)
13100	181319	CW/DE TIM (LIMON, COSTA RICA)
13169.5	311302	USB VOICE/HIGH SEAS STN WOM (MIAMI, FL) PHONE CALL FROM CARIBE ONE
13198	311241	RTTY 50-850/DE CAI7E (CHILEAN ALLOC) SENDING METAR TRAFFIC
13243.5	311247	USB VOICE/MALE ANNOUNCER GIVING WX AT VARIOUS US AIR FORCE BASES
13247	301231	CW/BAC9 (PROB BEIJING HRC) DE BPA (URUMQI PRC)
13285	201537	CW/W9R DE G1Y(UNIDEN) SPANISH CHATTER APPEARS BE NAVAL TYPE TRAFFIC
13375	311230	USB VOICE/STN IN BERLIN, GDR. TEST FOR CIRCUIT ADJUSTMENT PURPOSES. ANNOUNCEMENT GIVEN IN FRENCH, GERMAN & ENGLISH

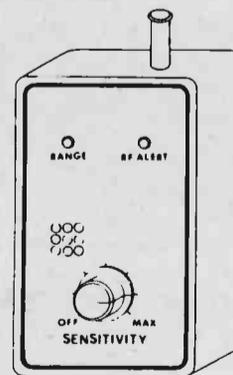
SUBCARRIER DETECTOR KIT

Tune in "secret" FM broadcasts. Kit covers the new 92 KHz subcarrier as well as the standard 67 KHz. Dual tunable filters in addition to adjustable automatic muting. Use with most any FM radio. Operates on 6 to 17 VDC @ 15 mA. 1 1/2" x 3" x 1" high.

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Furnished complete with battery, telescoping antenna, instruction manual and one year Limited Warranty.

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CATALOG of COUNTERMEASURES EQUIPMENT and UNUSUAL KITS \$1. (Refunded with first order.)

CAPRI ELECTRONICS
Route 1-M
Canon, GA 30520
(404) 376-3712

UTILTY INTRIGUE cont'd

13420	171707	CW/DE CUA48-59 CUL22-34 (LISBON, PORT.)
13500	301824	CW/NO CALLS/SPANISH TEXT, APPEARS BE NAVAL TRAFFIC
13512	312227	RTTY 50-850/TELAM (ARGENTINE PRESS SVC)
13867	211308	CW/NO CALLS/5 CHARAC GRPS, 3 4 5 6 7 SENT FULL, 1 2 8 9 0 CUT as A U D N T
13984	191941	CW/NO CALLS/SPANISH CHATTER
15738	181959	CW/NO CALLS/INTERPOL TFC IN ENGLISH
16948	191521	CW/CQ DE 6VA (DAKAR, SENEGAL)
17064	171636	CW/NO CALLS/MADRID IN HEADING, TRAFFIC IS NAVAL TYPE, SPANISH LANGUAGE MSGS
17162	171755	CW/DE PFO (OLINDA, BRAZIL)
18620	181820	CW/NO CALLS/SPANISH LANGUAGE CHATTER
18650	211506	CW/CLP23 (UNIDEN) BEING CALLED PROB BY CLP1 (HAVANA)
22156	181521	USB VOICE/TWO MALES IN CONVERSATION IN WHAT SOUNDS LIKE AN AFRICAN LANGUAGE
22420	171758	CW/PPRM (BRAZILIAN SHIP) DE PPR (RIO DE JANEIRO) PORTUGUESE LANGUAGE MSGS

SCANNING

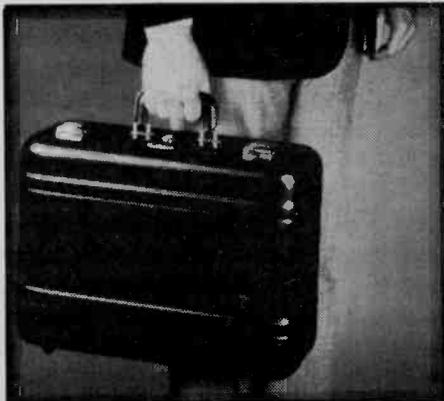
Keeping up with the President

When the President of the United States is on the road it is vital that instant communications be available at all times. In the air aboard Air Force One, an elaborate satellite communications system is backed up by normal air-to-ground single sideband (the Mystic Star network).

While riding in the presidential limousine ("Stagecoach") both clear speech and encrypted transmissions are assured with a VHF multichannel radio system.

But what about when he is in the middle of a national park or some other remote area? Walkie-talkies are not enough to provide

reliable two-way communications over wide areas. A portable repeater system is called into use.



Motorola is recognized as a prime contractor for agencies of the federal government. Shown here is one of their new portable repeaters, capable of providing clear or encrypted speech in the 136-174 MHz (or 406-512 MHz on other models) running 1.7 or 20 watts.

20/1.7 watts, clear speech or scrambled, 136-174 or 406-512 MHz



Monitoring Weather Sats

Many calls have been received recently at MT headquarters on using the new wide frequency coverage scanners to listen in on weather satellites. Are readers interested in an article concerning this new frontier?

Even more important, would serious monitors of the spectrum be interested in Grove Enterprises developing receivers, antennas and displays or printers showing weather pictures?

Let us know. We listen.

Scan/Search Hold

for the MX5000/7000 PART II

In our November issue (page 9) we presented an informative article by Greg Doerschler on how to provide a search hold function on the popular Regency MX5000 and MX7000 scanners. Unfortunately, one step was omitted to make the keyboard routine work!

The fix is simple: add "ENTER" after the first command sequence ("Press MANUAL, CLK SET")

VHF SKIP REPORT

by
Chuck Robertson
RR 2 Box 850
Creal Springs, IL 62922

Surveillance, Inc.

I know many of our readers enjoy monitoring law enforcement operations on their scanners. But don't overlook the "private police," better known as private detectives. Their surveillance activities can be just as thrilling as any federal, state or municipal investigation and often more colorful!

The private detective business can be divided into two main categories. First are the private investigators, or PI's. Marital infidelity cases keep some PI's busy. Other cases include determining the credibility of witnesses; the location or recovery of stolen property; the cause, origin or responsibility of fires or accidents; and securing evidence to be used in civil or criminal cases.

The second category includes guards, watchmen, patrolmen, or other individuals involved in protection of persons or property including residential, industrial or business property or districts (municipalities, resorts, subdivisions, etc.).

The Foothill Patrol and Alarm Company, Los Angeles, is a good example of the second category. When skip is coming in from southern California, mobile units and foot patrols can be heard investigating burglar alarms reported by the base, making arrests and conducting routine patrols. Their operations are indiscernible from municipal police except for the fact they're on a business frequency: 31.20 MHz.

Most private detective comms will be found on the FCC business allocations. The list below contains the prime VHF-low band frequencies, including the 27 MHz business channels.

We would like to thank veteran MT reader Rene Borde of Sunnvale, California, for this sharp-eyed observation and also for the following additional note about the routine.

The scan/search hold procedure will defeat the priority feature, normally available in the search, scan or manual mode.

27.39	31.00	35.18
27.41	31.04	35.70
27.43	31.16	35.72
27.45	31.20	35.88
27.47	31.24	35.90
30.76	33.16	35.92
30.80	35.06	35.94
30.88	35.08	35.96
30.92	35.10	35.98
30.96	35.12	42.96
	35.14	43.00

There are exceptions to this list, however; one night last August I monitored some very exciting PI surveillance skip on a Special Industrial frequency: 30.60 MHz.

Here are the VHF-high and UHF bands available to private detective businesses. Note that most business data transmission and paging allocations have been omitted from the list.

151.625 to 151.985 MHz
154.515 to 154.600 MHz
460.650 to 462.175 MHz
463.200 to 464.975 MHz
466.650 to 467.175 MHz
468.200 to 469.975 MHz
471.6625 to 472.4375 MHz
474.6625 to 476.4375 MHz
477.6625 to 478.4375 MHz
480.6625 to 481.4375 MHz
809.7625 to 820.9875 MHz
854.7625 to 865.9875 MHz

Additionally, the taxi allocations 152.30, 152.36, 152.42, 157.56, 157.62 and 157.68 MHz can be used by businesses on a secondary, non-interference basis.

PI's may also pop up on these itinerant business channels.

27.49	464.500
35.04	464.550
43.04	469.500
151.625	469.550

The low power business channels should also be checked:

27.51	33.14	42.98
27.53	33.40	154.57
30.84	35.02	154.60

There are also several UHF low power business channels (not listed).

Mobile telephones are very popular with private detective businesses. For example, Baker Protective Service, Miami, FL, owns and operates its own common carrier mobile telephone station on 152.15 MHz!

Some detective agencies use mobile-telephones as their only two-way radio communications! Here's a selected list of low band private detective businesses from the FCC files. All emissions are NBFM except where noted.

27.41,	35.14	George Alarm Co., KJA673, Springfield, IL (Note: alarm companies are not private detective businesses, although employees must be bonded and licensed by the state).
--------	-------	--

VHF SKIP cont'd

- 27.45 Eagle Detective Agency, DBV236, Worchester, MA. AM voice.
- 27.47 Sentinel Patrol & Alarm Co, KGW257, Malibu, CA
- 27.47 Brooks Armored Car Service, KQD485, Wilmington, DE, AM voice (Note: when monitoring the 27 MHz business allocations, you'll notice a lot of 11 meter out-of-banders working SSB and AM voice. Usually they operate on splinter frequencies like 27.472, although occasionally they land squarely on a business channel.)
- 27.47 Kensington Town Watch, In., WSC698, Philadelphia, PA, AM voice (Note: Crime Watch groups are not private detective businesses, but can make interesting monitoring.)
- 30.76 C & P Security, KIJ311, Granite City, IL
- 30.76, 31.16 Radio Surveillance Central Station, KXT212, Watermill, NY
- 30.76 Security & Safety Services, KVV590, Gallipolis, OH
- 30.76 Maximum Security Alarm, In., KEW886, Tannersville, PA
- 30.88 Baker Protective Services, KSR607, San Jose, CA
- 30.88 New England Security System, KA47645 (mobile units only) Milford, CT
- 30.92 Gamma Security & Investigations, KNFU259, West Paterson, NJ
- 30.96 Hudson Armored Car & Courier Service, KEZ347 Elmsford, NY
- 31.00 Guardian Security, WXL544, Windber, PA
- 31.04 C & G Security, WXH432, Tilton, NH
- 31.04 Security Motor Patrol, KA29339 (mobiles) Las Vegas, NV
- 31.04 Private Detective Service, KNCD625, Warren, OH
- 31.16 Security Patrol of Summerville, KNCV929, Summerville, SC
- 31.20 Foothill Patrol & Alarm, KUV225, Los Angeles, CA
- 31.20 North American Protective Services, WXU237, Windber, PA
- 31.24 Lyons Security, WQC735, Acme, PA
- 33.16 Mariman Security, WQC735, Acme, PA
- 33.16 Mariman Security, WSZ790, El Monte (Los Angeles area) CA
- 33.16 Eagle Security, KJQ294, Lancaster, PA
- 35.08 Sizemore Security International, KNFD259, Augusta, GA
- 35.10 Baker Protective Service, KBO417, Los Angeles, CA
- 35.12 D & G Patrol, KNCR 597, Longmont (Boulder area), CO
- 35.12 Baron Security, KNA2828, Montvale, NJ
- 35.12 Private Detective Investigations, KCK759, Jamestown, NY
- 35.12 Safeguard Security & Patrol, KNBY733, Broken Arrow, OK
- 35.88 Lloyd Detective Agency, WYK859, Baltimore, MD
- 35.90 Villines Security Pa-

OPERATION CANTALOUPE: Private Investigators at work!



- trol, WQX470, Harrison, AR
- 35.90 AACAC International Security Patrol & Guards, KZW573, San Dinas, CA
- 35.90 American Guard Service, KA70335 (mobiles), New Orleans, LA
- 35.92 Security Ranger Service, WXV388, Thousand Oaks, CA
- 35.92 Detective Bureau of Investigation, KVV635, St. Joseph, MO
- 35.92 Neo Investigations, KNHC739, Ashtabula, OH
- 35.94 Bomare Investigating Bureau, KNA0915, Salisbury, MD
- 35.94 Daken Investigative Service, KA55500 (mobiles), St. Paul, MN
- 35.94 Sentry Special Police Service, KQS810, Dallas, TX
- 35.96 Industrial Security Detective Agency, KVN939, Greensboro, NC
- 35.96 Gold Star Security, WZQ935, Camden, NJ
- 35.96 Baker Protective Service, KLR693, King of Prussia, NY
- 35.96 Hart Patrol Service, KNBB875, Upton, Wyoming
- 35.98 Lanier Security Patrol, KRD928, Gainesville, GA
- 35.98 Unlimited Security Services, WXA567, Milo, ME
- 35.98 Baker Protective Services, KAS797, Ann Arbor, MI
- 35.98 Sanford Security Service, KYN256, Battle Creek, MI
- 35.98 Russell's Detective Agency, WSJ857, Chattanooga, TN
- 42.96 Arizona Protection Agency, KJ0748, Tucson, AZ
- 42.96 Korbel Security, KA90405 (mobiles) Guerneville, CA
- 42.96 Sentry Security, KNEV560, Haily, ID
- 42.96 Gloss Guard & Investigation, KRS985, Glen Ellyn, IL
- 42.96 Gates Security, WZN823, Chelsea, MA
- 42.96 Henderson Detective Service, KK0270, Raleigh, MS
- 42.96 Stegall Security & Protective Service, WRF398, Charlotte, NC
- 42.96 Garner Security Patrol, WYS660, Tulsa, OK
- 42.96 Lycoming Security, KWQ760, DuBoistown, PA
- 42.96 Southwest Security, KNCF505, Lebanon, VA
- 42.96 National Detective Bureau, KNF4886, Huntington, WV
- 43.00 International Security Police, KNBB856, Mobile, AL
- 43.00 Investigation Services, WQF275, San Francisco, CA
- 43.00 Search Security, KNGP204, Battle Creek, MI
- 43.00 Investigative Services, KNAM286, Whitehall,

- MI
- 43.00 Landers Security, WXL488, Gulfport, MS
- 43.00 Carteret Investigations Anonymous, WQI661, Havelock, NC
- 43.00 Taos County Security, WSX939, Taos, NM
- 43.00 Ohio Safety Patrol, WSI921, Columbus, OH
- 43.00 Confidential Investigators, KUI683, Broken Arrow, OK
- 43.00 Security Management, Inc., KA26715 & KA43895 (mobiles), Sumter, SC
- 43.00 Palitz Detective Agency, WRT946, Tooele, UT
- 43.00 Puents Detective Bureau, KWQ941, Sparta, WI
- 43.00 Croson Detective Agency, WQM998, Charlestown, WV

PUBLIC INVESTIGATORS

Among the most riveting communications you will hear



Crime watch vehicle equipped with CB and business band radio on 151.865 MHz.

over your scanner involve law enforcement surveillance operations. Some "stakeouts" last months or even years, often culminating in a major bust that makes front page news! But which frequencies are used for surveillance?

Not all law enforcement agencies have moved their covert operations to VHF-high and UHF bands. In rural southern Illinois, municipal and county police on 39.50 and state police on 42.50 occasionally conduct joint surveillance, semi-duplex.

I've also monitored "heavy duty" surveillance skip from southern Florida on several 44.62 to 46.02 MHz frequencies. One of the channels, 45.42 MHz, is

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UNIVERSAL SHORTWAVE RADIO

1280 Aida Drive
Reynoldsburg, Ohio 43068
Phone: 614-866-4267

VHF SKIP cont'd

licensed to the state of Florida for correctional facilities. But why is it used for surveillance? Possibly the undercover operation on 45.42 was conducted in an area of Florida far from any of the correctional facilities using the frequency.

An identical situation exists here in southern Illinois on VHF-high band. The frequency 154.695 is licensed to the state of Illinois for use by District #10 state police in central Illinois. But some 150 miles downstate the same frequency has been put to use by a small municipal police department for car-to-car surveillance operations.

The police department has been using 154.695 for several years but is not licensed by the FCC for operation on the frequency. Of course, as long as no interference is caused to other agencies licensed for 154.695 MHz, there seems little reason for the FCC to be concerned.

This same municipal police department also uses 154.540 MHz for surveillance. But wait! The frequency 154.540 is a business channel! How could they dare usurp such a congested business allocation?

The answer is actually quite simple. After sleuthing through the FCC files, I discovered that the family of one officer on the police force operates a TV repair shop licensed for 154.540 MHz. The officer simply borrowed the family frequency and PL tone for his police work! (This theory has been proven from conversations on 154.540 between the officer and his wife.)

Other businesses in the area using 154.540 are on different PL tones, so little interference is caused to their legally licensed transmissions.

The radios used by this police department are ten channel programmable Wilson (Regency) models. These versatile, inexpensive radios are opening new vistas for law enforcement. The PL tones are also selectable.

The 72 to 76 MHz band is reportedly used for unlicensed car-to-car surveillance activity by some law enforcement agencies. This band is allocated by the FCC for low power industrial comms and point-to-point transmissions by businesses, telephone companies, law enforcement agencies, and others.

Last and least is the use of CB radios by law enforcement agencies and

"crime watch" groups. Here in southern Illinois most all local and state vehicles are equipped with CB radios. State troopers usually monitor channel 9 or 19.

County police have been heard conducting surveillance on CB's. It's just another addition to their spectrum of radio communication possibilities!

In conclusion, any law enforcement agency which uses two-way radios for day-to-day activities may also use those radios for surveillance--but not necessarily on licensed frequencies!

NOISE MAKERS

Tracking transmitters are sometimes used during surveillance operations to covertly follow a person or object. The devices are attached to the target vehicle or inside a package (usually contraband). Equipped with a direction/distance finder, the surveillance vehicle follows the target at a safe distance, usually just out of visual range.

The list below gives the frequency ranges allocated by the FCC for local and state government tracking transmitters. No license is necessary for law enforcement personnel operating the devices in these ranges. The only consideration is that the transmitter cause no interference to licensed radio systems.

The tracking transmitter is limited to ten days of continuous operation. This can be accomplished by using batteries of suitably short life span.

Maximum allowed transmitter output is one watt peak power. The emitted signal is type P0 (unmodulated pulse). Depending on the duration and number of pulses per second, you'll probably hear a "click" or brief open carrier on your scanner.

Tracking transmitters used by federal agencies will usually be found in the federal band allocations, in particular the frequencies used by the FBI, ATF, DEA, IRS, etc.

From what I've heard over my scanner, federal tracking transmitters use modulated pulsed emissions. The "beeps" occur every couple of seconds.

TRACKING TRANSMITTER RANGES (20 kHz channel spacing)

- 30.85 - 31.97
- 33.01 - 33.07
- 33.41 - 39.99
- 37.01 - 37.43
- 37.89 - 37.97
- 39.01 - 39.99

- 42.01 - 42.95
- 44.61 - 46.59
- 47.01 - 47.71

(25 kHz channel spacing)

- 150.995 - 151.490
- 153.740 - 154.445
- 154.635 - 155.195
- 155.415 - 156.250
- 158.715 - 159.465
- 453.0125 - 453.9875
- 458.0125 - 458.9875
- 460.0125 - 460.5125
- 460.5625 - 460.6375
- 462.9375 - 462.9875
- 465.0125 - 465.5125
- 465.5625 - 465.6375
- 467.9375 - 467.9875

EYE IN THE SKY

Surveillance aircraft play an important roll in today's law enforcement scene. Their lofty vantage point lends itself well to tracking target vehicles, marijuana eradication efforts and searches for escapees and wanted individuals. Infrared "night scopes" allow surveillance of poachers and other criminal activities in the dark.

The aircraft are usually in radio contact with ground crews. Standard VHF or UHF land mobile frequencies in use by the agency or agencies involved in the surveillance are the best bets for monitoring these air-to-ground comms.

If more than one surveillance aircraft is in the area, air-to-air communications may be heard on one of the VHF aero-band frequencies. The 120 to 123.575 Hz band, in 25 kHz steps, is a good place to search. UNICOM and MULTICOM frequencies not in use by airfields in your area should also be checked.

As an example, Illinois State Police aircraft use the high altitude UNICOM channel 122.975 MHz at tree-top level. In Illinois, 122.975 is used almost solely by state aircraft. Only rarely have I heard comms between other aircraft and they're always from out of state.

Here are some other frequencies which should be used for surveillance.

- 119.975 U.S. Dept. of Agriculture, Forestry Service
- 122.70, 122.80, 123.00 UNICOM for airports with no towers
- 122.725, 122.750 UNICOM for private airports
- 122.750, 122.850, 122.90, 122.925 MULTICOM air-to-air channels
- 122.975 UNICOM high altitude
- 123.025 Helicopter air-to-air UNICOM
- 123.05, 123.075 Helicopter UNICOM
- 123.10 Search & rescue. Sometimes used with 122.90 MHz

VHF aero-band radios tend to be low powered, usually 5 to 10 watts. Fortunately, the height of the aircraft above ground offsets this disadvantage, and transmissions are regularly heard at distances over 50 miles.

VHF police/federal band radios used in aircraft vary with the agency involved. The Illinois S.P. planes are outfitted with top of the line Wulfsberg radios. A turn of the thumbwheel selector puts them on any VHF-high band frequency from 138 to 174 MHz, or 148 to 174 MHz, depending on the model.



The Wulfsberg Programmable transceiver covers all VHF channels from 138 to 174 MHz.

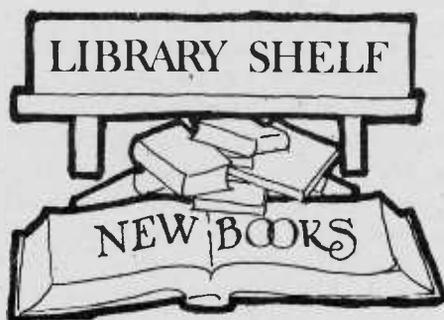
Programmable and crystal-controlled hand-helds are also used on aircraft, especially when federal agents are running surveillance from a state aircraft not equipped with their frequencies.

The receive ability of airborne hand-helds is good due to the power of land stations and mobiles, plus the high sensitivity of today's solid state radios. Unfortunately, transmit ability suffers from signal fade because the small whip antennas are shadowed by various parts of the aircraft structure. Signals may be loud and clear one moment, unreadable the next.

For reliable comms, hand-helds must use an outside antenna. Some aircraft are equipped with extra antennas for this purpose.

The Air National Guard is surprisingly active in surveillance activities, especially on state and federal lands. The 46.60 to 47.00 MHz band is a good area to search, although most any frequency may be employed, including business channels! A 50 kHz channel spacing is used.

Over the years I've monitored several aerial surveillance chases involving bank robbers and escaping marijuana farmers. Little did these criminals realize their race for freedom was hopeless. The surveillance aircraft lazily circling overhead inevitably leads the ground crew to the suspects. The moral of the



THE LISTENER'S HANDBOOK by Bob Grove (8-1/2" x 11", 94 pages, paperbound; \$12.95 plus \$1.50 shipping from Grove Enterprises, P.O. Box 98, Brasstown, NC 28902)

Unquestionably, two of the most popular books ever sold through Grove Enterprises were Bob Grove's **COMMUNICATIONS MONITORING** and **BEHIND THE DIAL**, now out of print.

Bob has taken the basic subject material from those two books, extensively reorganized, updated and supplemented it, and provided new illustrations and photos wherever necessary. The result is **THE LISTENER'S HANDBOOK**, destined to be a classic in its field.

Virtually every imaginable topic of interest to the listener is thoroughly and expertly explained in Bob's easy-to-understand

VHF SKIP cont'd

story is: When the law is in the sky, you can run, but you sure can't hide!

NEW YEAR'S PROPAGATION

The winter sporadic-E season continues to decline rapidly from its peak in November and December. As a consequence, the first week or two of January should see only a few E_s openings.

By late January, VHF skip will be at a minimum. Only the occasional solar flare, aurora or massive upper wind disturbance will allow the ionosphere to thaw out.

February will not be much better, although there should be a seasonal increase in auroral activity. Auroral skip tends to be weak, with signal fade and flutter. Here's when having a large antenna pays off!

January F₂ and trans-equatorial skip will also be rare. But don't give up! Amazing band openings may occur despite low solar activity. Keep on VHF'ing!

NEXT MONTH: Get your snow shoes ready; we're heading north to Canada! We'll also have an update on the German skip reported in the August '85 MT, plus a confirmation of the Florida Pirate mobile-telephone nets reported in the September '85 MT. See you then!

manner. Subjects include the radio spectrum and its users; security and surveillance equipment and techniques including scrambling; how to choose a receiver; selecting the best antenna for your installation; all about coax cable, preamplifiers and preselectors; interference and its cures; and a host of other important topics.

For the do-it-yourselfer, Bob has included a special home projects section with easy-to-build filters, tuners, receivers, descramblers, antennas, power supplies, converters, amplifiers, and many other essential accessories for the serious listening hobbyist.

Containing well over 100 illustrations, charts and tables, the **LISTENER'S HANDBOOK** is an indispensable reference for any listener to the first 1000 megahertz of the radio spectrum.

THE ARRL HANDBOOK, 1986 Edition, published by the American Radio Relay League (8-1/2" x 11", 1140 pages, paperbound; \$17.95 plus \$1.50 shipping from Grove Enterprises, P.O. Box 98, Brasstown, NC 28902)

This one publication had enjoyed for decades the well-deserved reputation as the singular publication for the technically inquisitive radio experimenter. Written primarily for the radio amateur, the material within its pages are also of interest to the monitoring enthusiast.

Over the years the **HANDBOOK** has changed considerably; while still concentrating on a core of information for the home builder (receivers, transmitters, antennas) it now contains considerable information on satellites, digital communications, radio direction finding, and other high tech developments. PC layouts for many of the more popular projects are included.

Ham or listener, if you are curious about the workings of radio communications, the **ARRL HANDBOOK** is the book for you.

WORLD RADIO TV HANDBOOK, 40th edition (over 600 pages, 6" x 9", softbound; \$19.95 plus \$1.50 shipping from Grove Enterprises); 1986

Recognized for decades as **THE** ultimate source on information regarding broadcasters worldwide, the **WRTH** is packed with program information, frequency lists, reviews of new receivers and accessories, addresses of broadcasters with names and titles of

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Ideally, the **SPECTRUM PROBE** should be mounted high and in the clear, away from electrical wiring. An attic crawl space, corner of a roof, or even on a chimney or existing TV mast works great.

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staff, predictions of broadcast conditions for the entire year, world maps showing broadcasting facilities.

Incidentally, Grove Enterprises has a few remaining copies of the 1985 edition for only \$12 including book rate shipping in the U.S.

THE SHORTWAVE GUIDE edited by Larry Miller (44 page monthly tabloid on newsprint; \$9.95 from Miller Publishing, 424 West Jefferson St., Media, PA 19063)

For those SWL's who are deeply involved in the broadcast monitoring aspects of their hobby, **THE SHORTWAVE GUIDE** provides in-depth insight into international broadcasters.

Occasional equipment reviews, editorial commentary, convention highlights, and an excellent English language broadcast guide combine to make the **GUIDE** one of the best publications going.

A sample copy is available for \$1.95 from the publisher.

WORLD SATELLITE ALMANAC, 1985 Edition by Mark Long (6" x 9", 544 pages,

paperbound; \$39.95 from World Satellite Almanac, P.O. Box 43, Boise, ID 83707 or call toll free 1-800-327-2100)

Interested in monitoring TV satellites worldwide? This compendium has them all, from Russia's Gorizonts and Molniyas, to Canada's ANIKs, to the U.S. Galaxies, SATCOMS and WESTAR, they're all here in one convenient volume.

Developed in two parts, the book provides excellent background information on both the history and technology of domestic satellites; the second part is a concise but comprehensive bird-by-bird compilation of specifications.

More than 70 domsats, regional and international, are covered with channel assignment plans, footprints for reception, transponder polarizations, and other important details.

Excellent illustrations help the reader visualize the book's concepts, while an appendix lists addresses of satellites services, a glossary of terms, a satellite location chart, and other quick-reference subjects.



by James R. Hay

NAVAIDS

This month we will have a look at the various navigational aids which are used within the marine industry. The advent of radio has brought about great changes in the art of navigation. The days when a ship at sea had to rely on a sextant and the ship's chronometer for navigation has developed to the point where the modern ship's officer can press a button to discover the current position of the ship as well as several other useful pieces of information.

Most radio navigational aids will not be of much interest to the SWL; however, some are and we will go through several of the systems so that readers will at least know what they are.

OMEGA

At the very bottom of the spectrum is the Omega system which operates at

10.2, 11.33 and 13.6 kHz with transmitters in Norway, Liberia, Hawaii, North Dakota, Reunion, Argentina, Japan, and Australia. Each station transmits a signal according to a specific pattern on the three frequencies used for position finding.

LORAN

At 100 kHz is found the Loran C system; stations broadcast on the same frequency in very brief pulse trains. Loran A is found in the band 1800 to 2000 kHz; now decommissioned in the U.S. and Canada; it is still used in Europe. Similar to Loran C, the stations transmit a pulse train which will show up on a receiver with a BFO.

The best known radio navigational aid and of most interest to SWL's are the low frequency radiobeacons. The first major radio aid and found virtually anywhere along the coasts, they are used for homing as well as position finding by taking fixes with a radio direction finder.

While most of the beacons operate continuously, many of the on the Great Lakes operate in groups, sequentially, on the same

Identity	Location	Freq kHz
C	Mobile Point, AL	320
CO	Chesapeake, VA	290
CM	Cape May, NJ	325
PJ	Point Judith, RI	325
NW	Nantucket Shoals Lightship	286
P	Thunder Bay, ON	325
TJ	Toledo, OH	320
SA	Sable Island, NS	374
RT	Rankin Inlet, NWT	284
R	Radio Island, NWT	304
YZ	Point Loma, CA	480
LB	Long Beach, CA	296
SF	San Francisco, CA	305
CJ	Cape St. James, BC	292
T	Cape Spencer, AK	286

frequency. The maximum number of beacons in a group is six and each will operate for one minute during the six minute cycle. The signal transmitted by a beacon will consist of one or more letters transmitted in Morse code and repeated three or more times.

Beacons can provide an interesting challenge to those interested in maritime radio as their signals, being low frequency, can travel great distances and have been heard as far as two thousand miles away. If you are looking for something different to try for a change, why not home in on the beacons? See how many you can hear and from how far away.

Listings of radio beacons are contained in the U.S. light lists, the Canadian publication RADIO AIDS TO MARINE NAVIGATION, and also in Publication 117 of the Defence Mapping Agency. Another excellent source is

Ken Stryker's new BEACON GUIDE, \$10 from Ken Stryker, 6350 N. Hoyne Ave., Chicago, IL 60659.

Table I is a selection of coastal radiobeacons which might be heard. Note that the U.S. Coast Guard and the Canadian Coast Guard are both making changes; some of these may soon go off the air if they haven't already.

This is only a very brief listing of a few of the thousands of beacons which exist. It must be borne in mind that some marine beacons will be found outside their 285-325 kHz allocation, but still within the 205-400 kHz band for aeronautical beacons, as many beacons serve a dual purpose.

Your comments, questions and suggestions are always welcome. Please address them to James R. Hay, 141 St. John's Blvd., Pointe Claire, PQ, Canada, H9S 4Z2.



ATC

PART I

"THE GOOD OLD DAYS"

Our two-part series, THE AIR TRAFFIC CONTROL SYSTEM, YESTERDAY AND TODAY, begins in this issue. My co-author is Mark Murphy--a former Air Traffic Controller and private pilot; a man of many and varied talents. Because of his background, Mark still has a very active interest in the ATC System, its state-of-the-art, and all of the ramifications thereof.

The photos which you see featured in this installment of "Plane Talk" were furnished by Mark from his own collection. During the actual interview portion of this column, my initials will be PT (for Plane Talk) and Mark's will be MM. Before we hear from Mark,

however, here's some background information about Air Traffic Control's birth and infancy.

In the early days of aviation development, it became apparent that some degree of standardization should exist, preferably on a worldwide basis. This was a necessity so that aircraft could be flown into different countries under regulations that would be as uniform as possible. As far back in the early pioneer years of aviation as 1910, nineteen European nations tried to reach international agreements to achieve this. At that time, however, it was virtually impossible for these nations to do so.

In 1919, following the end of World War I, the Versailles Peace Conference was held, and there the International Convention for Air Navigation was formed. Through this, the International Commission for Air Navigation (ICAN) was created. Among other regulations this commission developed the "General Rules for Air Traffic."

Even though the United States wasn't a signatory to the formation of ICAN, several of its concepts were followed here. Starting in 1927, a program to establish

a "Federal Airways System" was implemented. This program consisted of a network of radio beacons laid out to connect principal U.S. cities, followed later by a similar net of four-course low frequency radio ranges.

Prior to 1930, air-ground communication was practically nil; that year, however, heralded the arrival of two-way radio-telephone communication. By the time 1932 was underway, almost all of the airline fleets were in the process of being equipped for radio-telephone air/ground communications.

THE FIRST AIR TRAFFIC CONTROL FACILITIES

The first radio-equipped aircraft control towers went into operational status at the Cleveland, Ohio, Municipal Airport in 1930. It was under the control of the city of Cleveland's government at that time.

During the mid-thirties, enroute centers were established by a group

of pioneer airlines. The first of these centers went into operation at Newark, New Jersey, then others opened at Chicago and Cleveland a short time later. The first centers' and towers' control systems consisted of telephones, blackboards and large maps. One more piece of equipment was necessary at the ATC towers: a pair of binoculars! Grease markers were used on the maps to show the position of each aircraft. Data concerning each individual aircraft was written on the blackboard.

Eventually, this procedure gave way to the use of flight progress strips encased in small, movable plastic holders nicknamed "shrimp boats" because of their supposed resemblance to them. The "shrimp boats" were pushed around on map tables (and later on, for primitive radar facilities' usage) to designate the position of the flights whose numbers they bore. These "shrimp boats" were in use for quite a long time--

PLANE TALK cont'd

and may still be in use in some very small facilities around the world.

In 1938, the Civil Aeronautical Act was enacted by the U.S. and from then on, air Traffic Controllers had to be certified by this new agency. Consequently the first aviation regulations were passed requiring pilots to pay attention to controllers' instructions.

By this time, teletype communications had been installed between centers, towers and other aeronautical communications stations. By mid 1938 there were eight Air Traffic Control Centers across the country which were in operation 24 hours a day. As 1941 rolled around, the teletype net was considerably expanded and it was supplemented by a national interphone system which connected Air Traffic Control Centers, Towers, Communications Stations (run by airline companies for communications with their aircraft), and other related facilities. By the end of 1941 there were 14 Airway Traffic Control Centers employing 300 people. In 1942 nine more Centers were opened.

In 1941, the Airport Control Towers became the CAA's responsibility and jurisdiction passed into its hands from operations by the individual city governments at whose airports the towers were located. The CAA set up standards and established training schools for controllers. During the war years, through their schools, the CAA trained over 4,000 Controllers, men and women alike.

After the war years, radar came into civilian usage at airports and centers throughout the country. By modern standards, the radar equipment in use then would be considered stone-age relics. Back then it was a dramatic improvement over anything else utilized for air traffic control.

Now that we have some background, let's hear from Mark Murphy who was an Air Traffic Controller during the 1950's.

THE INTERVIEW

PT Mark, have you always been interested in aviation?

MM Yes, since the age of 10 when I first saw Charles Lindbergh at a local airport on his nationwide tour. That was back in 1927! Shortly thereafter, my eldest brother owned an airplane for a couple of years. By

that time, I was hooked. It was shortly after that I build my first crystal radio set, and radio became my second love.

PT Were you involved in aviation in any way before becoming an Air Traffic Controller?

MM That's affirmative. I worked for American Airlines for 11 years before joining the Air Traffic Control System. Among my various job titles/duties were ramp agent, ticket agent, reservationist, weight and balance agent, ticketing/reservations instructor, radio and teletype operator, ramp supervisor, flight operations agent, and assistant flight dispatcher. We had to wear many hats in those days.

PT It surely looks that way! Did you join the ATC system after leaving American?

MM No, after I resigned from AA (for reasons of company politics), I worked for six months with KLM Royal Dutch Airlines as a flight dispatcher. Then, I went to work for the CAA (Civil Aviation Authority) as a Controller trainee at the New York ARTCC (Air Route Traffic Control Center), which was then located at LGA (LGA is the 3-letter code for LaGuardia Field Airport).

In 1951, when I came to work for ATC, all training was done at the facility of assignment since this was before the inauguration of the Air Traffic Control Academy in Oklahoma City. The training was done by journeymen controllers during slack periods of VFR weather. In those days when aircraft were much slower and traffic much less dense, most all flights operated without benefit of ATC when VFR conditions permitted.

PT What actually was involved in the training program?

MM We had a heck of a lot of homework, that was for sure! The subjects which we were taught included CAA regulations, ATC Criteria and the complex communications set-up involving mostly telephones. There were



Idlewild Tower (now Kennedy) back in 1954.



CAA building (early 1950's) at LaGuardia Field. NY Air Traffic Control Center was located on second floor.

also military communications to handle that particular type of traffic.

Before becoming a controller, one had to commit to memory all the separate Center/Tower agreements, all of the LF range station frequencies, class, power, extent of usability, and idiosyncrasies; all of the radio beacons including frequencies, type, power, and class; all the VOR ranges and their categories; all mandatory and on request radio fixes; all intersections; all holding patterns (standard and non-standard, left and right, 1" and 2"); the various types of instrument approach procedures and missed approach procedures for each IFR airport within the control area.

In addition, we also had to learn all of the LF and VHF airways (some of which overlapped at that time), how to read weather sequences and forecasts, procedure turns, ARTCC boundaries, minimum enroute altitudes for the various airways, minimum reception altitudes, Center radio communication frequencies and procedures; up to over a hundred miscellaneous designators for reporting points, intersections and weather reporting stations, minimum off-airways obstruction altitudes, emergency procedures danger zones, restricted zones; airspace reservations; everything about every navigational aid to be used in controlling traffic; air defense security procedures which included air defense identification zones. These were just some of the various items which we had to learn during our training.

PT Holy Toledo!

MM Now as far as our actual duties went: Flight data for all aircraft were received by the assistant controllers from adjoining centers, copied on flight

progress strips and then calculated through the

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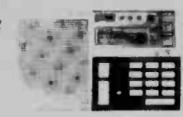
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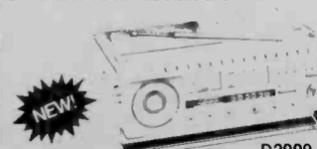
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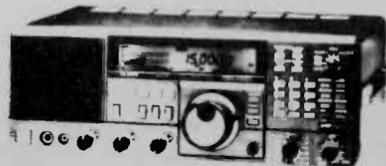
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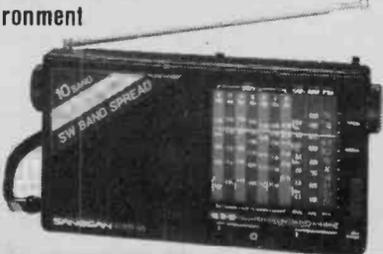
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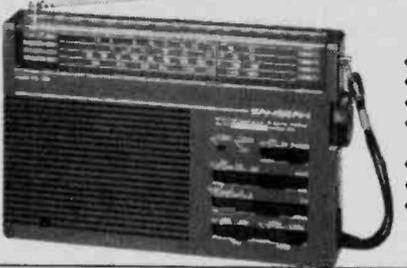
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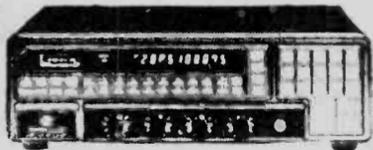
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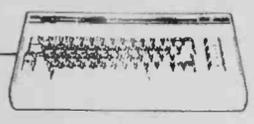
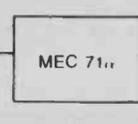
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On days when activity was slow, the controllers would catch up on manual revisions, instruct and/or resume training. Or just shoot the breeze!



In this photo, you can see the dictaphones (by the window). Also some of the controllers on a quiet day. Note the flight strips on the boards in front of them.

PLANE TALK cont'd

sector to which one was assigned, and a completed strip with the necessary data passed to the assistant controller working the adjoining sector. To give you a brief example: Traffic from DCA would enter the Philadelphia sector from CLE, the Philipsburg sector or Elmira sector, and from BOS, either the Harford or Albany sector. There was an average of from three to four required reporting fixes for each sector. The data for each flight included the estimated time of the last radio fix before entering the NY area, plus the routing, altitude, TAS, etc.

The first assistant controller would calculate the time over each fix in his assigned sector and give a completed strip to the assistant at the next sector who would repeat the procedure until the last strip was complete for landing or enroute aircraft. For the past 27 years all of this has been performed by a computer (from the most primitive models up to and including the present state-of-the-art); in a matter of minutes after a New York-to-Los Angeles flight is off the ground, the Los Angeles tower has the estimated time of arrival!

When all aircraft flew at much lower altitudes than they do today--and at correspondingly lower speeds, data was received not more than one hour in advance of an aircraft entering the particular ARC area! This was in the interest of accuracy, as the aircraft could change altitude, route or time which would require the work of passing on many revisions.

As aircraft speeds increased, it became practical for the assistant

controller to calculate the fix postings for all the sectors which meant that on a busy IFR day, sectors would have two assistants working at top speed to get the data posted.

When we worked the NY Oceanic Control sector, there were several dozen ICAO "Q" signals which had to be learned, all types of abbreviations used with these Q signals, service and priority prefixes; airline operations abbreviations, miscellaneous ICAO abbreviations, (remember, ICAO stands for "International Civil Aviation Organization," PT), prefixes, and message construction; teletype abbreviations, phone line abbreviations, ICAO flight plan construction, POMAR (position reporting) codes, Canadian designators for airways and weather stations; ICAO airport designators, location identifiers (with their ATA equivalents), off-coast intersections and their designators, air-ground radio stations, their locations, frequencies, and abbreviations, ocean weather stations, their locations (which included lat/longs) frequencies and identifiers; the ICAO phonetic alphabet, miscellaneous ocean mileages via rhumb line and great circle routes; the six routes from the east coast to Bermuda, the three routes to San Juan, and mileages between reporting points, Canadian airway names, routes, and minimum altitude.

The most experienced controllers were assigned to make up problems which were then administered by two controllers utilizing all possible criteria for each sector to test the trainees' knowledge.

As the assistant controller demonstrated his ability to control traffic

on each sector, he (or she) would be assigned to controlling traffic on that sector with a journeyman controller by his side monitoring every move and making corrections when and where necessary. Afterwards, the assistant controller would be critiqued on his progress, and a written report would go into his personnel file.

After checking out on each sector, he would then be given a written test which covered all the material listed above; in addition, he would be required to draw a map from memory (to scale), showing all the navigational facilities, all of the airways with all of the fixes shown of the whole Center control area. Upon successful completion, he would be designated as an "Area-Rated Assistant Controller." Depending upon the availability of training, and the aptitude of the assistant, training would normally be completed anywhere from one to two years.

Most everyone subscribed to Jepsen charts and, as the system grew, the changes were learned as they

became effective. On VFR days, when traffic was light, we updated manuals, training progressed; some controllers were sent out to visit the various nearby tower facilities, etc. On those days, we took long lunch hours; other days when things got hairy, we didn't find time for one.

The tools which we had to work with consisted of very primitive radar equipment, grease pencils, telephones, dictaphones (also primitive), flight data strips; "shrimp boats", circular distance-time calculators, maps (wall and table). Jepsen charts that sometimes were not all that we wanted them to be (ditto the transmitting-receiving equipment)--these would seem positively stone-age stuff to modern controllers--but we used 'em--and used 'em well!

I wanted to explain the dictaphone usage: There was one for each sector which recorded both sides of any phone conversation. There were four plastic records on each machine and each record held 30 seconds of conversation. Each had an amplifier



NY ARTCC scene in the early 50's. Supervisor's desk is in the foreground.

PLANE TALK cont'd

for instant replay if necessary. Each machine was checked periodically by the assistant controller assigned to the sector. He would replace completed records, mark them with date, time and his initials with a wax pencil and file them in special containers. The Mid-Shift watch would collect the records and flight strip from each sector and file them together to be destroyed after 90 days unless needed.

Another item that I'd like to elaborate upon is in regard to handing off flights to the tower(s) in the Center's control area: We'd start laddering the flights down when they were about 90 miles out; Center would maintain control until and aircraft had left 2,500 feet, then hand it off to Approach Control. The Approach Control Controller would take the handoff and bring the aircraft through a monitored ILS approach to the runway. This monitored ILS approach was called a GCA for "Ground Controlled Approach."

PT Mark, how many ARTCCs did you work at during your time with the Air Traffic

Control System?

MM I was qualified to control traffic in three high-density centers: New York, Pittsburgh, and Cleveland. After serving a stint as director of crew training in Pittsburgh, I successfully bid on a promotion to the Cleveland, Ohio, ARTCC. I worked at the Cleveland Center until I left the ATC System. Oh, yes--before I left the system, I entered a program that had been set up to train foreign nationals by U.S. Controllers who were bi-lingual. I went to Mexico as part of this program for six months.

That about says it all. I have just touched on the subject lightly, and I could go on and on--but space wouldn't permit it, I guess. I do want to say that even with all of the myriad improvements of today's air traffic control facilities over the way it was "back then," the job is still one of the most stressful and demanding of any that I can think of. It will always be a young person's job due to the lightning reflexes required, split-second timing demanded, excellent eyesight, etc. I have to agree with the controller who said that when radar

SIGNALS FROM SPACE

by

Larry Van Horn

160 Lester Drive

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FROM CANADA

MSAT, or Mobile SATel-lite, is a proposed telecommunications system to provide a more effective and reliable two-way radio and radio telephone service to supplement today's short range terrestrial mobile communications systems. It would reach virtually all Canada to serve those traveling on foot, by land vehicles, airplane, or ship and be able to link them with anyone served by radio or telephone system.

The system, operating in the 806-890 MHz band, will include the capacity for data collection from platforms, much like the DCS used by U.S. weather satellites. An experimental extremely-high-frequency communications package for use by National Defence is also being studied. The elements of the MSAT system are: a

failed with a board full of traffic, the situation is comparable to a surgeon having the lights go out in the middle of a major operation!

PT Thanks, Mark. We really appreciate your giving this interview to "Plane Talk." I know that all of our readers will find this as informative and fascinating as I did.

Next month we will take a look at air traffic control in modern times. Please feel free to drop a line to me (address at the beginning of the column) if you should have questions regarding any of the features which you see here.

73s and out,
Jean Baker
RMS KIN9DD



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SIGNALS FROM SPACE cont'd

satellite in geostationary orbit, a partially integrated spare spacecraft on the ground, ground control facilities, and a family of terminals for mobile and fixed installations.

A study of feasibility began in 1980, with a launch projected for late 1987 or early 1988. If the MSAT system is implemented, experiments and pre-operational services would be carried out for seven years.

The ultimate goal, in the 1990's, is a commercially viable communications system in which one MSAT could serve tens of thousands of small, low-cost mobile terminals such as in airplanes or police cars. MSAT would provide reliable mobile voice communications as well as data to places, people and machines now unserved.

Cost to the user would be comparable to mobile radio or mobile telephone rates in major cities. Its benefits would be measured not only in dollars, but in health and safety as well as in the knitting together of sparsely populated country.

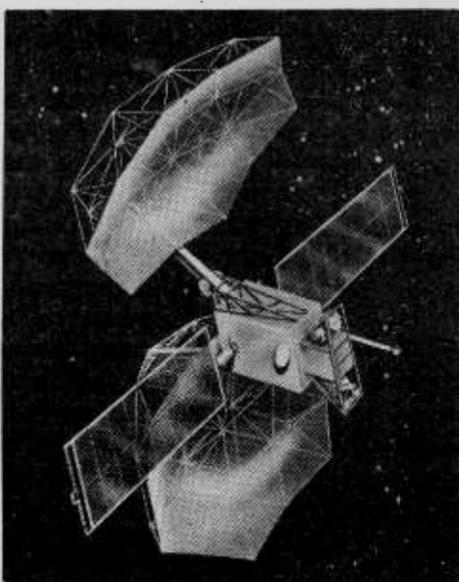
The Canadian DOC has been working to change the Canadian Table of Allocations that would give the mobile satellite service primary status in the 800 MHz frequency band, specifically 821-825, 845-851 and 866-870 MHz; and in the L-band, 1545-1559 and 1646.5-1660.5 MHz.

A second spectrum policy proposal suggesting allocation of the band 890-896 MHz to mobile and mobile satellite service in Canada will likely be final when the other frequencies are approved.

"Canada is trying to make arrangements so that allocations for mobile satellite service in the frequency range 500-2500 MHz can be discussed in 1987 at the World Administrative Radio Conference for Mobile Services," said Ed DuCharme of the DOC's International Relations Branch.

As for the satellite itself, it will carry two 9-meter dishes and the maximum dimension (in orbit) from sail tip to sail tip is 30 meters. The spacecraft's solar power system is capable of producing 3kW of power minimum and the design lifetime is seven years.

COMSAT International has announced that it was selected by the State Department to provide satellite communication services from Washington, D.C., to



the United States Embassy in London and the United States Mission in Geneva.

COMSAT International will lease to the State Department two half circuits of 1.544 Mbps that it will use for voice, data, facsimile and videoconferencing services. COMSAT International will provide this capability via its new international earth station that will be located at its headquarters in Washington, D.C.

Final testing and launch integration procedures for SATCOM K-2, which will be the nation's most powerful domestic communications satellite in service, are underway at the Cape as this column is being written. Launch of K-2 is expected November 27 aboard the Space Shuttle Atlantis.

SATCOM K-2, with 16 transponders of 45 watts power, is the first of three such spacecraft RCA Americom will operate to provide a variety of communications services for television program distribution and business networking. The satellites are designed and built by RCA Astro-Electronics.

"The launch of SATCOM K-2 heralds a new era in satellite communications services for America," said Andrew T. Hospodor, President and Chief Executive Officer of RCA Americom. "These satellites, along with a network of terrestrial facilities, are providing unprecedented opportunities in broadcast television program distribution, satellite master antenna television services, direct-to-home television program services, videoconferencing, and private business networking."

With their 45-watt Ku-band transponder power, these new Ku band satellites can deliver high quality television signals into antennas as small as one meter in diameter. And because Ku-band satellite signals are not affected by terrestrial microwave sig-

nals, antennas can be located anywhere in line-of-sight to the satellite, even in major metropolitan areas.

"Broadcast television networks are the first to take advantage of Ku-band transmission," said Mr. Hospodor. "Eight of the SATCOM K-2 transponders will be used by the NBC Television Network for program distribution to affiliates, and for backhaul services into the network. In addition, Hubbard Broadcasting and its United States Satellite Broadcasting, Inc. subsidiary have leased four transponders for distribution of the Conus News Service and the Conus Washington Direct Service."

"Two of the SATCOM K-2 transponders are being marketed by RCA Americom as part of its Syndication System offering," Mr. Hospodor continued. "As part of this service, RCA Americom is offering earth stations to all standard power commercial broadcast stations in the lower 48 states. To date, more than 500 stations have accepted this earth station offer, meaning that SATCOM K-2 is the route to the nation's broadcast television stations."

The remaining two transponders on SATCOM K-2 have been reserved by AT&T Communications, Inc. According to Karl R. Savatiel, Director of Satellite Communications for AT&T Communications, "These high-powered Ku-band transponders will allow AT&T to further expand its line of satellite services."

The launch of SATCOM K-2 will be followed December 20 by the launch of SATCOM K-1 aboard the Space Shuttle Colombia. SATCOM K-1 is being marketed for satellite master antenna television, direct-to-home television distribution and private business networking.

SATCOM K-2 has been assigned an orbital slot of 81° west, SATCOM K-1, 85° and SATCOM K-3, scheduled for launch in 1987, 67° west longitude.

William Walters in Mississippi has been kind enough to provide MT readers with the frequencies that will be used by ESA's Giotto Comet Halley spacecraft.

Uplink----2116.722994 MHz
Downlink--2298.703704 MHz
8428.580240 MHz

I would like to thank Mr. Walters for all his trouble in getting these frequencies for Signals from Space.

The Soviet Union

expects to launch a new modular Salyut space station sometime in early 1986. The new station will be capable of being expanded significantly in size over previous space stations.

The main component of the new station will be a central core containing multiple parts that will allow from four to six modules to be docked to the facility. Launch of the modular station could come as early as the first half of 1986. It's logical that the Soviets would want to replace the Salyut 7 space station which is getting old and is showing its age. The Soviet Salyut 7 is currently operational and they have said that they do not want two space stations in use at the same time. I would expect that Salyut 7 will be abandoned once the new space station is operational.

There are some indications that the station could be operational in time to support the international gathering of data during the appearance of Halley's comet in March, 1986.

The University of Surrey, England, has begun development of new control and telemetry systems for two amateur radio satellites designated UOSAT-3 & 4. The control and telemetry devices for UOSAT-3 will be approximately 1/3 the size of the systems now operating aboard UOSAT-2. Launch dates have not been announced.

Europe's Meteosat F-1 geostationary weather satellite has depleted its on-board hydrazine fuel supply. The satellite has now drifted away from geostationary orbit and is no longer operational.

Hughes Communications, Inc. has decided not to launch the orbital ground spare Leasat IV-5 until mid-1986. This date represents the earliest the 5th Leasat could be launched to replace the failed Leasat 4 that failed September 6, 1985. The Leasat 5 was a ground spare and had been planned for a December 1985 launch.

SPACE LAUNCH REPORT

Information for this monthly feature is courtesy of the Spacewarn Bulletin, NASA Thirty Day Special Bulletins-Goddard Space Flight Center, "Communication Satellites" authored by the editor, and the editor's monitoring during the period covered by this report. Numbers in parenthesis are NORAD catalog numbers.

SIGNALS FROM SPACE cont'd

85-76A(15992) STS-51I launched 8/27/85 from the Cape by NASA. Period 91.41 Min, apogee 358 km, perigee 351 km, inclination 28.5°. On board J.H. Engle, R.O. Covey, J.E. Van Hoften, W.F. Fisher, J.M. Lounge. Payload included Aussat-1, ASC-1, Syncom IV-4. The Space Shuttle mission also included the repair of the dormant Syncom IV-3 fuel-laden military communications satellite. The mission returned to earth 9/3/85.

85-76B(15993) Aussat-1 launched from orbiting STS-51I 8/27. Geostationary orbit 156° east. This is a Regional COMSAT launched for the Australian government. No frequency information currently available.

85-76C(15994) ASC-1 launched from orbiting STS-51I 8/27. Geostationary orbit 128° west. Launched for the American Satellite Company; no frequency information available at press time.

85-76D(15995) Syncom IV-4 (Leasat 4) launched from orbiting STS-51I 8/29 for Leasat network. Geostationary orbit 178° east. Failed in orbit and abandoned by parent company, Hughes Communications.

85-77A(15997) Cosmos 1678 launched 8/29/85 from Plestetsk on A-2 booster by USSR. Period 89.12 min, apogee 303 km, perigee 193 km, inclination 82.3°. Mission: 3rd generation, high resolution earth resources, film return photo recon. Freq: 19.989 MHz with simple FSK.

85-78A(15999) Cosmos 1679 launched 8/29/85 from Tyuratam on A-2 booster by USSR. Period 89.68, apogee 3643 km, perigee 181 km, inclination 64.8°. Mission: 4th generation with solar panels, long duration photo recon. Freq: 240 MHz FM with low & high data rates.

85-79A(16011) Cosmos 1680 launched 9/4/85 from Plestetsk on C-1 booster by USSR. Period 100.84 min, apogee 822 km, perigee 786 km, inclination 74.05°. Mission: Military COMSAT-store/dump type. Freq. unknown.

85-80A(16018) Cosmos 1681 launched 9/5/85 from Plestetsk on A-2 booster by USSR. Period 88.96 min, apogee 250 km, perigee 224 km, inclination 82.3°. Mission: 3rd generation, high resolution, earth resources film return photo recon. Freq: 19.989 MHz with simple FSK.

85-81A(16051) Soyuz T-14 launched 9/17/85 from Tyuratam on A-2 booster by USSR. Period 88.63 min, apogee 240 km, perigee 199 km, inclination 51.61°. Mission: Manned mission with Lt. Col. Vladimir Vasyutin, Georgiy Grechko, Lt. Col. Alexandir Vokov. After docking with Sal-

yut 7, Vasyutin and Volkov of the T-14 crew and Savinykh of the T-13 crew remained aboard the Salyut 7 and Grechko and Dzhanibekov returned with the Soyuz T-13 spacecraft. Freqs: 20.008, 121.750, and 922.750 MHz.

85-82A(16054) Cosmos 1682 launched 9/19/85 from Tyuratam on F-1-m booster by USSR. Period 93.30 min, apogee 453 km, perigee 437 km, inclination 65.02°. Mission: Elint intelligence ocean recon satellite.

85-83A(16056) Cosmos 1683 launched 9/19/85 from Plestetsk on A-2 booster by USSR. Period 90.24 min, apogee 398 km, perigee 207 km, inclination 72.88°. Mission: 3rd generation, medium resolution, photo recon. Recon maneuvered to a 423 x 363 km orbit at end of first day. Freq: Simple FSK on 19.989 MHz.

85-84A(16064) Cosmos 1684 launched 9/24/85 from Plestetsk on A-2-e booster by USSR. 726.02 min, apogee 39790 km, perigee 632 km, inclination 62.92°. Mission: Missile Early Warning satellite. Freqs: 2292, 2280-2304 MHz.

85-85A(16088) Cosmos 1685 launched 9/26/85 from Plestetsk on A-2 booster by USSR. Period 90.05 min, apogee 378 km, perigee 208 km, inclination 72.8°. Mission: 3rd generation, medium resolution, photo recon. Recon maneuvered to 419 x 360 km orbit at end of first day. Freq: 19.989 MHz with simple FSK.

85-86A(16095) Cosmos 1686 launched 9/27/85 from Tyuratam on A-2 booster by USSR. Period 89.17 min, apogee 319 km, perigee 177 km, inclination 51.61°. Mission: Soviet space tug that docked with Salyut 7. Sometimes called the Star Module, this spacecraft resembles the Cosmos 929, 1267, 1443 type spacecraft. According to Radio Moscow it contains "no reentry capsule."

Freq: 19.954 MHz with PDM telemetry. Telemetry word lengths as of 11/9/85 sync pulse (characteristic purr) Word 1-medium 2-short, 3-long, 4-long, 5-long, 6-short, 7-long, 8-short, 9-long, 10-long, 11-medium, 12-long, 13-medium, 14-long, and 15-medium.

85-87A(16101) Intelsat VA-F-12 launched 9/28/85 by ITSO. Period 634 min, apogee 35956 km, perigee 310 km, inclination 23.08°. Mission: International COMSAT, part of the Intelsat system. Freqs: see latest edition of "Communication Satellites" for a complete breakdown.

85-88A(16103) Cosmos 1687 launched 9/30/85 from Plestetsk on A-2-e booster by USSR. Period 706 min, apogee 39104 km, perigee 618 km, inclination 62.97°. Mission: Missile Early Warning satellite. Freqs: 2292, 2280-2304 MHz.

● And with Cosmos 1687,

that brings to a close another edition of Signals from Space. I would like to hear from you. Send your questions, comments, satellite frequencies, military aircraft frequencies to: Signals from Space, c/o Larry Van Horn, 160 Lester Drive, Orange Park, FL 32073. I'd like to take this opportunity to wish each and everyone of you and your families the best of New Years and may 1986 fill your shack with signals from space. ●

NEW ARRIVALS**CHANGES IN THE SCANNER MARKET**

by Bob Grove

There are some stirrings in the scanner market which should prove of great interest to listeners. The biggest impact will be felt from the long awaited arrival of the ICOM R-7000, not a scanner in the strictest sense, but a VHF/UHF general coverage receiver with 99 memory channels which can be scanned.

Because of the sophistication and inherent quality of this receiver, it is destined to be the standard of comparison for some time to come. The Yaesu FRG 9600 has been something of a disappointment, although it works reasonably well and does provide continuous tuning over its frequency range, an odd 60-905 MHz due to its original target, the European market, thus reflecting that band plan.

The cumbersome SX-400 from J.I.L. is probably doomed due to its early technology, awkward interfacing of optional converters and inflated cost.

Look for Regency to offer some new programmable scanners early this year; the popular HX-1000 has been discontinued and replaced by the new HX-1200, a 45-channel hand-held with aircraft band; its \$349 recommended retail (\$249 from Grove Enterprises) will provide strong competition to the Bearcat 100XL.

BEHIND THE DIALS**REGENCY HX1200**

As reported in an earlier issue of MT, Regency has replaced their popular HX1000 hand held scanner with a new model. Now in stock at Grove Enterprises, we have tested the new HX1200 and are very pleased with what we have discovered.

Identical in outward appearance to its predecessor, the new model has quite

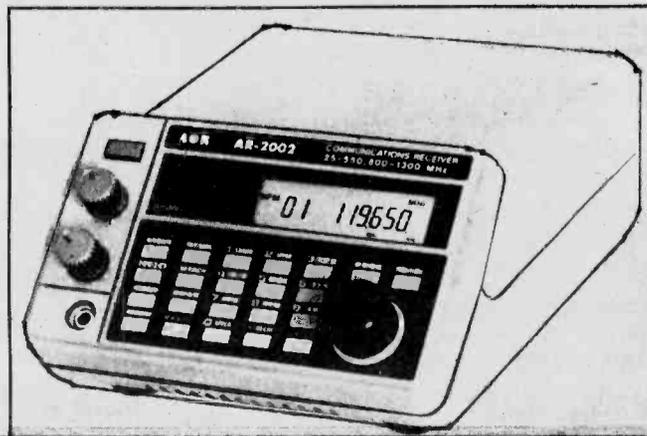
We forecast a replacement of Regency's venerable MX 7000. Now in European distribution from the Tokyo based A.O.R. Corporation is the AR-2002 which will probably be given a Regency number and imported under the Regency label.

The AR-2002 offers a tuning dial and improved keyboard with the same selectable increments (5, 12.5 and 25 kHz) as the MX 7000 and has the same frequency range and cabinet. A slowdown in MX 7000 production and scarce availability would seem to add credibility to the suspicion that it is due for replacement.

Featuring LED signal meter, RS-232 address and priced at about \$420, the AR-2002 is not yet available in the U.S.

Regency will be replacing its discontinued Z 10 with another entry level scanner and Fox Marketing still expects imminent release of its promised Tracer series programmables with plug-in memory packs and frequency converters, but their present BMP-10/60 will probably continue to be made.

As always, MT will bring you additional news on these and other products as soon as it is available. ●



The AR-2002

a number of improvements, most notably 45 memory channels (although no channel lockout) and the addition of the VHF-AM aircraft band. The side "press-to-talk" switch illuminates the LCD display.

Total frequency coverage on our sample was 25.58-59.995, 118.0-175.995 and 405.0-519.995 MHz. Sensitivity on all ranges is excellent, clearly equalling or outperforming the competition. Distance received is limited only by the rubber duckie antenna, always a compromise on portable radio equipment.

Attachment of an external antenna, either a rooftop or mobile unit, or replacement with the Grove ANT-10 telescoping whip improved reception range measurably. A BNC antenna connector is provided.

A rechargeable battery pack and charger/AC adaptor come with the HX1200, and an optional mobile power cord is available to drop the automotive 13.8 volt system down to the 9.6 volts required for the scanner. A drop-in charger is also available.

Search frequency increments are 5 kHz at VHF, 12.5 kHz at UHF with a search/

CLUB CORNER

Paul Swearingen
P.O. Box 4812
Panorama City, CA 91412

Let's start January's column with a letter I received a few days ago from Fernando Diego Garcia of La Rioja, Argentina, which is about 550 miles northwest of Buenos Aires. I've reproduced it almost exactly as is:

"First I want to tell that my english it's not

scan rate of 12 increments per second. Selectable scan delay is 0.6 or 2 seconds; search delay is 4 seconds (nominal) or hold.

Published sensitivity is 0.5 microvolt on low and high VHF, 0.7 microvolt on UHF and 1.0 microvolt on the aircraft band. Adjacent channel selectivity at the 6 and 50 dB points is rated at ± 7.5 and 18 kHz.

Other panel-selectable features include channel one priority, entry clear, direct channel access, search/scan speed, and keyboard lock.

As with its predecessor, audio quality is crisp and loud, a pleasant departure from the tinny, marginal sound emanating from many competitive models. The HX1200 comes with case, belt clip, and earphone. ●

very good and that this is my first letter in this language.

"I'm a DX-er of 16 years old and I'm in DX activities since April 1984 and listening shortwaves since March 1982. I haven't got professional equipments, just a NOBLEX NT118 receiver, without a digital display, with a tuning-battery display and I have a lot of antennas.

"The main object of this letter is to acknowledge you the WRTH WORLD RADIO TV HANDBOOK that you free gift (I don't know if you say like this) or that you gave to the ADXL ASOCIACION DX DEL LITORAL of Argentina, and that they send me last week.

"I know that you gave or free gifted to the ADXL two handbook; I have the 1982 edition. The WRTH is very interesting. It isn't update, but it doesn't matter because for me it will be very very useful.

"Again thank you very much (I don't know how to say or thanks in english) for the handbook - Good DX's

"Cordially:
"FERNANDO DIEGO GARCIA"

And you're certainly welcome, Fernando; I hope you make good use of it, as old as it is.

The point is that about a year ago I mentioned that radio equipment and WRTH's were luxuries to DX'ers in Argentina, which suffers from double digit inflation each month, let alone through the year. Last year's wheelbarrow-full of currency to buy a loaf of bread will barely buy a crust this year, and not many young DX'ers like Fernando can afford to invest in the peripheries of DX'ing. Several of you responded with your old WRTH's, and I passed them along to ADXL's Emilio Pedro Povrezenic, who passed them on.

If you'd like to make better use of your pre-1986 WRTH's than to have them around as dust-catchers, wrap them up and send them by surface mail (and specify to the USPS that you're sending books; it's cheaper) to Emilio Pedro Povrezenic, Asociacion DX del Litoral, Casilla de Correo 26, Villa Diego 2124, Pcia. de Santa Fe, ARGENTINA.

While you're at it, include three or four IRC's and request a sample copy of "Latinoamérica DX" (in Spanish) or the more con-

densed "Latin American DX Report" (in English). By the way, practically all of the sample copies of DX bulletins I receive go to ADXL, too, but I'm sure that any SW-oriented bulletins would find a good home if you wish to send them on with your old WRTH's.

CADX's Austin Kelly writes to add more information about the CHICAGO AREA DX'ERS. Their club dues are \$12 per year, with "DX! Chicago" being published monthly at the present. CADX holds summer barbecues and a winter banquet, and membership is open to anyone living within 150 miles of Chicago. For more information, write Austin at 6524 S. Sacramento, Chicago, IL 60629.

Plans for the first annual 1986 SCAN-FAIR for the NY/NJ area are underway. Philip J. McCue writes that if you are a non-commercial participant, send an SASE for more information; if you are a dealer, make your request on letterhead and plan to make booth arrangements early. Send your requests to SCAN-FAIR Director, P.O. Box 418, Pleasant Valley, NY 12569.

January's meeting for the non-club the ROCKY MOUNTAIN RADIO LISTENERS, will be held on Saturday the 18th in Littleton, from 1-4PM at the Bemis Library, 6014 S. Datura, according to newsletter non-editor Wayne Heinen. For more information, send your SASE to RMRL, 4131 S. Andes Way, Aurora, CO 80013. Wayne adds that Allied Appliance and Radio of Englewood will be donating a door prize at this meeting.

ASWLC's January meeting, on the 4th, will be at 16182 Melody in Orange County. Call (714) 846-1685 for further directions from club director Stewart Mackenzie.

Fred White indicates that his 515 CLUB will send one free copy of their newsletter, SW Spectrum 515, to JRC NRD-515 owners who send him a #10 SASE and an accompanying letter describing their interest in the hobby, their sets and equipment. Mail it to 857 Virginia Court, Sonoma, CA 95476. He adds that the newsletter will include such features as "DX'ing the Polar Regions," "The Search for FAX," and "The Unexpected Treasures of the SW Sky."

Here's a few tips from ANARC's Dave Browne: RCMA (Greater Los Angeles area) information can be yours for the price of an SASE sent to Eric J. Christiansen, P.O. Box 3962, Santa Fe Springs,

NEW AND HOT!

THE BRAND NEW REGENCY HX1200 hand held programmable scanner is loaded with features....Count 'em!

1. 45 memory channels
2. Wide frequency coverage (see below)
3. Aircraft band
4. Direct channel access
5. Strong, clear audio
6. BNC antenna connector
7. Professional rechargeable battery pack, charger
8. Fast scan/search rate
9. High sensitivity, sharp selectivity
10. Bright LED night display
11. Programmable search, priority, delay, search hold

HOW ABOUT THIS FREQUENCY RANGE?: 25.6-60, 118-176, 405-520 MHz!

Regency's popular predecessor, the HX1000, was probably the most popular hand held ever made; now the new HX1200 actually exceeds that performance with more features, and at a low, low price!

SAVE \$110 from the advertised retail price of \$359

ONLY \$249 plus \$5 UPS

NOW AT GROVE ENTERPRISES.....IN STOCK!

CALL NOW - supply limited 1-800-438-8155 MC or VISA

Accessories include wall charger, carrying case, belt clip, earphone, flex antenna, and nicad battery pack. A drop-in charger and mobile cigarette lighter power adaptor are also available.

GROVE ENTERPRISES, INC.
P.O. Box 98, Brasstown, NC 28902
704-837-9200

CLUB CORNER cont'd

CA 90670; for RCMA (Philadelphia) send the SASE to Gerald M. Schoaf, P.O. Box 213, Upper Darby, PA 19082. The January 10 meeting of the MINNESOTA DX CLUB will be Friday, 7PM, at the Rarig Center, Room 540F, University of Minnesota.

Speaking of RCMA, their own newsletter lists the new RCMA Wisconsin address: c/o Scott W. Miller, 122 Greenbriar Drive, Sun Prairie, WI 53590. RCMA's contact for the DC, MD, VA, and DE areas is through the Capitol Hill Monitors, c/o Alan Henney, 6912 Prince Georges Ave., Takoma Park, MD 20912.

For the Twin Cities, send your SASE to Chuck Steier, 4820 Hwy 7, Minneapolis, MN 55416. In southern New England, your contact is Maurice Dennis Dandeneau, SNEC President, P.O. Box 7052, Warwick, RI 02887.

Also from the "RCMA Newsletter" comes notice of NOSO, the NATIONAL ORGANIZATION OF SCANNER OWNERS, "dedicated to protecting all rights of Americans related to the ownership and operation of police scanners." A non-profit organization, NOSO features a newsletter which includes unbiased test results, plus a U.S. Scanner Frequency Directory. Annual membership is \$9.00. Contact NOSO at Box 3047-R, Greenville, NC 27836.

WE LIKE...the All-Ohio Scanner Club's practice of extending the membership of any member by two months when he recruits a new member, as long as he is not one who had been a member previously. AOSC's Dave Marshal notes that the club's membership had dipped to a low of 88 during the summer of '84, but that since then it has doubled and should have passed the 200 mark by the time this column gets into print. You can bet that aggressive and creative leadership was the cause of this rejuvenation.

Keep those cards and letters coming...just about the time I think I've heard from all the DX clubs in North America I receive notice from another one which has just come into being or has been around but has received no publicity.

My deadline is always the tenth of the month for the second month following; in other words, there's a lag of seven or eight weeks before these words get into print. Compared to the slick magazines four to six months, that's pretty quick...but don't send your February meeting time to me in January! 73

TUNE IN
WITH
Ed Noll



Adopt a Station

Time never drags for the person who has chosen radio listening as a hobby. but we often do so much frequency skipping that some of the joys of the pastime avoid us. A bit of concentration on one objective can be a welcome and rewarding effort. Last month we suggested adopting a band; this issue, a station.

Choose either a station you listen to consistently or one you are attracted to

but never really paid much attention to. Concentrate on their programming or technical operation or, preferably, both. Be a reliable monitor--send in monthly (or more frequent) reports as time permits, but special event reports immediately.

Be on the lookout for new frequency and time changes or new program services. Hop on these immediately and send in reports because they are eager to receive them. By keeping your name active you receive program and technical changes automatically.

I have two adopted stations because of friendship and a liking for their traditional music: Austrian ORF and Spanish REE. Both make available rather complete periodic schedules.



RADIO EXTERIOR DE ESPAÑA

Sr. D. *Edward M. Noll*

Muchas gracias por su informe de recepción.

Tenemos el gusto de confirmar su control de nuestra emisión en *15365* KHz.,

de fecha *20 05 85*

hora *2159-2216* UTC/GMT.

Le saludamos muy atentamente,

F. X. Tenreiro

RADIO EXTERIOR DE ESPAÑA
Apartado 150.039 - MADRID-24

Programming is excellent. Each has a fine balance among news, culture, entertainment and pleasant chatter. Both, in a quiet

Regency hand held scanners
bring you all the action... wherever you are!

HX1000 HX2000 HX750 HX650

When you need to hear the action from wherever you are, Regency delivers. Our portable scanners keep you in touch with the local news. Whether it's bank hold ups, three alarm fires, weather, business, marine radio, or aircraft calls, Regency portables bring you the on the scene action. While it's happening from where it's happening... in your neighborhood.

PROGRAMMABILITY WITH A CHOICE

Regency offers you two new exciting keyboard programmable hand held scanners. First there's the HX2000 20 channel, no crystal scanner. It offers UHF and VHF ranges with the important addition of 800 MHz and aircraft frequencies. And with features like search and scan, priority, liquid crystal display, and selectable search

increments, the HX2000 is a sure winner. If you don't need the extended coverage, there's the HX1000. It let's you cover your choice of over 15,000 frequencies on 30 channels at the touch of your finger. No crystals are necessary. Six band coverage, search and scan, priority control, and a liquid crystal display with special programming messages and clock are all part of the package. And with the sealed rubber keyboard and die-cast aluminum chassis, the HX1000 is the most rugged and durable hand held on the market.

CRYSTAL-CLEAR

If you don't need all the features of programmables, but you want the convenience of portability, we've got you covered. Our two crystal controlled hand held scanners, the HX650 and HX750, offer

six channels, individual channel lock outs, LED channel indicators, step control, two antennas and an adaptor/charger. Both cover VHF high and low, UHF and "T" public service bands, with the HX750 offering the additional coverage of VHF aircraft band.

DECIDE FOR YOURSELF

Your Regency Scanner dealer would be happy to give you a free demonstration of these and other new Regency Scanners. Stop in today. Or, write Regency Electronics, 7707 Records St., Indpls., IN 46226.


ELECTRONICS, INC.
7707 Records Street
Indianapolis, IN 46226

and subtle way, bring you close to their people.

I like the technical information too. The current schedule for ORF lists 22 active frequencies; my log shows the reception of all but four of these frequencies. UTC time and service area to be covered are also included as well as power output.

To satisfy my antenna interests beam angle as well as antenna type are included. Signals received are all influenced by propagation conditions, and comparative observations demonstrate the influence of antenna directivity as well as the short and long paths to your receiving site.

HOW TO GET STARTED

Spend some time selecting your station of emphasis. Choose a station you can receive well on a daily basis, preferably on at least two frequencies. Check out their various frequencies at the times signals are directed into your area. You should be attracted to their programming and willing to listen for extended periods.

These considerations can qualify you as a regular and interested listener. Keep a check on signal quality and programming content. Keep notes and build up a knowledge of their operations. Do this daily, if possible, for several weeks. Learn the station scheduling as well as names of programs and personalities.

After this initial period you are ready to send in operational SINPO reports as well as technical data regarding interference and propagation conditions that have an influence on reception. Program notes and comments help you establish a link with the programming department.

Ask to be placed on their mailing schedule. Write to their mailbag program faithfully. Follow their DX program (if they broadcast one) and contribute your own bits of DX information. Participate in all of their listener activities.

Be patient about their replies to you; remember, most all of the mail departments realize that most incoming mail is a once-and-done bit. Keep sending reports so your name becomes familiar to them.

Study each new schedule they send you as soon as it arrives. Look for changes and send in reports as quickly as possible. At



these times SINPO reports are most welcome for frequency or schedule changes as well as opinions on new or revised programs. Be frank and helpful.

Some day when the incoming signal is especially good try making a tape. If reception becomes poor over an extended period of time a tape is welcome that shows the results of interference and poor conditions on their received signal in your area.

Remember, they are most interested in the transmissions that are being directed to you; but log some of their other frequencies at times when their transmissions are being sent out to other parts of the world. Such a logging may be consolidated into a single report that may or not be of value to the technical department. When you do this

do not expect a deluge of QSL cards; you are doing this just with the hope of being of some limited help.

You can be a one-man fan club for your station in your own area and country. Contribute bits of information about the station to the various club publications. Try to recruit new short wave listeners by describing and demonstrating your general activities. Also show the specific closeness you have with your adopted station. It will take some time to build up such a portfolio but it will be well worth the effort.

A final step in the process is to learn as much as possible about the country that the station serves. Learn about its people, culture and history. Visit your local library or purchase a couple of books on the country. Libraries and schools often present free travel and other film documentaries about various countries.

Such information and your short wave activities may help you set up a hobby fair demonstration and, if you want to take on more than one country, you certainly can!

by too much distance to be of mutual service.

Finally we drove into one of the nearby towns (14 miles away) and found the location of the county fire service headquarters. We introduced ourselves as a contributing editor (myself) and proof reader (Mea) for Monitoring Times and were immediately dispatched to the office of the countywide civil defense director.

For the next half hour or so we had a most informative discussion of various radio transmissions and techniques and, in due time, I asked if he noted any interference from other stations that were not within his local service area. He replied that "...there was a lot of interference but it was only at this particular time of year."

Further questioning revealed that he was aware of the possible problem of skip conditions, but "...these stations aren't coming in due to skip. We're hearing them because of the sap running back down into the base of the trees. It's a proven fact and it happens every year in September."

Aw c'mon now. During my 36 years of service as a short-wave editor (and a licensed general class radio amateur operator for 44 years) I've been led down the primrose path a couple of times (anyone remember the infamous Nibi-Nibi incident?) but I've never in my life heard anything about sap running down into the base of the tree as being a good cause for station interference.

The poor guy looked me straight in the eye and he was deadly serious. He wasn't just some guy doing a job about which he knew nothing; he was experienced in matters of civil defense and, as I've said, he was serious. No one - NO ONE - will ever convince him that those outlying stations, some sixty miles or more distant, were coming in by any means other than the pure (?) and simple (!) means of the sap running back into the tree bases in September.

I mentioned all of this to the DXer who lived nearby and he offered the suggestion that it could have been as a result of the fact that I was located in the mountains some 1200 feet above sea level and the stations to the south, southeast and southwest were all located in much lower altitudes but I don't really buy much of that theory.

He could have been right, though. Here at home

BROADCASTING...

HANK BENNETT ON SHORTWAVE

When the Sap Runs Down the Trees

During the latter part of this past summer, your editor and his wife, Mea, spent four wonderful weeks on vacation at a remote spot in the northeastern part of the United States. I'm purposely avoiding giving any actual place names to prevent any possible embarrassment to a certain person who, like the locations involved, shall remain anonymous.

While we were "hibernating" up there in the mountains, we had several receivers with us which assured that we were able to cover frequencies from 535 kHz to 510 MHz. The frequencies on the upper end were covered in the trusty Bearcat 100 scanner which I had purchased earlier from Boss Man Bob Grove. With the assistance of a nearby DXer we were able to line up several frequencies so as to monitor a number of nearby municipal and county fire and ambulance channels.

As it turned out, the two nearest towns, both of good size, shared one common frequency while the county

in which they were located had their own frequency. Evidently all of the other fire stations within the county utilized the county frequency and this was not surprising since all of the other fire stations were located in mostly rural areas.

While listening in on the various transmissions during those few weeks, we noted quite a few transmissions coming in from other outlying areas, some as far as fifty to seventy miles away and from areas which were much less mountainous than our location.

It seemed rather strange to me that there should be so many stations operating within the confines of one specific frequency, especially since the various stations, while also being in the fire service, were in no way able to be of benefit to one another for mutual aid in view of the distances involved.

The more distant stations were in an area to the southwest, some 60 to 70 miles distant, while a second group was about 50 to 60 miles south-southeast, and the two groups were separated from one another

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*Specifications guaranteed from 25-1000MHz and 1260-1300MHz. No coverage from 1000-1025MHz. No additional module required for coverage to approximately 2.0GHz.

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. R7000985

HANK BENNETT cont'd

we often hear fire and ambulance services in Mercer and lower Hunterdon County, some 35-40 miles to the north. But here at home we're only 33 feet above sea level and there aren't too many trees between us and points north...

Back in the May 1985 issue of Monitoring Times I mentioned that Alta Dunlap of Malibu, California, had just received her Novice amateur license as well as having passed the examination for a Technician license. Now we're even happier to report that this fine lady has notified me that she has passed the code and theory examinations for General Class license.

And, as we mentioned last May, this was not easy chore for this lady is past retirement age for most of us. At that time she was on two meters but undoubtedly she will be showing up on other bands as well. Look for her--she's KB6CGP.

From the Static Department: While on vacation a letter came in from one of my acquaintances with a list of complaints. First he took me to task for not knowing exactly when the old WPE Program was begun. I had said in a previous column that it was in the mid 60's. I stand corrected. It was, indeed, in 1958.

The complainant also states that the WPE designation was sort of semi-authorized by the FCC. Not so. They simply said, in effect, that as long as actual callsigns were not duplicated, it was OK.

True, I did change WPE to WDX/KDX as part of the agreement made in 1970 when the magazine that had sponsored WPE dropped the program. As a result of this agreement I received all of the past issued WPE callsign identification assignments which I have to this day.

Further, it has been stated that I now charge as much as \$5.00 for a single-letter identifier. True. It's a fiver for either one-letter or two-letter identifiers. But what the complainant failed to state was WHY we charge that much for those more desirable identifiers. Out of that comes expenses for the certificates, the mailing envelopes, labels, postage, and free certificates for those who are unable to afford any certificate.

Need I say more? This gentleman makes a parting shot by stating he would not take my job if it were

offered to him. Fine. I agree. He couldn't handle it!

From Wrightwood, California, comes word that WB6FNI will operate from the Jet Propulsion Laboratory's Table Mountain Observatory, where he (also known as James Young) is the resident astronomer, to commemorate astronomical observations of Halley's Comet during the International Halley Watch.

Operation will be limited to 40 meters during the months of February and March 1986 on a non-interference basis with normal observatory activities. Frequencies and times: (all times in Universal Time) on CW 7120 kHz ± 5 kHz (Novice) 0400-0500; Phone - 7228 and/

or 7077 kHz (DX to Europe & Africa) at 0500-0600; on 7249 kHz (stateside/Western Hemisphere) at 0600-0700; on 7249kHz (Triple HHH Net) at 0700-0800; on 7228 kHz (to South Pacific, Australia, and New Zealand) at 0800-0900; on 7228 and/or 7084 kHz (DX to Asia/Far East) 0900-1000.

Certificate plus an original 1986 Halley's Comet photo taken at the Observatory for a #10 self-addressed stamped envelope (39¢ postage) stateside or five IRSS for foreign requests. QSL via the operator at P.O. Box 576, Wrightwood, CA 92397.

Join me next month when we do some scanner DX'ing on AMTRAK.

SWL WORLD WATCH

by Ken Wood

We are already into the swing of the DX season on the short-wave broadcasting bands and I hope you are spending a lot of time tuning the bands--there's a lot to be heard. Peruvian stations are doing quite well of late and so are many of the Africans.

Some listeners have told me that, after a couple of "downer" years, the Papua New Guinea stations are being heard more regularly once again. One note of caution if you're going to tune for these: many of the PNG's in the 120 and 90 meter bands are in the process of changing frequencies, so be sure of IDs.

There's also a new clandestine on the air from Korea according to the Clandestine Confidential Newsletter. It's called Echo of Progress, is located in North Korea and runs from 1100 to 1400 on 5885, in Korean.

The new transmitters of the Voice of Kenya have been heard on 7220 but not at the scheduled 0300 sign-on. It's more like 0330 here. This transmission is scheduled to run to 0630. Others are listed for 1530 to 2010 on 7220; 0630 to 1530 on 9725; and 1800 to 2010 on 4840 or 4980.

AFRICA

ALGERIA - Radio Algiers noted on 17745 with English news at 2000, followed by rock music.

BENIN - ORTB Contonou

on 4870 heard often lately, in French after 0500.

CENTRAL AFRICAN REPUBLIC - Radio Centrafrique on 5035 as early as 0428 with anthem, ID and talks in French.

CHAD - Radio Mondou on 5289 from sign-on at 0500 with interval signal, anthem, ID in French, and then local music. Noted a couple of times lately at quite good strength.

DJIBOUTI - Radiodiffusion Television Djibouti still noted occasionally at its 0300 sign on on 4780 but the Venezuelan, La Voz de Carabobo, has to be absent.

EQUATORIAL GUINEA - Radio Bata on 4925 noted at 0500 sign-on in Spanish. Usually only fair at best; lots of African music.

IVORY COAST - RTV Abidjan on 7215 after 0600, all French with music and talks.

LIBERIA - ELWA on 4760 in English at 0700 with ID and religious program.

MAURITANIA - Radiodiffusion Nationale Mauritaine, 4845 at 0600 sign-on, in French.

SAO TOME - Radio Nacional is coming in again at 0530 sign-on on 4806. All in Portuguese, but not all that strong.

SOMALIA - The Voice of America is now occupying Somalia's 7200 channel, but sometimes Radio Mogadishu's 0258 sign-on can be dug out from underneath the VOA's signal.

SOUTH AFRICA - Capital Radio, Transkei, noted at sign-on at 0300 on 3930 with English, but QRM from ham operators.

TUNISIA - Radio Tunis in French on 7225 from 0430 sign-on. Usually good.

ASIA

BANGLADESH - English news from Radio Bangladesh

heard at poor level at 1230 on 17645.

KUWAIT - Radio Kuwait in Arabic, with ID and music at 1900 on 9840.

MALAYSIA - Radio Malaysia heard in unidentified language at 1505 on 11770.

PHILIPPINES - Radio Veritas on 9570 at 1500 with news in English, listener mailbag program.

SYRIA - Radio Damascus on 11640 in Arabic at 2205. Better with English at 2055 on 12085.

VIETNAM - Voice of Vietnam heard at 1335 with English news, then commentary and Vietnamese music on 10040.

EUROPE

BELGIUM - BRT on 15590 noted with English and "Brussels Calling" at 1330.

NORWAY - Radio Norway International with "Norway Today" (on a Sunday) at 1300 to 1330 sign-off on 9590.

POLAND - Radio Polonia, poor in English at 2230 on 7270.

NORTH AMERICA

COSTA RICA - Radio Impacto, absent from its usual 6150 for about a week, was noted back on the air on 6140. They went through the same routine a month or two back and were badly QRM'd on 6140 the first time. Jeeves wonders why they're trying it again.

GUATEMALA - La Voz de Nahuala heard at 1035 on 3360 in Spanish. Poor, with time check and ID.

HONDURAS - Radio Luz y Vida, 3250, noted at 0259 with an English ID giving address. Back into Spanish.

NICARAGUA - Radio Zinica, Bluefields, 6120 noted at 1105 with music and IDs in Spanish.

SOUTH AMERICA

BOLIVIA - Radio Santa Cruz, 6135, heard at 1000 with good signals at times, but some rather deep fades. ID and into some sort of educational program in Spanish.

BRAZIL - Radio Educadora Rural on 4755 heard at 1000, all Portuguese and lots of music.

Radiodifusora Amazonas, 4805, often heard with powerful signals during the evenings lately.

Ditto for Radio Anhanguera on 4915, though this one is best in the mornings around 0800.

COLOMBIA - Radio Armonias del Caqueta, 4915, heard with sign-on at 1002.

ECUADOR - Radio Splendit sits underneath Cuba's

SWL WORLD WATCH cont'd

Radio Rebelde here. Rebelde has been a little inconsistent with its schedule of late, so if you need the Ecuadorian, keep checking this frequency.

Emisora Atalaya still noted often in the evenings on 4792.

Radio Nacional Progreso, 5063, heard at 0305 with all Spanish IDs, ads, time checks, music.

PERU - Recently heard Peruvians include Estacion C on 63245 around 0300; Radio Mundo at 0245 on 5120; Radio San Martin on 4810 around 1015; Radio Imagen on 5199 around 0230; Radio Los Andes on 5030 at 0120; Radio Frecuencia San Ignacio on 5801 to 0400 sign-off; and Radio Frecuencia Siete on 7010 at 0300. Signals vary in strength from very poor to quite good.

VENEZUELA - Radio Nacional, 5020, noted a couple of times varying up to 5022, nudging Rebelde.

Radio Occidente, 3225 at 0235 with music.

CHALLENGER:

The arrival of earlier sunsets opens up an opportunity to hear Greenland on

3999. Try around 0000 to as late as their sign-off just after 0200. It requires good conditions and a reduction in the usually heavy ham QRM in this area. Programs are in Greelandic and Danish on this one kilowatt station. A top catch by anyone's standards.

JEEVES SAYS:

My nightly reading in bed lately has been the new editions of Radio Database International (when I can sneak them away from Ken). I think you'll find them reviewed elsewhere in these pages (Nov MT.ed), but I can tell you it's a first rate piece of work and something that belongs in the shack of every short-wave broadcast listener.

Time to quit. Ken wants me to take the lawn tractor and sweep up leaves again. He likes to maintain the green look as long as possible into the fall and with all of the trees he has that means making a run every two or three days during the peak of the fall.

Hope you will do some listening and let us know what you are hearing.

Til next month, 73 from Ken and me.

Chinese music (not enough!) and rather long-winded folk stories with interesting cultural content. Since you can't miss them on the dial, you have probably already made up your mind about their programming!

INDIA-All India Radio

The Delhi outlet of A.I.R. is fairly often heard, but not often at good strength. The 11620 kHz outlet is the channel your editor hears best, rated at 100 kW. Frequencies in the 7 and 9 MHz band are also in service but not heard by yours truly, nor am I reading any reports of them. If any reader is hearing A.I.R. on such channels please write and tell me. The broadcast at 2100-2230 is heard on 11620.

ISRAEL

Kol Israel continues to be the reliable Eastern signal on 5915, 7410, 9435, 9815, 11605 kHz among other channels. The 0100 transmission on 7410 provides me with the best reception. part from news, programs such as "Spotlight" provide an insight into current events in Israel.

JAPAN-NHK Tokyo

This station has taken on a new lease of life as far as reception goes, with the use of the Moyabi, Gabon, relay site. Although signal strength continues to be irregular, good reception has been observed on 15300 around 0015. Other channels in use are 15420, 15195, 9735, 9645, 5990 kHz (courtesy ODXA-Grishin).

KUWAIT

Radio Kuwait continues to be heard on 11675 around 1800-2100 with news, comments and popular music. Transmitter is listed as 250 kW power which explains the

consistency of reception.

SOUTH KOREA

The K.B.S. from Seoul is variable in signal consistency but can quite often be heard in the 19 meter band if propagation permits. 15575 kHz is a useful channel, heard around 2300. Other channels in use at different times include 11810, and 9 and 7 MHz outlets. English news and political commentaries are featured and sometimes classical music.

TURKEY

Ankara has a consistently powerful signal across the dial around 2300 on 7215 and 9560 kHz. Programming includes news, political commentaries, talks about Turkish culture, and Turkish music of different types. Some of the political material is of limited interest unless you are a student of the history and background of the Armenian dissidents; but much of the music is unique and fascinating.

UNITED ARAB EMIRATES

U.A.E. Radio at Dubai has modern high-power stations which give variable but often strong signals. Best bets for reception in North America at present would seem to be: 15320, 15300 and 11730 kHz (ODXA-Ross) at 1600-1700 but other channels heard at times include 17775, 9695 and 7310 kHz (ODXA-Reid).

Please send any comments on this column to me c/o Monitoring Times. Next month will acknowledge correspondents support in past months. Please note that the aim of this column is to report what can be HEARD--as opposed to encyclopedic lists of English broadcasts.

ENGLISH LANGUAGE BROADCASTS

by Tom Williamson

This month we will look at broadcasting from Asia. Depending upon where you reside in North America this can be a difficult area from which to expect reliable reception, a fact which is not eased by the present tendency of some broadcasters to continue utilizing frequencies which are too high for reception at certain times of day. This is, of course, due to the present very low sunspot activity in recent years and likely to continue for at least a couple more years.

Anyhow, here is a look at some of the more consistent stations from the continent; if your favorite broadcaster is not here it's probably because of unreliable reception.

CHINA-People's Republic

RADIO BEIJING continues to be an important source of information about this huge country and its political and cultural facets. They are not as well heard at the moment, at least in the eastern part of N. America, as they used to be, in part due to the propagation problem. At present they are using 15520, 15385, 11860 (this latter being the best with your editor) kHz; they

have also used 15120, 11650 and 9820 in the past so check around, since the present results can hardly be satisfactory to their engineers.

Programs like Music Album, Music from China, Profile, and China in Construction may be of interest to you; and also there are numerous news and political comments (not usually as "heavy" as Radio Moscow however!). Folk stories, painting and philosophy are also featured quite frequently. Some of the ideas and viewpoints are strange to our Western minds, but they are of significant interest to the understanding of the world around us.

CHINA-Taiwan

Without wishing to get into any political trouble (!), I would point out that the Voice of Free China has an infinitely better signal than R.B. Of course this is due to the use of the Florida relay by WYFR which seems to dominate the dial for long periods of the day! Their "own" 6065 and 7285 kilohertz!

Programs tend to be politically rigidly anti-mainland, of course, but they do have some fine

SUMMARY CHART - Selected Asian Broadcasts to N. America

CHINA	Beijing	11860 15385 15520)	1200-1300 0000-0100
CHINA	Taiwan	5980 6065	0200-0400
INDIA	A.I.R.	11620	2100-2230
ISRAEL	Kol Israel	5915 7410) 9435)	0000/0100/0200- for half-hour segments
KUWAIT		11675	1800-2100
S. KOREA	K.B.S.	7550 15575	2200 2300
TURKEY	Ankara	7215 9560)	2100-2200/ 2300-0000
UNITED ARAB EMIRATES		11730 15300) 15320)	1600-1700

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*=Reprinted in 1986 "Best of Monitoring Times"

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 - THE EVOLUTION OF TV
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 - "IT'S FOR YOU"; Pers Comms
 - *PERSPECTIVES ON RADIO
 - ARMSTRONG AND RADIO
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 - IS CRYPTOLOGY YOUR GAME?
- Columns**
- SCANNING: DXpedition, II
 - *HIGH SEAS: Morse Code
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 - *HIGH SEAS: Calling Channels
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 - *Central FL & Cape Kennedy Gov't & Military
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 - HELPFUL HINTS: Bally Bearcat
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 - LABRADOR - I
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 - *ANTENNA SPECIAL
 - Ideas from Antenna Experimenter; SWL LPMA Antenna; Simple but Super Ground; Underground Antennas; How Long?; Compact SW Antenna; Optimum Rx on Grove Omni; Improving Grove Power Ant Big Sky Antenna; Catalogs
- Columns:**
- *UTILITY INTRIGUE: Radio Spectrum
 - SCANNING: Regional Rescue
 - HIGH SEAS: Ship tx freqs

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- NEW ARRIVALS: The Portable Office: New 900 MHz Converter from Hamtronics
- RADIO NOSTALGIA: Why Do We Call Wireless "Radio"?
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- GETTING STARTED: Wavelength and Frequency
- HELPFUL HINTS: Digital Scrambling and Scanner Squelch
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- LIBRARY SHELF: Radio Equipment Review; Police Call Radio Guide; Late Releases from TAB; International Radio Broadcasting
- PROFILES: Motorola Centracom
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 - LIBRARY SHELF: Illustrated Dict. of Electronics; Scan America's Traveler's Freq Dir; IC Master Guide to Utility Stats; Receiver Shopping List; Scanner Radio Data; The Spotlight Directory; AM Stereo & TV Stereo
 - TUNE IN ED NOLL: Tour Your State with a Car Radio
 - LISTENERS LOG: A Listener Surveys His Area (CA)
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- HIGH SEAS: Africa
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- BEHIND THE DIALS: *Yaesu FRG-9600; LF Engineering Low Freq Preamp
- LIBRARY SHELF: Communications Satellites; Air and Meteo Code Manual; RTTY Code Manual; Repeater Directory and Net Directory; Radioteletype Press Broadcasts; Fox Scanner Radio Listings, Baltimore/Washington, Houston/Beaumont, Buffalo/Erie; The New KGB
- LISTENER'S LOG: *Monitoring Stock Car Races; Harrisburg, PA
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Spanish-speaking stations in South Florida, this one openly declares that it is transmitting to Cuba and the Caribbean as well as South Florida. At night its signal is beamed directionally to the south toward Cuba. Only a brief identification on the hour is in English and some of the programming has a definite anti-Castro, anti-Sandinista tone.

Castro's reaction has been swift: Radio Mambi is jammed. In the mornings conditions are usually not too bad, but they deteriorate in the afternoon. In the evening hours often the jamming is overwhelming, and Radio Mambi is close to unintelligible as a result.

The jamming removes all doubt about Castro's ability to interfere with American broadcasters; however, he continues to leave Radio Marti alone, while privately owned Spanish speaking stations in South Florida encounter either no or very minimal interference.

Perhaps Cuba fears American retaliation if it hinders Radio Marti. Other Spanish stations may be considered more of an annoyance rather than a threat since they largely seek a domestic rather than international audience.

This last minute item on the Radio Mambi story has just been received from Hawaii's Chuck Boehnke. In early November Chuck, Richard Wood and Doug Martin received powerful signals from Cuba's Radio Rebelde. Chuck logged it on 712 kilohertz on November 4 from 0900 to 1000 GMT at his Hawaii location. It was logged here in Central Florida on November 13 at 0210 GMT.

Undoubtedly, the purpose behind this is to provide further interference for Radio Mambi in addition to that resulting from the conventional jammer. Castro obviously has an intense dislike for this station. Morning daylight hours at my location provide the best time to hear Radio Mambi over the Cuban interference.

Despite the jamming and possible interference from other broadcasters such as WOR New York and KEEL Shreveport, Radio Mambi may be audible at times in a large portion of the United States around sunset and during the hours of darkness. Along the Gulf and southeast Atlantic coasts daylight reception may also be possible. Your loggings of this station would be most welcome.

RADIO CAIMAN: An envelope mailed from Canada arrived. Inside was a strip

of white cardboard with a small picture of a caiman or alligator taped in the center. Below the alligator was the number 9960, the frequency used by anti-Castro Radio Caiman. In the upper right corner was a large letter "C" cut from a sticker used by Radio Caiman's sponsors in their efforts against the Cuban government. As usual there was no return address.

Could we call this a Radio Caiman QSL? In any case, muchas gracias, señores. Todos me gusta oír desde Radio Caiman. También me alegro que Ustedes lean mi columna.

COLOMBIA: On November 6 Colombia's largest guerrilla group, M-19, made a bold attack on the Supreme Court building in the heart of Bogota. Although the army retook the structure, there were many fatalities, including the Chief Justice of the Supreme Court.

With an increase in operations and the breakdown of its former truce with the government, it is possible M-19 may decide to reactivate its now silent clandestine transmitter. Known as Radio Marquetalia, it was last heard in April 1985 around 2100 GMT on 10543. Please let us know if you log this station or have additional information about it.

SO THEY TELL ME: There was an undisclosed casualty as a result of the Grenada invasion. A source who has spent considerable time on the island informs me that the Grenadan government and Cuba previously had definite plans to greatly increase the output power of Radio Free Granada's short wave transmitter.

A source very close to the VOA has verified for me C.M. Stanbury's claim that Radio Marti does, indeed, have a second transmitter site in the Florida Keys. He further stated that while he did not know when it would be fully operational, it would have both short wave and medium wave capabilities. Programs beamed to Europe may also originate from this location.

In April 1980 over 10,000 Cubans broke through the gates of the Peruvian Embassy in Habana and sought refuge. This event ultimately led to the Mariel boatlift and the arrival of 120,000 Cubans in the United States. Comandante David and other anti-Castro clandestine broadcasters have been given some of the credit for

PIRATE RADIO



by
John Santosuosso
 P.O. Box 1116
 Highland City, FL 33846

THE DEATH OF LASER: Last minute word has just been received that British offshore commercial pirate Laser 558 has ceased broadcasting. The ship "Communicator," from which Laser transmitted, was towed into the port of Harwich by the Government Department of Trade ship which had been blockading it.

The Laser crew had been unable to take on fresh supplies of food, water or spare parts since August. Conditions aboard the ship were described as "horrendous," and it appears that the deteriorating situation plus a storm finally forced the "Communicator" to send a distress call to the government surveillance ship.

Members of the Laser crew may be prosecuted for violations of the 1967 Marine Broadcasting Offences Act. Laser's British audience was estimated at five million persons.

Meanwhile, although it, too, has been under government surveillance, Radio Caroline apparently is managing to continue operations. The offshore pirates are quite popular in Europe.

WAQI RADIO MAMBI: Look out Radio Marti, Radio Caiman and La Voz del CID! There is a new kid on the block and he is packing quite a punch! It's 50,000 watt WAQI Radio Mambi, Miami, Florida, which now occupies the 710 kilohertz spot formerly held by WGBS Miami.

Radio Mambi takes its name from the title given to all men who fought in the Cuban war for independence against Spain. The station is owned by the Mambisa Broadcasting Corporation, 2960 Coral Way, Miami, FL 33145. There is apparently no connection with the clandestine short-wave Radio Mambi which is sponsored by Junta Patriótica Cubana, an umbrella organization for about 150 Cuban exile groups, and has broadcast on an off-and-on basis for several years. Armando Perez-Roura appears to be in charge of the operation but a number of other Cuban Americans are known to be involved.

Radio Mambi made its initial broadcast at 12:00 noon on October 23. It was first monitored here on November 4 and again on November 6 when it gave extensive coverage to the M-19 guerrilla raid on the Colombian Supreme Court building in Bogota.

Unlike most other

PIRATE RADIO cont'd

inspiring all of this.

Now, however, a source with impeccable credentials in Miami's Cuban exile community indicates that Castro may have directed all of these events from the start. After doing extensive research on the matter, he concludes that the Cuban leader was looking for a way to get those who would not support the revolution out of the country.

The people involved will not say much, but more clandestine broadcasting from inside or near Afghanistan has been seriously considered. An Afghan source recently returned from that area says jamming is the major obstacle. The VOA is almost always jammed, while the BBC is the target of occasional jamming efforts.

Meanwhile, you can try to hear Radio Free Europe/Radio Liberty's new Radio Free Afghanistan service; the program appears Tuesdays and Saturdays at 1345 GMT on 17750, 17895 and 21510; and at 2315 on 7295, 9625, 9660 and 11970 kHz.

CONFIDENTIALLY YOURS:

To Cuba Independiente y Democratica: I am glad to hear you are regular readers of "Monitoring Times." However, is anybody ever going to get that promised interview with Comandante Matos? To You Know Who: C. M. Stanbury had solid evidence for his claim that some (not all) Radio Swan transmissions originated from locations other than Swan Island.

BURMA: Although it was largely ignored in DX publications, this column reported some time ago that clandestine Voice of the People of Burma was broadcasting from the Burmese border town of Panghsan, not from inside China as was commonly supposed. Operated by the Burmese Communist Party, the station had been on the air since 1971. However, on April 16, 1985, Voice of the People of Burma appears to have made its last broadcast.

Less than a month after the final transmission, Burmese strongman Ne Win made a visit to Beijing. Relations between China and Burma were already improving and that improvement accelerated after the Ne Win visit.

China has drastically curtailed the shipment of supplies to the Burmese Communist guerrillas as well as pressuring them to silence their transmitter.

In this case the disappearance of a clandestine station tells us as much as the appearance of a new one. China wants good relations with Burma and is determined to keep it that way.

LEBANON: Pro-Syrian guerrillas of the Lebanese Communist Party attacked the semiclandestine Voice of Hope radio station on October 18. Five people, including three guerrillas, were killed in the raid, and the station's studios and a warehouse were destroyed.

The station is only two and a half miles from the Israeli border in an area controlled by the pro-Israeli South Lebanon Army. It is operated by High Adventure Ministries of Van Nuys, California.

The Voice of Hope operates on 6215 kilohertz as the King of Hope. According to some reports, despite the attack broadcasts were continuing, and the station planned to go ahead with a previously announced frequency shift to 6280 kilohertz.

EL SALVADOR: Dave Alpert of New York sends along information on a black clandestine version of Radio Venceremos. According to Associated Press writer Joseph Frazier, the black clandestine uses frequencies and schedule times very similar to the genuine Radio Venceremos, although it broadcasts only occasionally.

Programs are designed to give the government position and demoralize and confuse the guerrillas. El Salvador government officials deny any connection with the station.

THAILAND: Also from Dave Alpert is a brief report on an unsuccessful military coup in Thailand during September. The leaders did for a time take over major radio stations in the capitol city of Bangkok.

TROUBLES ON THE HIGH SEAS: And Dave sent still additional material on Laser 558, the American owned off-shore commercial pirate which began operations May 24, 1984. Laser 558 is located on the ship "Communicator," anchored just a few hundred yards from Radio Caroline off England's southeast coast.

When the magazine "Campus Voice" paid Laser a visit on its first anniversary, things seemed fine enough; however, the disc jockeys and crew did complain of boredom. But the September 28 issue of

"Melody Maker" reports several deejays jumped ship and only two were still on board. Laser missed a payroll, and a blockade by a British patrol boat was preventing it from taking on fresh supplies of water and food.

OTHER NEWS A November 13 ABC TV news report claims that Radio Monte Carlo had a part in the "Achille Lauro" story. Muhammed Abbas, whom the United States accuses of planning the ship hijacking, supposedly used the station's Arabic service to send an encrypted message to the "Achille Lauro" telling the hijackers to end it.

From his Minnesota location Marty Croze has had considerable success in logging Radio Caiman. In the past Marty has contributed logs of this station when it was using its "Radio Nat King Cole" format. On October 13 he received Radio Caiman on 9960 around 0010 GMT. He is also hearing La Voz del CID's Radio Camillo Cienfuegos on nearby 9940.

From the Province of Quebec in Canada, Martin Barry heard a strange

station alternating between 6045 and 6120 kilohertz. The station was logged October 9 around 1500 GMT, gave no identifications and played a mix of jazz, banjo and calypso. Among the songs played was the familiar tune "Yellow Bird." Martin heard it until 1651, and the signal was quite strong. He concludes it may well have been a Canadian pirate.

Probably because of the August closings of Missouri's KKMO and Arkansas's KBBR (which also broadcast as KQRP and KRZY) by the FCC, pirate activity has declined in recent months. However, the Christmas and New Years holidays have traditionally been favorite times to broadcast. Pirate fans may have some luck around those days.

Don't be surprised if pirates move away from the formerly-favored frequencies in the 41 meter band; there is just too much interference there now. In the past frequencies between about 6200 and 6300 as well as around 6900 and above have been used. They may be worth watching in the months ahead.

"Los Numeros"

32444 69213 88816 52196 63811 94216

Havana Moon



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+++++
au pays des aveugles les borgnes ont rois*
+++++

ADIOS

IT IS WITH DEEP REGRET that I will be forwarding my last column to Monitoring Times in just a very few days. This 1986 "farewell column" will--at long last--provide "numbers" monitors with the locations of some U.S.-based 5-digit Spanish transmitter sites. Till then...

MAILBAG

A reader from the Rockies checks in with some 4-digit Spanish information that I think you'll find interesting. Here's just a portion of what this monitor and "los Numeros" readers

* In the land of the blind the one-eyed are kings.

has to say:

"...Here are two particularly interesting numbers intercepts I've made recently. The first was October 13th at 0411 UTC on 6802 kHz. These were 4F Spanish numbers from a YL. They were quite weak and on USB of all things. A few nights later (Oct 16, UTC) at 0211 UTC, I heard the same YL with 4F Spanish numbers using AM on 5812 kHz. The signal that evening was excellent, putting my S-meter (TS-430S) at 5. The strange thing about these is that the woman's accent is decidedly Cuban. But Radio Havana at 6140 kHz at that same time had a really poor signal. She was not in Cuba. She had to be closer, and bearing in mind my QTH, that's indeed puzzling..."

Thanks very much for this interesting intercept, James. Patrick Kerrigan, city and state unknown, checks in with some very interesting information this month. Pat says that he heard part of an introduction to a "numbers" transmission on the frequency of



LOS NUMEROS cont'd

6775 kHz on 19 August at about 0645 hours. In Pat's words:

"...I heard a short piece of music, which was followed by a YL, in English, who made a statement about the Cuban story, with a slight Hispanic accent. This seemed to be cut off as if someone made a mistake. This was followed by some tones and then a carrier until 0700 hours. At this time a 5-digit Spanish transmission came on until about 0707 hours. During and prior to the transmission I heard--what sounded like--SSB traffic in the background..."

Pat also says that he enjoys reading the column and is an intelligence bug. Be sure to read the upcoming "farewell" edition of this column, Pat. You and other readers will find it most revealing.

Ralph Fellows of Germany has offered a very nice service to this column. Since there will be only one more edition of "Los Numeros," Ralph, I would suggest you contact John Santosuosso. You'll find John's address elsewhere in this and previous issues.

Thanks very much for the offer and the nice letter, Ralph.

THE INTERCEPTS

A Florida source with unimpeachable credentials reports the intercept of a 3820 kHz 5-digit German transmission at 2200Z on October 3rd. This South Florida source says that each group was repeated twice and signal strength was very good. Transmission mode was AM. Said transmission resulted in some rather unkind remarks from a few of the hams that were attempting a QSO on that frequency.

This was possibly the same German transmission that's often reported by New England monitors.

Another Florida monitor near Boca Raton reports a very strong 5-digit 196

group Spanish transmission on 4125 kHz at 0230Z on November 7th.

I find it very strange that a "numbers" station would make use of one of the international ship station calling frequencies. But, as Rosetta Tharpe used to say: "There are strange things happening every day."

++++
MIAMI SITES
++++

sans Crockett and Tubbs
++++
THE INFORMATION FOUND HEREIN HAS ORIGINATED FROM AN UNIMPEACHABLE SOURCE. THIS INFORMATION WAS VALID AS OF 01 JANUARY 1985.

SITE #1

Location: southwest of Miami, Florida.
This site has various tenants including: INS/BP offices and a U.S. Prison. In addition: A U.S. Navy time services station with VLF/HF and one 16 meter dish antennas (This is probably a dish for FLTSATCOM).

This site is very near a major Dade County recreational area and was a U.S. Navy Blimp site during WW2. The CIA and various anti-Castro groups once conducted various activities from this location.

SITE #2

Official Name: U.S. Army Communications Service Detachment
Location: Just west of the new Dade County Metro Zoo.

This site contains three fenced lots and two wooden buildings. Two of the lots contain HF log periodic antennas. A large number of VHF/UHF directional and unidirectional antennas are also located on various buildings and towers. High speed encrypted RTTY on 149.000 MHz FM is being transmitted north from this location.

In addition: a security guard armed with a .38 cal. revolver and a 9mm UZI SMG patrols the compound on foot.

U.S. Army/N.C.S. signs are also present at this site.

SITE #3

Official Name: USCG COMSTA Miami

Location: NE corner of site #1, at Florida Turnpike.

This site is host to dozens of various HF antennas including log periodics, rhombics, conical monopoles, and a 250 ft. tower with VHF/UHF unidirectional antennas.

Any other activity other than USCG is unknown.

SITE #4

Official Name: U.S. Navy Security Group, Card Sound Road Operations

Location: Card Sound Road, about four miles south of Florida City.

This site is host to a multistory building, set inside two rings of 150 ft. (approx.) radio towers. A 20 ft. high fence encloses the entire compound. Armed U.S. Marine guard patrol this compound day and night.

A very BIG THANKS to this Florida source.

COMMENTS

The "two rings" as mentioned above are RDF arrays and are operated by Naval Security Group and National Security Agency. Common nicknames for arrays of this type are "dinosaur cages" and "elephant pens."

Numerous clandestine-like operations exist in the Florida Keys and in several areas just north of Miami. There's also NSA/Miami, Army Security Agency/Miami and various Cuban Intelligence (DGI) front operations in the Miami area.

N.C.S.

This is--in all probability--another site of the National Communications Service that's headquartered at Warrenton, VA. There is also a western U.S. N.C.S. site among others.

RADIO CAIMAN a/k/a RADIO NAT KING COLE

Thank very much for the non-QSL with the stickers and the alligator. I read you "loud-and-clear." Is that a copy?

A photo of this "non-QSL" is reproduced here. Again, thanks.

MEMO TO TEXAS

I do not compromise sources. I'll give up a story before I'll "burn" a source.

MILITARY MORSE

The Defense Department has announced that it has decided to consolidate the Morse training centers of the Army, Air Force, Navy, and Marine Corps at Fort Devens Army Base in Ayer,

MA.

Training centers to be closed: Morse centers at Keesler AFB at Biloxi and Corry Station at Pensacola.

NEW RADIOS

Press Reports indicate that Nicaraguan rebels will soon find themselves in possession of very sophisticated radios. Giver of these wondrous gifts is our very own CIA. I told you there was a Santa Claus.

It's said that the rebels are in need of more sophisticated radios so that intelligence information they receive from the CIA--via radio--can be broadcast to their base camps without being intercepted. One source says that the other side was intercepting as much radio transmitted information as the Contras were.

TRIVIA ANSWERS

I darn near forgot about the answers to the trivia questions in a previous issue of MT. The answers: YKW were the initials for "you know who." The southern broadcaster was WLAC, Nashville, Tenn. The records sold by mail were from the Randy Record Shop, Gallatin, Tenn.

DECISIONS

Life is full of the decisions. One of the more difficult decisions was made just a few weeks back. As you now know, I have decided to bring "Los Numeros" and Havana Moon to a respectful end. As another "numbers" writer reported "...numbers writers are getting tired."

NEXT AND FINAL INSTALLMENT

Location of some 5-digit Spanish domestic sites. In addition: a look back, a look ahead, what one California group thinks the numbers in the logo equate to, a reading list and one of the most bizarre transmitter projects you'll ever read about. Be sure to catch the big and final adios.

THANKS TO

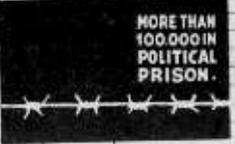
James from the Rockies, Patrick Kerrigan, the source with unimpeachable credentials, Ralph Fellows, Radio Caiman, Willie of the Valley, and those that wish to remain anonymous.

Time now for a Tecate and ...

Adios,
Havana Moon y Amigas

The views expressed in this column are those of Havana Moon and do not necessarily represent the views of the MT management, staff or readers.

PART NO.	DESCRIPTION	DATE	IN	REFERENCE	OUT	BALANCE	DATE	IN
	GREETINGS FROM							
	RADIO CAIMAN							
				9940 kHz				
				9960 kHz				



THE IRAC MICROFICHE: A Real Eye Opener!

by Rickey Stein

Many readers of Monitoring Times have purchased the IRAC unclassified microfiche files from Grove Enterprises containing listings of government agencies. The IRAC fiche set is comprised of 80 cards arranged by frequency, 9.375 kHz through to 8635 GHz. These cards contain more than 21,400 pages of information on over 150,000 Federal assignments! That's a mind-boggling amount of information.

I was very much aware that the list was of unclassified assignments and would not openly list such agencies as one would expect to have a classified status--FBI, DEA and the like. Secretly, I was hoping that snuggled somewhere within these 80 4x6 sheets of film would be some of those very agencies' listings perhaps in a clandestine or oblique manner.

For almost two years the fiche cards sat in a drawer, used only occasionally to check a frequency I had received or some information that I had exchanged with another monitor. That was the situation up to a couple of months ago.

On the way to work one day I noticed a Naval facility that I had not been aware of before; there were antennas on the roof! I spent a day going through the cards, searching for a listing. Nothing. I decided to pull out all of the listings for my local area, enter them in a data-base computer listing and then print them out in ascending frequency order. It was quite a job and it took several weeks.

Although I never did find a listing for that Naval facility, I did discover some of those snuggled clandestine listings I had hoped to find. The listing that first caught my eye was 166.100 MHz. This was a fixed base listed to the State Department on the fiche but everyone here knows it is used by the United Nations for security.

I quickly scanned the list and found 165.6125, also listed to the State Department and also know to be used by the U.N. as a voice paging channel. Right below that was 165.7125, a frequency with which I was not familiar; I programmed that into my scanner and-- behold, another U.N. Active frequency!

The list of fiche frequencies now became very

interesting. In addition to those frequencies already mentioned the following were also listed:

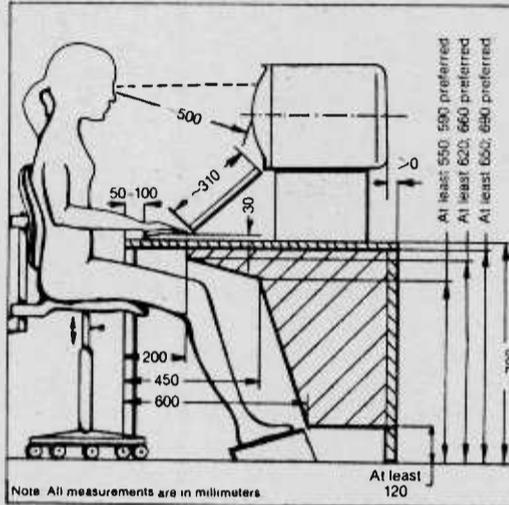
- 170.5750 No activity heard yet
- 407.6000 KHA-200 mobile
- 408.1000 KXJ-780 mobile link
- 408.6000 KHA-200 mobile
- 409.6250 KHA-202 fixed base rprtr/mobile link
- 409.7000 KXJ-780 fixed base repeater

I have no doubt that there are other very interesting bits of information hidden away in those listings just waiting to be discovered by sharp-eyed and sharp-eared monitors. The fiche cards are still available from Grove Enterprises and I would heartily encourage every active monitor to pick up a set NOW. New editions will not be forthcoming due to changes in the Freedom of Information Act and this may be the last listing of this type to be available for a long time to come.

COMFY?

Ergonomics is the art of matching machines to human beings and the environment. The figure printed herewith was taken from a West German labor Union report and illustrates the ideal seating considerations of a computer terminal operator.

Similar considerations may be assumed for the radio listener at his operating position. All measurements are in millimeters; divide by 25.4 for inches.



New Computer Bulletin Board

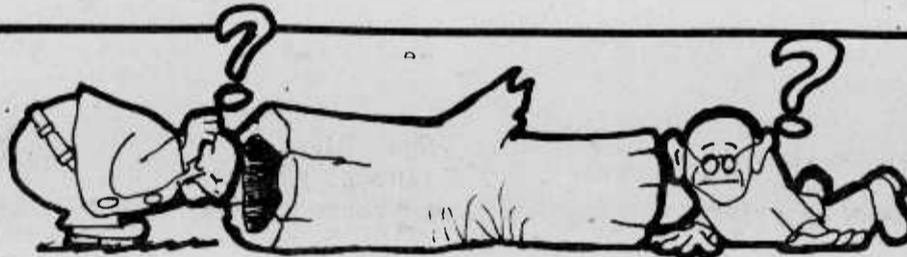
by G. S. Danes

A new bulletin board open to the general public in the D.C. area is called "SMA Industries" and eventually will have certain products for sale. The BBS supports both 300 and 1200 baud modems.

This BBS is easy to use--you just log on, give your name and follow the menus. What makes this different from many bulletin boards around is that its sysop (system operator) has allowed a message section for scanner and shortwave hobbyists.

Those people who have radio news, items for sale or various hints and kinks to our hobby now have a new electronic medium to use. For those familiar with bulletin boards, this one is a "fido" style board and is very "user friendly." Give it a call and share some info on the radio hobby!

Hours are Monday through Sunday 06:00 to 24:00; ph# 703-250-1837.



Listener's log

SPRINGFIELD, MO, SCANNING
contributed by
Kent Hawkins WBØTVY

Police Department		
Base	Mobile	
460.100	465.100	N. Side
460.225	465.225	S. Side
460.400	465.400	TAC
154.86		Wx info

Fire Department		
Base	Mobile	
453.100	458.100	Primary
453.600	458.600	Secondary

**JOHNSON CITY, TN,
AND TRI-CITIES SCANNING**
contributed by Curtis Harbin

Police Department		
154.725	Johnson City	
155.010	Kingsport	
155.700	Bristol, TN	
155.595	Bristol, VA	
154.785	Greeneville	
155.055	Jonesboro	
154.700	Bluff City	
155.640	Bluff City	
155.580	Mountain City	
155.130	Erwin	
155.415	Elizabethton	

Sheriff's Department		
155.250	Washington Co.	
155.640	Sullivan Co.	
155.415	Carter Co.	
155.130	Unicoi Co.	

154.785	Greene Co.
155.580	Johnson Co.
155.580	Hancock Co.

Fire Department	
154.250	J. C. Fire
154.235	Kingsport
154.250	Bristol, TN
155.025	Elizabethton/ Carter Co.
154.370	Greeneville
154.130	Avoca VFD
33.480	Bloomingsdale VFD
33.640	Central VFD
33.52	Fall Branch VFD
33.84	Gray VFD
154.220	Piney Flatts VFD
33.960	West Carter Co. VFD

**Rescue Squads, Ambulances-
Med Com Dispatch**

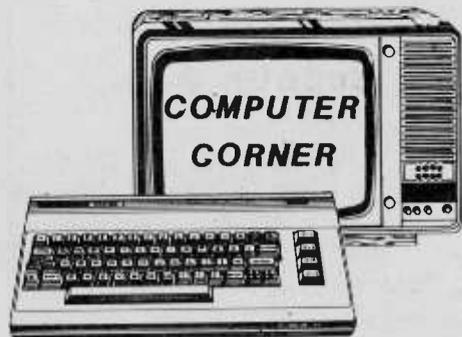
15.205	State-wide EMS all cities Med- Com Dispatch
155.160	Carter Co Rescue
155.160	Gray Rescue
155.160	J.C. Rescue (Hazard- ous Materials Team -Paging)
152.480	Greeneville Rescue- Paging
155.340	EMS Ambulance to Hosp (Statewide)
37.26	Inter-city (low band)
155.370	Inter-city (high band)
154.755	Mutual Aid

163.250	Hospital Paging (Tri-Cities area- all hospitals)
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Utilities	
153.530	J.C. Power Board
153.455	J.C. Water
154.100	J.C. City Services
153.410	Elizabethton Power Board
155.025	Elizabethton Water
37.700	Kingsport Power

Mobile Phones	
152.030	RCC Ch 1-Kingsport
152.060	RCC Ch 3-J.City
152.120	RCC Ch 7-Bristol
152.150	RCC Ch 9-Greenev11
152.210	RCC Ch 13-Secode Johnson City
152.720	Telco-J.City
152.630	Telco-Bristol
152.810	Telco-Kingsport
152.540	Telco-Greeneville
152.240	RCC-Paging (Tri- Cities)-Dial-Page
152.840	Telco-Paging (Tri- Cities) United Telespectrum

State Police - T.H.P.	
42.420	Base
42.260	Mobile-Base
42.280	Mobile-Base
42.360	Mobile-Mobile
45.66	Mobiles
42.860	Mobiles-Base
155.505	Holston Mt. Rptr. Link (Mobile)
159.090	Bays Mt. Rptr. Link (Mobile)
45.580	Mobile-Base
45.700	Mobile-Base & also TBI use
42.420	Car-car
148.150	Civil Air Patrol



by
C.W. Ellis
 P.O. Box 202
 Ulster, PA 18850

COMMUNICATING - DIGITALLY

Last month I promised you a look at RTTY and Morse reception via computer. I'm going to go one better and include the story of packet radio--the latest and hottest new communications mode for the radio amateur.

WHAT IS PACKET RADIO?

Packet Radio is a form of digital communication between computers using radio as the link. It is usually done with small home computers but can be done with a dumb terminal; the only requirement is an RS-232C interface, standard on most microcomputers.

A dumb terminal is normally a display and keyboard with enough logic to allow keyboard input to be sent to the screen and down the cable to whatever it is attached to, and in return accept data from the cable for display. A dumb terminal is characterized as not having the ability to mani-

pulate data such as a computer would.

The dividing line between terminals is indistinct, as there exist dumb terminals, smart terminals, personal computers, and all sorts of work stations in between. A teletype machine hooked to a phone line is as good an example of a dumb terminal as any. In fact, the first display/keyboard combinations were nicknamed "glass teletypes."

The merging of radio, communications and computers is surely creating a mixed mess of terms. I know of large IBM mainframe computers that use the command "Dial" as a hangover from the days when the computer actually dialed phone numbers, but the command is now used to call other system access programs rather than the phone company.

Getting back to our topic, the terminal or computer RS-232C interface attaches to an adapter called a Terminal Node Controller (TNC). The other side of the TNC connects to a radio. Two stations involved in packet communications operate just as they would using modems and telephone lines.

NAME DROPPING

Lyle Johnson, WA7GXD, President of Tucson Amateur Packet Radio Corp., who is quite active in packet radio and the Tucson Amateur Packet Corporation, deserves a lot of credit for helping to advance the state of the

and the new, multi-agency Drug Enforcement Policy Board.

An FCC official was quoted as saying he "knew of no location" where all the channels on the list were available. English speculated that "the information was purchased from government sources."

Jane Vezeris, a Secret Service spokeswoman, stated that her agency is very much aware of monitoring and agents were careful about what they say over the airwaves, switching to voice privacy when necessary.

In a related story, the Associated Press reported that a former National Security Agency (NSA) communications specialist was arrested on espionage charges.

Ronald William Pelton, 44, worked for the super-secret spy agency from 1965-1979, reputedly meeting with Russian agents and selling information about U.S. intelligence gathering systems aimed at the USSR.

art. Also heavily involved for many years is a group of radio amateurs in Vancouver, B.C. I understand that they have set up a protocol for packet transmission and in general promoted the use of digital communications for many years. Unfortunately, I am unable to come up with an address for them.

TAPR sells equipment to get into computer communications, as do GLB Electronics and others. Below are addresses of some companies involved in hardware for computer/radio communications.

Advanced Electronic Applications

P.O. Box C2160
 Bldg O&P 2006 196th SW
 Linnwood, WA 98036-0918

AMRAD

1819 Anderson Rd.
 Falls Church, VA 22043

Bill Ashby & Son
 P.O. Box 332
 Plukemin, NJ 07978

GLB Electronics
 1952 Clinton St.
 Buffalo, NY 14206

Heath Company
 Benton Harbor, MI 49022

Kantronics
 1202 E. 23 St.
 Lawrence, Kansas 66046

Packeterm
 Box 835
 Amherst, NH 03031

Richcraft Engineering Ltd
 #1 Wahmeda Industrial Park
 Chatauqua, NY 14722

Tucson Amateur Packet Radio Corp.
 P.O. Box 22888
 Tucson, AZ 85734

VADCG
 818 Rondeau St.
 Coquitlam, BC, Canada

I have been told that packet radio and computer communications were well represented at the Dayton Hamvention. Representatives were there from the ARRL, the Miami Valley FM Association and the St. Louis Amateur Packet Radio Association, as well as others whom my informant couldn't remember.

In March of this year, the fourth ARRL Computer Networking Conference was held in San Francisco, co-sponsored by the American Radio Relay League and the Pacific Packet Radio Society. The ARRL Computer Networking Conference papers are an excellent source of information on developments in amateur digital communications. The Proceedings may

be obtained from the ARRL by mail.

Now that we know where to get our equipment, just what do we need? As stated above, a TNC is required to make the appropriate hardware adaptation between the radio and the computer.

Judicious tuning of the receiver presents the mark and space tones to the TNC which, in turn, decodes them and translates them into TTL levels to feed the computer RS-232 port input. Most TNC's have an LED or other tuning indicator to indicate when data is being decoded.

We will also need one more element to complete our setup--software. I have already seen and used several packages written for packet and Morse/RTTY reception. I am currently looking for more public domain software with intentions of making it available to readers, but it is a slow process.

Some digital enthusiasts are using a software package called PC-TALK III on an IBM pc to "read" the TTL signals and convert them into letters for display. I have heard of the popular bulletin board package RBBS being used in modified form to do the same job.

As for some of the other home computers out there, firms such as Kantronics have software for the Commodore, the Timex, Apple, etc. A good source of information on various brands and offerings is the advertising in Ham Radio, QST and others.

KEEPING EVERYONE TOGETHER

Having everyone transmitting and receiving on the correct frequencies is only a small part of the game in digital communications. While the RTTY and Morse transmission speeds are pretty much standardized (both amateur and commercial), the packet mode is still undergoing refinement. In computer terms, the rules followed in any given area of endeavor are called "protocol," a fancy word for "standard procedure," and two protocols are in general use by amateurs today:

- * The Vancouver protocol developed by the group mentioned earlier and
- * AX25 which is a subset of the standard X25 protocol, a modified version of A25 which is more widely used in commercial networks.

With packet radio, amateurs can connect with another station and send messages back and forth. They can transfer large

COMPUTER CORNER cont'd

quantities of data from one station to another, run programs in the other stations and in general do almost anything with each other's station as if they were physically present.

There are more and more digital repeaters coming into use which extend the range of any stations covered by the repeater network. If you run into the term "Digipeater," this is what is being talked about.

There is a satellite in orbit at a high altitude where it is used as a repeater with coverage of almost one-half of the earth. Amateurs have been using this satellite to communicate packet data using their home stations for some time now. This is, I think, their tenth satellite.

The Amateur Radio rules and regulations were recently amended to provide for digital transmission via packet, following a Special Temporary Authorization (STA) from the FCC. The amateur HF bands provide world-wide communication via Morse, RTTY and packet as well as the usual voice transmissions. Most of these bands are restricted to 300 baud operation due to the FCC rules just mentioned.

Packets have been exchanged between the U.S., Australia and New Zealand. Data is routinely exchanged throughout the U.S.

READING UP ON IT

For those of you who want to know more about computer reception of Morse, RTTY and packet, here are some references to get you started:

- Jan 1985 QEX (published by ARRL) - interfacing to the IBM PC bus for packet radio
- Jan 1985 73 magazine - "Shoestring RTTY," by David Oliver, W9ODK
- Feb 1985 QST - the "On Line" column contains a condensed history of packet radio
- Mar 1985 QST - long distance packet radio transmission between U.S. and England
- July 1985 QST - "What's All This Racket About Packet," by Harold Price, NK6K
- Aug 1985 QST - "A Closer Look at Packet Radio" again by Harold Price

Next month we will take a look at some hardware and relate some personal experiences with RTTY reception, and perhaps look at some of the pitfalls that might be encountered.

PACSAT: The Mobile Satellite for the Developing World

Reprinted from the September 1985 issue of PERSONAL COMMUNICATIONS with permission by the author and the publisher.

Somalia, East Africa, India, Costa Rica. These are probably not the places you would think to look for breakthroughs in satellite communications. Soon, however, PACSAT (the PACket SATellite) will bring inexpensive and easy-to-use personal communications to the developing countries.

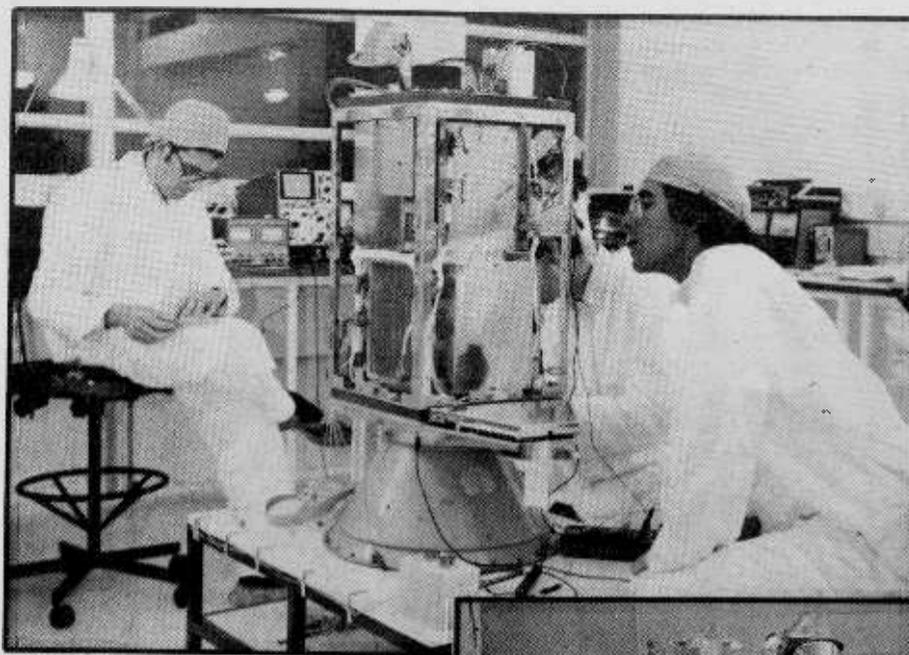
Linked by satellite with agricultural data banks, weather information and engineering experts, volunteers in developing countries will be able to send and receive vital technical information over inexpensive, transportable ground stations. Relief crews will be able to communicate with the central region of an earthquake-shattered country, relaying needed information and tracking down supplies. Teams traveling in dangerous, rugged territory will be able to stay in touch with others who can monitor their route if rescue becomes necessary.

PACSAT is a joint project of the Radio Amateur Satellite Corporation (AMSAT) and Volunteers in Technical Assistance (VITA). For 25 years, VITA has been providing technical assistance to Third World nations through the mails. PACSAT will act as an orbiting mailbox to increase the timeliness and reliability of this important information. Radio amateurs ("hams") will also be able to use PACSAT to communicate with each other around the world.

Send, Receive Messages Anywhere

The satellite will be able to receive a message from any point in the world, hold it and deliver it to any other point in the world. The ground equipment needed—including the antenna—will fit inside a briefcase, will run off of batteries and should cost less than \$1000 to manufacture in small quantities. A prototype of this type of spacecraft is already in orbit. If you have an amateur radio license, you'll be able to use two "production" spacecraft that should be in orbit by mid-1987.

If you're involved in personal communications, you've probably been exposed to electronic mail systems. Most large com-



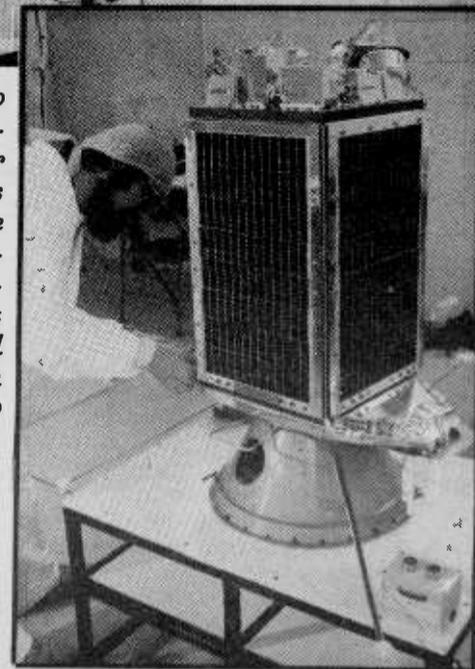
PACSAT will be similar to the UoSAT-OSCAR 11 spacecraft pictured here. Oscar 11 was built by researchers and radio amateurs at the University of Surrey in England. Among its many experiments, it carries a packet radio package designed and built by radio amateurs in Canada and the U.S. Photo credit: Dr. M.N. Sweeting, University of Surrey.

puters these days have a provision for electronic mail, which uses the data storage capability of the computer to save a message so it can be retrieved later by others. Some computers are linked together and pass messages between them, so that users of one computer can leave messages for users of another. Users of smaller, "personal" computers use electronic mail—by linking their computers together or by leaving messages on a central computer called a "mailbox" or "bulletin board."

Launched by Space Shuttle

PACSAT, currently under development for a launch by the Space Shuttle sometime in 1987, will use a mode called "packet radio" as its primary access system. Packet radio is not new, but it is just now starting to see wide use by amateur and commercial radio systems.

Packet allows for error-free exchange of information and permits the simultaneous use of a single radio channel by multiple



users (see sidebar). This process allows computers to be hooked up via radio in an efficient manner. Although these procedures have been available for many years, their cost and complexity have kept them out of the hands of most users. Radio amateurs have taken packet radio and added their own unique touch: extreme low cost and compatibility with existing radio systems.

PACSAT: What It Does

PACSAT will circle the globe in a low polar orbit. It will pass over the north and south pole once every 90 minutes, 500 miles up. At the same time, the earth is spinning underneath it once every 24 hours. The net effect is that PACSAT passes over any point on the earth four times a day. It will be in sight of any given location for an average of 10 minutes each pass.

When PACSAT is in sight, a ground station can transmit messages for storage in PACSAT's memory and/or retrieve messages from PACSAT's memory. The data transfer rate will be at least 4800 baud—or about 480 characters each second. Allowing for varying amounts of overhead (i.e., information that is not part of the data being sent), a ground station can send 216,000 characters during a pass.

Although this is a small number compared to the data rates achieved by the large geostationary satellites now in orbit, consider the following: To guarantee global coverage—so that any two stations anywhere can pass information—three geostationary satellites are required. At least two additional well-equipped ground stations are required to move the messages between satellites if the users are on opposite sides of the earth. Otherwise, the satellites must be able to pass messages directly between themselves.

These types of satellites require either (1) large antennas on the ground, or (2) extremely large and expensive antennas in space.

Coat-Hanger Antennas

PACSAT is different. Because of its low orbit and relatively slow data rate, a PACSAT ground station can use an omnidirectional antenna constructed from an ordinary coat hanger. The rest of the day, you can store the receive system in your coat closet.

The disadvantage of a store-and-forward message system such as PACSAT is time. You

PACSAT DEFINED

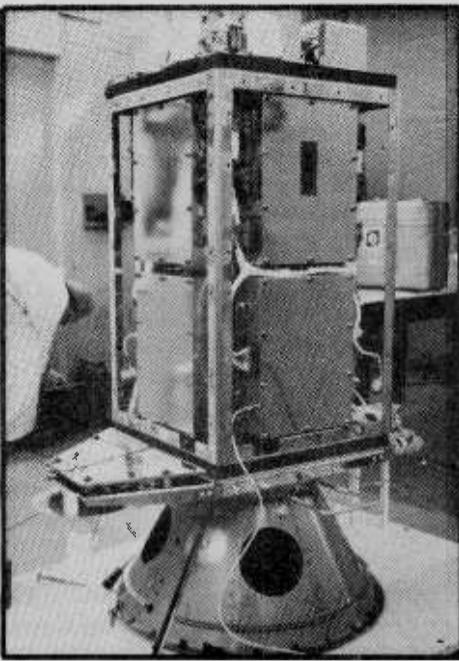
In its simplest form, packet radio connects one computer to another via radio for error-free data communication. A device called a "terminal node controller" (TNC) takes your message, formats it into small sections called "packets" and uses a radio to transmit it at high speed. At the same time, the TNC "listens" to the radio and sends received messages to your computer. TNCs are available today at prices below \$200.

You obtain error-free communications because the destination station confirms the correct reception of each packet by transmitting a short acknowledgment. The source station retransmits each packet at random intervals until it gets an acknowledgment. Although this process sounds complicated—and it is—the

tasks of formatting packets, adding address and error-check codes, transmitting, retransmitting, acknowledging, and monitoring are done by the TNC. The computer simply sends and receives data in the same way it would if it were connected to a standard telephone modem.

The important benefit that results from this business of breaking data into small individually addressed packets is spectrum efficiency. With packet radio, you can use the same frequency at the same time as many other stations. You simply insert your packets between others' packets. Each station's unique address keeps the messages separate. The error detection and acknowledgment procedures take care of the cases in which two stations transmit simultaneously.

-H.P.



PACSAT cont'd

can only send and receive messages at certain times of the day or night. Because the spacecraft is actually carrying your message from you to the destination, time is lost. Depending on the location of the source and destination station, the message can take as little as zero minutes or as long as 10.5 hours to relay.

Because PACSAT is optimized for slow, short and sporadic messages and because low cost and portability of the ground stations are of prime concern, the time and rate problem is not important. (This line of reasoning is known as "matching the application to the resource," or turning "bugs" into features.)

PACSAT will be built mainly by volunteer labor, and estimates of its cost are less than \$1 million. Although contributions have been received from Tektronix, the Hoover Foundation and the U.S. Agency for International Development, additional funding from public- and private-sector sources is required to allow the project to continue.

Physical Configuration

PACSAT is the first amateur satellite designed to be launched by the Space Shuttle. NASA offers an inexpensive ride on the Shuttle for payloads that can fit into a garbage-can shaped container 28 inches high and 22 inches in diameter. Called the "Get Away Special" program, a "GAS Can" can be rented for \$10,000. A flip-top lid and spring-loaded ejector costs an additional \$10,000, but you won't find a cheaper ride into space.

PACSAT will be an 8-sided cylinder, covered with solar cells. It will contain a propulsion system, transmitters and receivers and several microprocessors to run the message system. It will also hold the 4 megabyte memory system and various attitude control and other spacecraft housekeeping devices. The total power available to the spacecraft will be on the order of 35 watts—the equivalent of a somewhat dim light bulb.

How Will It be Used?

A PACSAT ground station will consist of a small portable computer, a terminal node controller (see sidebar) and a radio. The user will store messages in the computer, and the messages will be automatically relayed to PACSAT when the satellite comes into range.

The computer will also query PACSAT to see if any messages are waiting for it. If so, they are downloaded from PACSAT to the computer. When used by amateurs in developed countries, the computer can be any size and can be left on at all times.

When built to be carried into the bush, the computer and radio will be as small as possible. The station will operate from solar-charged batteries and will be briefcase sized. The computer, using information fed into it regarding its current location and information about PACSAT's orbit available from PACSAT itself, will be able to turn itself off and "wake up" when PACSAT is about to come into range.

The amateur radio satellite enthusiasts of AMSAT have built and flown 11 satellites since 1961, three of which are still in operation. One of them, UoSat Oscar-II, carries a PACSAT message-system prototype, allow-

ing the storage and retrieval of up to 120,000 characters of information.

VITA, a non-profit organization concerned with the transfer of appropriate technology to developing nations, maintains a large library and sponsors research in areas such as efficient stoves, ovens, windmills and agricultural systems.

Information from the library is available by request to field workers, but usually the places that need the information the most are the most isolated. In 1982, when AMSAT first published its PACSAT concept, VITA recognized the worth of a system that would allow the transfer of information to any point on earth using low-cost portable earth stations. AMSAT and VITA volunteers joined together in late 1982 to form the PACSAT project to prove the concept of low-orbit computer mailbox systems.

What Does It Mean to Me?

If you're a radio amateur, you can expect to be able to use this technology in 1987 to communicate with other amateurs worldwide. A similar packet-based orbital message satellite called JAS-1 has been built by Japanese amateurs and is due for launch on a Japanese rocket in the fall of 1986. If you aren't a "ham" yet, you still have several months to obtain your license and join the fun.

If you are more curious about commercial applications of satellite packet radio, take heart. Interest in packet radio in the commercial communications sector is spreading, and proposals for mobile satellite services with packet message capabilities are now before the FCC. Expect to see more on commercial applications of low-orbit message-store systems in the coming years. Packet-radio applications are already here, however, and they may come looking for you. ■

Harold Price (radio amateur call sign NK6K) is a Los Angeles-based software and communications consultant. A pioneer in the field of low-cost radio data transmission, he was one of the developers of a system used world-wide in the amateur and land mobile radio services. He holds a B.S. degree in computer science and is project manager for the PACSAT communications satellite, a joint venture of the Radio Amateur Satellite Corporation (AMSAT) and Volunteers in Technical Assistance (VITA). (Harold Price, 1211 Ford Ave., Redondo Beach, CA 90278, 213/376-3147; AMSAT, P.O. Box 27, Washington, D.C. 20044, 301/589-6062; VITA, 1815 North Lynn, Arlington, VA 22209, 703/276-1800.)

antenna uses quarter wave-length elements, the .5 meter element length marks this antenna as a two-meter (144 MHz) model. Two meters is an amateur radio operator band, so we begin to suspect that a "ham" lives in this home.

Let's take a look at antenna C now. Another quarter wavelength vertical ground-plane antenna for a longer wavelength band, you say? Well, not quite right. This is a vertical ground plane all right, but it's a 1/2 wavelength model--the clue to this is the coupling circuit, the enlargement just below where the ground plane radials attach to the antenna.

That enlargement comprises a circuit which is necessary for matching the relatively high impedance of the end-fed 1/2 wavelength element to the relatively low impedance of the coaxial cable which is feeding the antenna. The central vertical element of the antenna, its radiating element, is over 17 feet (5.3 meters) long so it appears to be a citizens band (11 meter band) antenna.

Since it is hard to estimate length from the street, we can't determine its length this accurately, and it could be a CB antenna which has been shortened from its 11 meter CB band specifications to work on the 10 meter amateur band (26-30 MHz). By the way, what's that ring or open-sphere at the top of that antenna? It's an anti-static ring to prevent static electricity discharges to-or-from the antenna's otherwise sharp point.

Many antennas have a ring, small ball or rounded tip at the top to prevent their presenting a sharpened point to the atmosphere. On high power transmitting antennas this is sometimes called an anti-corona ball, due to the fact that it also helps prevent corona electrical discharge of the transmitter's power into the atmosphere.

is how much it will tell you about the occupants of the buildings associated with the antennas. We're not being "nosey," mind you, but we are radio enthusiasts, right? And it's always fun to learn more about this exciting field of radio communication.

Unfortunately, I can't take you with me on one of my antenna-sleuthing trips, but we can do a "simulated run," so here we go. Just imagine that we are out walking in a pleasant neighborhood and, as we turn a corner, we observe the scene shown in figure one.

Here's a chance to show what you know! What is that antenna at A and what is its fundamental operating frequency likely to be? Its elements appear to be about 19 or 20 inches (about .5 meter) in length. Notice that it has a coaxial cable (B) entering it from the bottom and we can bet that the center of the cable is connected to the upright or vertical element, making that the active element.

Yes, you guessed it!, it is a vertical ground-plane antenna. The four horizontal elements comprise the ground plane against which the active element operates. And since this

ANTENNA TALK
by W. Clem Small

Antennas--a mystery to many listeners. Certainly, they are the most important consideration for the monitor next to his receiver.

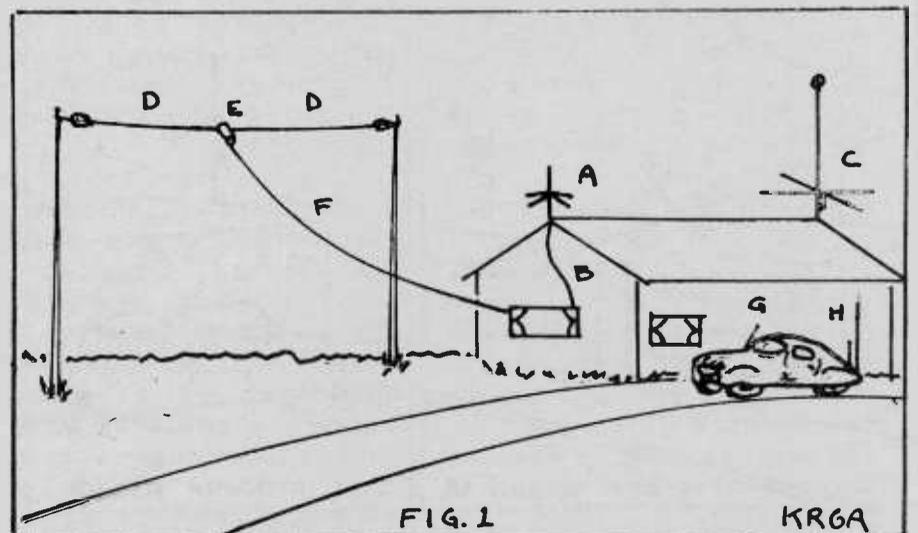
We are privileged to present this new column by noted MT writer W. Clem Small, and know that Clem will appreciate hearing comments, criticisms and suggestions from his readers.

Know Your Antennas! A "Detective" Game for Radio Buffs

How many antenna types can you identify? Our first column gives you a chance to quiz yourself on this question and perhaps learn a few new types of antennas in the process. This article is also a sort of instruction manual for a game I've invented called "Antenna Sleuthing." The clues can often give you surprising insight into the pastimes or occupations of the persons who utilize them.

Here are the rules to the game: As you walk around a neighborhood, drive down a street or cruise along a highway, watch the rooftops and open fields for antennas; then, when you see one, try to guess what type it is and the band (or bands) for which it is designed to operate. With a little practice it's surprising how accurate you can become at this game.

Perhaps more surprising



ANTENNA TALK cont'd

Now let's move on out to the yard. See that long-horizontal, center-fed antenna at D? Well, I estimate its length at 65 or 70 feet (about 20 meters) and we can see that it has a small device (E) about the size of a 6-inch tall stack of Oreo cookies at its center. The coaxial cable which feeds the antenna enters through the base of the "stack of Oreos"--a balun for matching this balanced antenna to its unbalanced coaxial cable feedline (F).

The word "balun" is derived from the function of this type of device in matching a balanced circuit to an unbalanced circuit: thus bal-un, or balun. The antenna, being center-fed with low impedance coax and balun as it is, would appear to be a dipole antenna. Its length, always a half-wavelength for a dipole of this sort, suggests that its fundamental frequency of operation is in the 40 meter (7 MHz) band. Considering the antennas which we've discussed so far, we become more convinced of the likelihood that an amateur radio operator lives at this address.

Let's check out the hypothesis of "ham in the house" a bit further. The whip antenna (G) on the automobile in the driveway is very likely to be an AM-FM broadcast antenna which, by the way, may be close in length to being a quarter wavelength or even half wavelength on the FM band. It will be nowhere near any sizable fraction of the AM band wavelength where it functions more like a small coupling capacitor than it does like a resonant antenna.

Unfortunately for our sleuthing, this sort of antenna might be found on any vehicle and offers no support for our hypothesis. But don't give up on the car yet; look at that strange antenna at H.

That antenna appears to

have a top element (the tip standing alone above the double-rod section) which extends about twice the length of the active element of the two-meter ground-plane antenna at A in figure one. That might make us suspect that the antenna at H is for operation on 4 meters, or just twice the wavelength of that two meter antenna. Not so, however; this one happens to be an end-fed half wavelength antenna rather than a quarter-wave. It's a two-meter "J" antenna, named for its shape. The length of double-rod section of the antenna is actually a quarter wavelength of high-impedance open feedline used to match the low impedance of the coaxial cable coming from the two-meter transceiver in the car to the relatively high impedance of the end-fed half wave J-antenna.

Well, with two two-meter ham-band antennas, a possible ten-meter ham-band ground-plane antenna, and one 40 meter ham-band antenna at this residence, our hypothesis of "ham in the house" seems likely to be correct!

It looks as if we're doing pretty well so far at this game, so let's walk on for a bit and see what other antennas we can spot. As we move down to Main Street we see the scene depicted in figure two. Wow! Six antennas showing here: We do live in the electromagnetic communication age, don't we?

The configuration and element lengths of this antenna give it away quickly as a common Yagi-Uda VHF-UHF TV-FM antenna. Looks like employees at Mary's Tax Service enjoy a bit of background music on FM as they work. They could catch a few TV programs on that antenna also. As a matter of fact, the large dish (J) on the roof would suggest that TV is a major pastime for someone in that building. That dish is a TVRO (television, receive-only) parabolic reflector microwave unit

with a horn feed antenna at the focus of the parabola.

It seems likely that the antenna is pointed at some home entertainment bird (TV transponder)--no one at Mary's Tax Service is likely to receive satellite weather maps!

Acme Cleaners seems to enjoy home entertainment TV too: The antenna at K appears to be another parabolic reflector type, probably pointed at a distant cable TV company's local coverage transmitter. Looks like someone is "pirating" cable TV cross-town-link movies for free at Acme Cleaners!

There's also a scanner buff at Acme's--see that multiband vertical dipole antenna at L on the front corner of the building? Those folks at Acme seem to have plenty of entertainment to help them pass the time between customers!

But enough of this skywire-clue detective work on that building, let's mosey over past Joe's TV and see what that strange, tall mast-mounted antenna at M suggests. It looks like a quarter wavelength ground plane antenna that took too many vitamins! Actually, it is a ground plane antenna as indicated by the four radials at its base, but only these radials are a quarter wavelength long; the active vertical element is several times that length.

The radials are about 6 in. (16 cm.) long, so that would be about a quarter wavelength at 450 MHz. So I'd say that this antenna is designed for the UHF business radio band (450 MHz). It could be cut for the 432 MHz amateur band but this is unlikely considering it is for use at Joe's TV shop.

Why is that vertical element so long? Well, it's a collinear antenna consisting of several half wave sections tied together with phasing circuits. The collinear is actually a high gain, nondirectional antenna for use in covering the countryside surrounding Joe's shop. This allows Joe to talk to the repair person out on the route quickly when new customer orders are obtained at the shop.

Take a look at Joe's repair truck sitting in front of the shop. Notice that little whip antenna (N) on the roof of the truck. Can you guess what type it is? It is actually a quarter wavelength ground-plane antenna for the 450 MHz business band using the metal roof of the truck as its ground plane; thus, no radial elements are needed.

Like the antenna at M, it, too, gives a nondirectional radiation (and reception) pattern so that, regardless of its location, it can always be receptive to the signals from Joe's collinear antenna when a call comes through. So we can see that Joe--or his radio communications consultant--seems to know what he is doing in planning for his shop's communication needs.

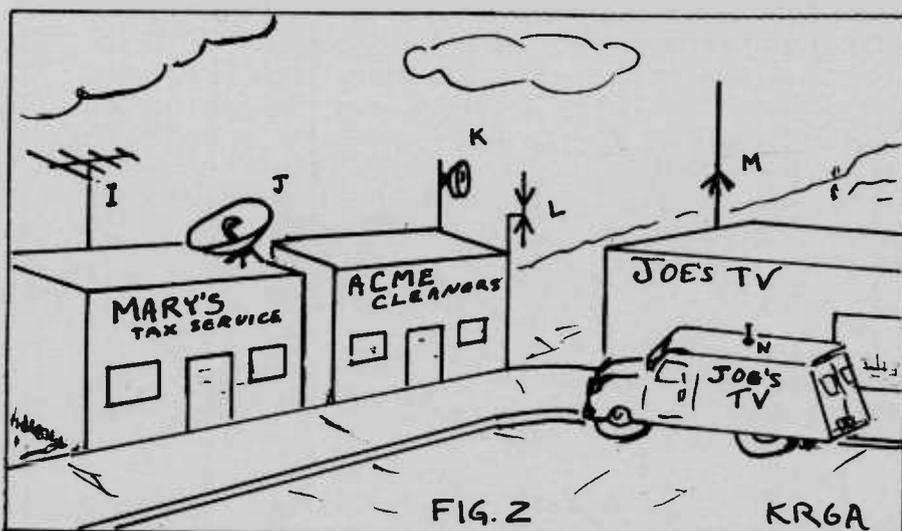
Well, it looks as if we're coming to the end of our antenna tour for this time. I do hope that you enjoyed the walk. Isn't it surprising what you can deduce about people's activities just by carefully observing their antennas? Perhaps, with deference to all the antenna elements involved, Sherlock Holmes would say: "It's elementary deduction, my dear Watson!"

If you'd like to be able to identify antenna types more easily, you can find lots of helpful information in ABCs of Antennas, (1) or Antennas for Receiving (2). Also useful are The Radio Amateur Antenna Handbook, (3) the ARRL Antenna Book, (4) High Frequency Antennas for All Occasions, (5) Antennas and Transmission Lines, (6) and Television Antennas (7).

If you would like to tour through other antenna types, write me in care of Monitoring Times and let me know. We could visit a military base, civil defense communications center, or other area of your choice. In the meantime, happy antenna sleuthing!

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HELPFUL HINTS

LEARN CODE FOR LESS

by Peter J. DeHart

After nearly 25 years of radio monitoring, I, as many of you, have formed some opinions about various aspects of our hobby. Some aspects cannot be changed; others are challenges. I know, for example, that barring some ionospheric miracle I cannot possibly enjoy programming from Japan, Papua New Guinea and the rest of the Orient on a daily basis here on the east coast. I know, too, that whenever the subject of

accurate, professionally presented news and information is approached, the BBC will be part of that conversation.

Finally, I am convinced after all of these years that mastering the international Morse code ranks near the top of the list of the greatest frustrations of mankind. However, that situation need not be permanent and can be remedied with work, patience and persistence.

Learning CW (continuous wave or Morse code) in this day and age of technological wizardry may literally require a price. Thank goodness for code schools and courses which make learning the dots and dashes pleasant and worthwhile. Thank goodness as well for computer capability to devise programs making CW a "visible" medium.

Suppose, however, that your financial resources are not quite sufficient to invest in a modern, sophisticated code course or computer outfit. Or suppose that you find yourself just a bit unsure that an investment in a code study course will bring you lasting enjoyment, and thus your reluctance is strong to part with money which could buy you a nice book, membership in a club or a piece of equipment.

How can you know code--and know code is for you--on a small investment? A year and a half ago, I set out to master CW on my own, on a limited radio budget, and now find it one of the most enjoyable aspects of my listening experience. Hopefully my experience will help you to learn and enjoy CW as well.

I began my study, of course, with a list of the CW symbols for the letters and numbers. These can be easily found in radio books, journals and publications in libraries or even flea markets. Purchase of a code study book is helpful but the information can be found without a large outlay of money in places other than in stores.

As I "dedicated" myself to mastering code I printed the various symbols on small index cards. These were helpful study aids on trips or even while walking to and from work. I had read somewhere that saturating oneself with code would be a giant step in the learning process. Thus began the process of spelling out highway signs on bus trips in CW, or attempting to put the minister's sermon into

code.

Perhaps a bit bizarre but important in the initial learning process, that part of my "commitment" to practice now seems to have been very important.

I was fortunate to be able to borrow and copy an old reel-to-reel recording of a code tape. The tape had three outstanding characteristics: It cost me nothing; it no longer contained a title or description as to its author; and it was about as unsophisticated and simple as can be imagined.

It even included a few gaps and mistakes in its interpretation of some of the sentences it used for examples. In short, the code tape did little more than acquaint me with the alphabet and the sounds of CW.

It only took a brief period of time before I realized that something as basic as this particular tape could only be put to full use by the concept of repetition. When constant rewinding of the reel to reel soon became a burden I decided to make the most of what I had to work with and create my own tapes. In the end, what saved me from the constant rewinding process was the use of an inexpensive "endless" cassette--a versatile, yet perhaps underrated, audio tool.

With a patch cord, a cassette recorder and a bit of editing, I soon had a 20 second "endless" cassette playing "Dit-dah-dit; this is an R" which I transferred to a 60 minute tape. With a little bit of patching and a push of a record button I filled 20 minutes of the new cassette with "R's."

From there I went back to the reel to reel and filled the "endless" with "This is an S: Dit-dit-dit" which I transferred to the 60 minute cassette just after the "R" segment. Soon, 4 or 5 letters, each repeating for about 15 minutes, filled the new tape. The repetition, intense and, admittedly, at times annoying, served well and I credit it with helping me to learn CW in a short period of time.

In the absence of even a poor code recording, a wonderful learning alterna-

tive exists as close as your receiver. The ARRL (American Radio Relay League) code practice sessions of 5 to 35 WPM are invaluable. The 5 word per minute transmissions move slowly enough that off the air copying of individual letters to make your own practice tapes is simple. And it takes just as little effort to add your own voice to the descriptions of the letters.

After you've mastered the alphabet and numbers, the ARRL broadcasts will help you increase your speed and comprehension. Although I have progressed to 13-15 WPM, I frequently use the 5WPM transmissions to improve writing speed and comprehension. The ARRL transmissions are free and provide a wonderful public service to radio enthusiasts (See accompanying schedule).

Finally, I have found a code repetition reinforcement source in the utility bands of the radio spectrum: Utility broadcasts, beacons and markers in particular offer a chance to benefit from the reinforcing power of code repetition. I use CFH Halifax, 8697 kHz, to improve my subconscious absorbing of V, CFH and the numbers included in its marker. It is one of hundreds of markers and beacons, some with detailed description which repeat almost endlessly and which subsequently invite the code student to benefit from their transmission.

Here are a few others which are quite audible, simple and useful for code absorption. As each plays, begin silently sounding each letter in your mind. If you miss a letter, no harm done! The marker will be back in just a few seconds. A wonderful way to learn! ●

- CFH-Halifax: 8697
- NAM-Norfolk, VA: 8090
- HXO-Haifa Israel: 17060
- PPO-Brazil: 8520
- IAR-Rome: 8650, 12977
- XFM-Mexico: 8565 (very slow, excellent!)
- WLO-Mobile, AL: 13098
- HEB-QSX-Switzerland: 16863
- VCS-Canada: 8440
- WNU 33-Slidell, LA: 8525
- OXZ-Tyngby, Denmark:
- OST 42-Oostende Radio Belgium: 12718
- DAM-Elmshorn, Germany: 12762

THE ICOM BATTERY REPLACEMENT:

A Followup

In the December issue we mentioned that the lithium memory backup battery in the ICOM R71A could be replaced by attaching an external voltage across the appropriate line. In the meantime, we have learned from ICOM that an even simpler process would work: turn the radio on!

Yes, it would appear that simply turning the receiver on while making the battery switch will keep the microprocessor alive, avoiding the inconvenience and expense of a return to the factory.

It is important, however, that an isolated, ungrounded soldering iron is used to desolder the lithium battery to avoid shorting out the grounded supply during the procedure.

Even if factory replacement is chosen as the best alternative, only the RAM card need be sent in for replacement along with a \$25 check. Since lithium battery life may be several decades, even ICOM recommends replacement no more often than five years.

The latest word from ICOM is that they expect the RAM card and associated lithium battery to last longer than the entire receiver's projected lifetime! They expect that under worst case conditions a battery lifetime in excess of 15 years. So cheer up, readers, apparently the apparition of memory battery failure is not a serious concern at all.

--READER FEEDBACK--
THE KIND OF "INTERFERENCE" WE LIKE!

*W1AW (ARRL) SCHEDULE:

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Slow Practice: T Th S Sa - 0000, 2100 GMT
Slow Practice: Sa also 0300

Frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08 and 147.555 MHz

*"QST" Magazine, October 1985, p. 67

EXPERIMENTER'S



WORKSHOP

BC-50 BATTERY UPDATE

The cute little BC-50 hand held scanner from Uniden is a hot performer, but there is concern about short battery life. The lifetime of replaceable ("throwaway") batteries--even alkalines--is quite limited due to the high current drain of the BC-50.

The BC-50 uses a five-cell holder for replaceable batteries; the same holder cannot be used, however, for rechargeable cells since the scanner requires six of them to equal the voltage of five standard AA's (over seven volts) and the holder itself, unmodified, will not touch a third contact in the case necessary to engage the recharging circuitry.

Fortunately, Uniden now offers a rechargeable battery pack and charger for \$24 retail (available at Grove Enterprises with free shipping).

Unfortunately, the beeper is not user-defeatable except by some surgery; it would be a distinct improvement if the triggering threshold voltage could be made more realistically lower.

Billy Wiggins of Albany, Georgia, has found a way to defeat the beep. The procedure should be attempted only by someone thoroughly familiar with electronic circuitry.

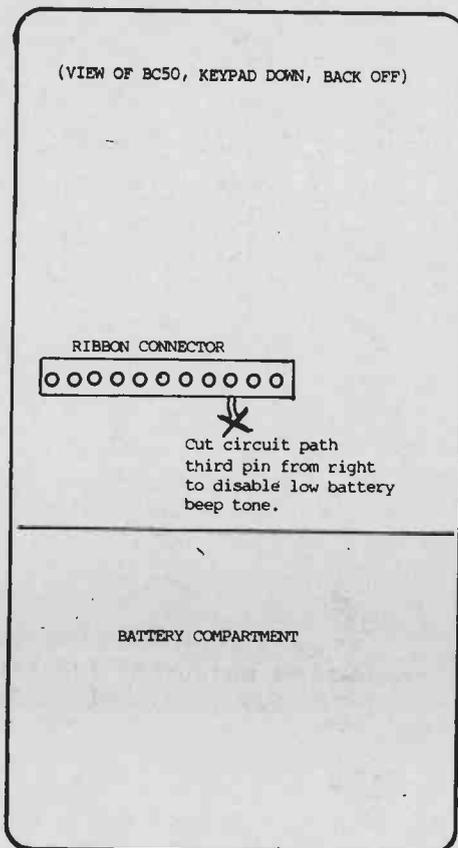
With the BC-50 lying face down on the bench, remove the back, exposing the circuit board and a ribbon connector. Counting from the right hand side, the third wire to the left is the "beep" lead. You may wish to test the defeat by unplugging the ribbon and bending this lead away; plug the remaining strip of wires back in and test the unit for full operation (less beep) (see illustration).

A permanent "fix" would be to use a sharp knife blade to cut the foil path (carefully!) leading from the third pin from the right on the connector. To restore the feature, merely bridge the gap with a dab of solder.

CAVEAT: Any modification of circuitry may cancel your warranty.

Billy also discovered that when a DC power cord is plugged into the external power jack the ground connection to the normal battery pack is opened to prevent applying voltage to non-rechargeable batteries. The ground return now routes to a mysterious third contact on the battery compartment which allows charging of nicad batteries in the appropriate holder.

With the radio turned off the batteries are trickle-charged at 20-30 milliamperes, increasing to above 100 milliamps when the radio is switched on.



A ONE-CHIP, ONE-EVENING ACTIVE AUDIO FILTER

by Chris Williams

The bands are crowded. If you've been listening for any length of time, this isn't news to you. QRM (adjacent signal interference) is one of the first irritants listeners become aware of and accustomed to.

But in many cases you don't have to accept it; there are relatively easy things you can do to make QRM crowding less of a detriment to your listening pleasure. This article will describe one of them.

SELECTIVITY

The ability of a radio receiver to separate signals closely spaced in frequency is called its selectivity. The degree to which a receiver is selective is generally a function of the "Q" (sharp tuning) of its circuits and though you have little control over your receiver circuits' Q, there are, nonetheless, acces-

TECHNICAL TOPICS by Bob Grove

Q How do these receivers compare in sensitivity: Radio Shack DX-302, Panasonic RF-300, RF-B600, and ICOM R71A? (Jassar Nassar, Adailya, Kuwait)

A With the possible exception of the discontinued DX-302, virtually all modern general coverage receivers have good sensitivity, often better than 1 microvolt. But with the relatively large wire antennas erected for most short wave sets, sensitivity is not the problem--they all pull in a great deal of signal.

Selectivity is the real standard of comparison, the ability to reject close-by signals which cause interference to the desired station. The receiver with the best selectivity will seem to be more sensitive because you will be able to hear that weak signal better--it has been weeded of its undesirable adjacent interference.

Q I have heard that it is possible for a police radar operator to know if you are using a radar detector in your car. How is this possible? (Robert Brown, Parma, OH)

A All of the newer radar detectors, in an effort to improve selectivity and sensitivity, are of the "super-

heterodyne" variety. That is, they employ a local oscillator which may be heard by a sensitive receiver some distance away.

The effectiveness of a receiver capable of detecting the radiation of the radar detector will depend upon the level of the radiation, the distance from the vehicle, the frequency of the radiating oscillator, whether or not the radar detector is enclosed in a metal or shielded cabinet, and its relative placement in the vehicle.

Q The Grove Scanner Beam seems to work on both the amateur 2 meter and 60 centimeter bands; have you done any formal or informal tests on these bands? (William Painter WA4QLH, Rossville, GA)

A Yes; as an avid ham myself I use the Scanner Beam frequently on 2 meters with outstanding results. I don't have a 70 cm rig, however, so have no data on using it there.

Q I do not understand an abbreviation in MT, "DTOI"; could you please explain it? (Wes Parker, Kennewich, WA)

A Commonly used in logging military and government communications, DTOI stands for "date/time of intercept."

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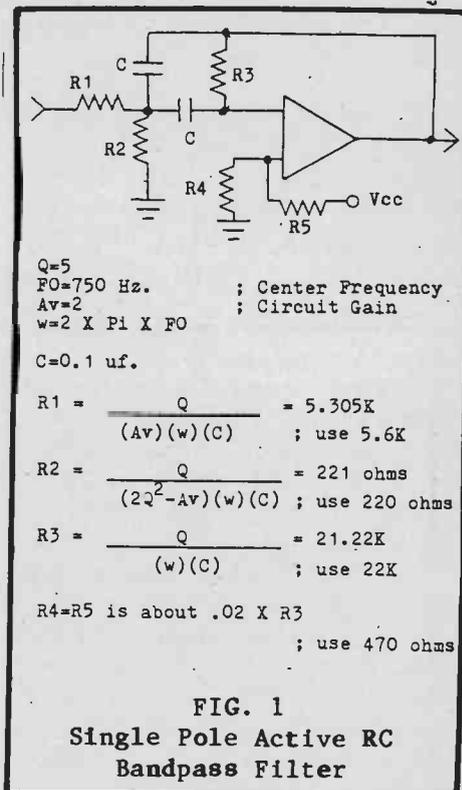
series for your receiver that will improve selectivity.

One of the simplest of these is an audio filter. The one we'll discuss in this article consists of one chip and a handful of components. Once you have the parts, you should be able to construct the filter in a single evening.

AUDIO FILTERS

Audio filters come in two distinct types: passive and active. Passive filters employ inductors in conjunction with capacitors to yield the required audio resonances. Several of these can be stacked into multiple filter poles which will provide frequency responses as sharp or narrow as one might wish.

In general, passive audio filters work quite well, but they do have a few shortcomings. The two most important of these are



EX. WORKSHOP cont'd

insertion loss and bulk.

With no amplification in the filter, the loss resulting from its insertion into the audio chain can attenuate weak signals so much that they cannot be heard, even if they've been separated from QRM. Careful attention to impedance matching can maximize energy transfer and minimize this problem, but it is never entirely eliminated.

Fortunately, the attenuation is usually tolerable. Indeed, many hams and SWL's use passive filters and have audio amplitude to spare.

The second problem, bulk, results from the large inductances required for audio resonance. Large inductance requires many turns of wire on the coils, which means lots of wire. This makes the circuit neither small nor light. And this, of course, precludes significant miniaturization.

ENTER, THE ACTIVE FILTER

The other category of audio filter is the active audio filter. These typically use operational amplifiers with resistor-capacitor combinations to produce a desired passband.

Fig. 1 comes from the 1985 Radio Amateur's Handbook (available from ARRL, 225 Main St., Newington, CT 06111) and shows what has become the standard basic design for a single pole audio bandpass filter.

A one-pole filter is not very sharp in its response and is, by itself, of little value. When we combine it with other poles, however, we can achieve a sharp, well-defined audio frequency pass band, which is exactly what we want.

The numbers used in Fig. 1 are the design values of the circuit in Fig. 2. Note especially the values of Q, Av, and FO. These parameters define the performance of each pole of the four-pole filter in Fig. 2.

THE CIRCUIT

With all that as preamble, I'd like you to examine Fig. 2, a schematic of a four-pole active audio filter. There are four operational amplifiers used with each wired as an active filter pole according to the basic design in Fig. 1. The four are then connected together to sharpen the "skirts" of the response curve.

Four poles in a band-pass filter of this type produce a very sharp window of frequencies which are allowed to pass, appropriate for use with CW signals, but only after a given signal has been heard and you wish to focus on it.

To search through a band, you should either select the two-pole position of the switch which will widen the skirts and permit examination of a wider range of frequencies, or perhaps you could modify S1 to have three positions with the third a complete bypass of the filter.

The equations in Fig. 1 show how the component values are selected according to the desired frequency. The procedure given on page 7-10 of the ARRL Handbook for calculating these values is a good one in that it helps you avoid selecting prohibitively bizarre values for components.

The center of the pass band I've chosen here is 750 Hz which is nothing more than personal preference. I know many hams who prefer a lower frequency for copying CW.

I suggest you start with may numbers in building this filter; later, should you prefer some other frequency, use the equations in Fig. 1 and change the values as you wish.

Incidentally, the equations lend themselves nicely to simple implementation in BASIC. Having a program on your computer to do the math makes it easy to experiment with different parameters to

achieve performance more to your liking.

All four op-amps in the circuit are on one chip, the popular LM324 which works well in this circuit, but there is no reason you couldn't substitute a different quad op-amp.

This circuit pulls little power and will operate effectively off a 9-volt battery. The voltage is applied to pins 4 and 11 (Vcc and ground, respectively). The other pins of the chip are specifically labeled in Fig. 2.

IDIOSYNCRACIES

The circuit is generally straightforward; there are, however, a few odd items worth mentioning.

First, an important concern in building the filter is the degree to which a component you use in one pole is identical to the corresponding component in another pole. You must pay attention to tolerance ratings.

The values you select should not vary more than about five percent from the matching components in the other poles of the filter. If you allow more than this, the pass band will widen--and it doesn't take much widening to render the whole device worthless.

I've found it wise to spend time measuring identically marked resistors on an ohmmeter in the attempt to find matching values. This is the surest way to guarantee near identical components among the stages.

The capacitors you use should have polystyrene dielectrics because of that material's high-Q, highly stable characteristics. Silver mica would work just as well or better. If you have access to a capacitance meter, I recommend measuring the capacitors as you did the resistors in the attempt to ensure identical values.

SPECIAL NOTE

Operational amplifiers have extremely high input impedances (tens of megohms) and low output impedances. This means that if you try to feed the filter directly from your receiver's output, you will be placing an almost non-existent load on that output.

The primary consequence of this is that you may overload the filter and destroy its response, not to mention the chip itself. To deal with this problem, I've placed D1 and D2 in the design. The use of back-to-back diodes is a classic technique used to limit an input voltage to the forward-bias voltage of the

diode.

If you choose silicon diodes (1N914's or 1N4148's, for example) about 0.7V will be applied to the filter from the audio, regardless of the gain setting. If you choose germanium diodes, the input will be about 0.3V.

The low impedance output of the final op-amp stage may drive headphones or a small speaker. C10 (1 uf) and R21 (470 ohms) couple the output to the headphones and protect the final stage from a shorted output.

If you choose to try and drive a speaker from the final stage, pay special attention to total current draw from the battery. If the current gets too high, you may want to power the circuit from a small power supply.

The filter is designed to be driven from a receiver's output, but if you have a receiver you are willing to modify, you may instead want to install the filter between the audio gain potentiometer and the stages it ordinarily feeds. The impedance match there should be quite good.

One last note before I close. Audio selectivity is often a handy thing to have available. Indeed, when it's so easy to obtain, there's little reason not to have it. But it is definitely not a cure for overall poor receiver selectivity.

For example, consider the effect on the receiver AGC of a strong signal adjacent to the one you're interested in. You might be able to use this active filter to attenuate this adjacent signal down to nothingness, but this won't do anything about the reduced receiver gain being applied to the signal you want amplified. The strong signal affects the AGC because your filter wasn't applied until later in the circuit.

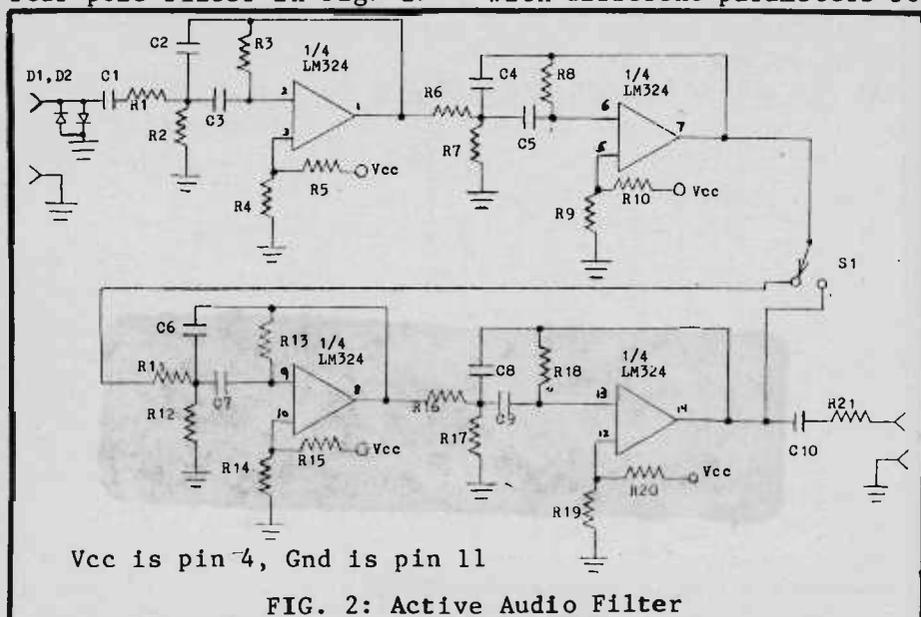
PARTS LIST

- C1, C10--1 uf
- C2, C3, C4, C5, C6, C7, C8, C9--0.1uf polystyrene
- D1, D2--1N914
- R1, R6, R11, R16--5.6K
- R2, R7, R12, R17--220 ohms
- R3, R8, R13, R18--22K
- R4, R5, R9, R10, R14, R15, R19, R20--470 ohms
- R21--470 ohms

All of the above parts are available from Radio Shack or, alternatively, from:

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FOR SALE: Once SCANVERTER CVR1B \$60: one GLOBESCAN \$35. US Postal money order only and an SASE for a return of your money order if I get more than one buyer. Free UPS in USA only. Reason for selling, I have little vision left. H. Joselyn, 620 Grove Avenue, Zanesville, OH 43701.

WANTED: 1981 World Radio TV Handbook. Call 704-366-6549 (Bob)

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FCC NAILS "THUNDERHAMMER" and announces amnesty period

William B. Schultz, who operated illegally on the air using the CB "Handles" "Thunderhammer" and "Probation Officer Number One," has been fined \$1500, given three years supervised probation and has forfeited his equipment which included linear amplifiers and out-of-band CB radio gear.
The Federal District Court of Norfolk, Virginia, passed sentence November 25, 1985, reflecting that the criminal charges had been under investigation since December 1983 because of complaints of more than a dozen neighbors regarding severe interference on TV sets, video recorders and telephones.

INFORMATION PLEASE

Monitoring Times will print at no charge (as space permits) announcements and questions of a non-commercial service nature.

WANTED: UHF pager receiver around 412.7625 MHz new or used. Robert Lebreux, 6346 Drolet St., Montreal, Quebec Canada H2S2S7.
+++++
LOUISIANA. Want to swap military and gov't freqs in S. Louisiana area. T.F. Marcott, 116 Fernway Lane, Duson, LA 70529.

AMNESTY PROGRAM ANNOUNCED
J. J. Freeman, Engineer in Charge of the Norfolk District Office of the Federal Communications Commission has announced a limited amnesty period during which illegal CB equipment may be surrendered anonymously to the FCC with no questions asked. CB radio operators presently under investigation for unlawful operation may avoid prosecution by taking advantage of the special program which expires December 31, 1985.
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