

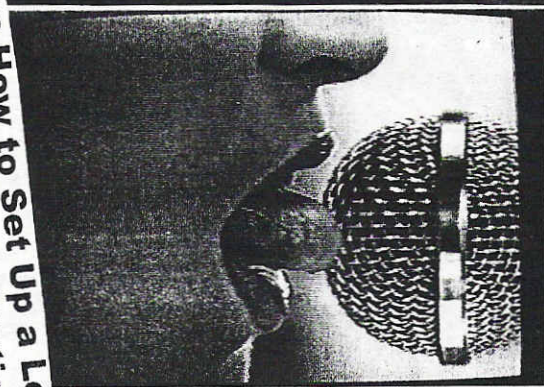
# SEIZE THE AIRWAVES WITH MICROPPOWER BROADCASTING!

Carrier-current broadcasting consists of plugging the transmitter into a regular wall socket. It draws power in the same way as any other electrical appliance, and feeds its signal into the power line allowing the broadcast to be heard on any AM radio tuned in to the operating frequency. The transmitter can be adjusted to different frequencies until a clear band is located. The signal will travel over the electrical wiring until it hits a transformer where it will be erased. The trouble with this method is that in large cities, almost every big office or apartment building has a transformer. You should experiment with this method first, but if you are in a city, chances are you'll need an antenna rigged up on the roof. Anything over 12 feet is illegal, but practice has shown that the FCC won't hassle you if don't have commercials and refrain from interfering with licensed broadcasts. There are some cats in Connecticut broadcasting illegally with a 100-foot antenna over a 30-mile radius for hours on end and nobody gives them any trouble. Naturally if you insist on using dirty language, issuing calls to revolution, broadcasting bombing information, interfering with above-ground stations, and becoming too well known, the FCC is going to try to knock you out.

Guerrilla Radio

Abbie Hoffman

## Learn How to Set Up a Low Power FM Broadcast Station



The FCC is seldom interested in tracing down and seizing hobbyist pirates unless there is some kind of complaint. They estimate that they close down fewer than 20 pirates a year, a small fraction of the total. Sentences tend to be light (especially for minors), and repeat offenses are common. But if a higher profile is taken (e.g., by political broadcasting), cheap electronics have made it possible to set up expendable stations. The programming is prerecorded on cassettes, and a transmitter and tape player are taken to some high-vantage point. The lashup is plugged into any available outdoor outlet, or street-lighting wires are tapped, or an old car battery is used. If the authorities go to the trouble of deploying radio direction finders, and closing in on the source, all they net is the equipment, which can cost as little as \$50 if homemade. Even this loss can sometimes be avoided by installing a radio-controlled switch and posting a lookout. If any suspicious vehicles seem to be approaching the broadcast site, the transmitter is switched off till they leave.

Another approach is to use more sophisticated equipment that can change frequency quickly, thus making direction finding more difficult. A California company called Pan-Axis sells such a rig for \$500. Selling and owning broadcasting equipment is not illegal—only using it is.

Yet another trick is to set up three transmitters in a triangle. By adjusting the phase of the signals fed by each, the signal can be made to appear (to a direction finder) to be coming from any point within the triangle. Ordinary listeners will notice little or no change in the signal.

Erwin S. Strauss

Pirate Radio Pirates

If it really gets heavy, you could still broadcast for up to 15 minutes without being pinpointed by the FCC sleuths. By locating your equipment in a panel truck and broadcasting from a fixed roof antenna, you can make it almost impossible for them to catch you by changing positions.

You can build a miniature transmitter and with a small magnet attach it to the underbelly of a police car to keep track of where it's going. This would only be practical in a small town or on a campus where there are only a few security guards or patrol vehicles. If you rigged a small tape recorder to the transmitter and tuned it to a popular AM band, the patrol car as it rode around could actually broadcast the guerrilla message you prerecorded. Wouldn't they be surprised when they found out how you did it?

# THREE Meter REVOLTY

www-Applied Revolutionary Wave - Dynamics #1



\$1 Suggested donation  
 Anti-copyright  
 RADIO FREE CASCADIA  
 P.O. Box 12204  
 Eugene, OR 97440

A PIRATE RADIO ZINE

If you hanker to find out whether World War III has got started yet, you just naturally won't want to fiddle around for a whole 30 seconds tuning a nine-dollar transistor radio; instead you'll require to boot up your \$1700 power-draining modern corporation-approved appliance which you wouldn't think of going without because you are at heart a total conformist and scared as a rabbit that somebody else is hipper than you.



### REVOLUTIONARY RADIO

The use of radio as a means of propaganda and ideological support for armed struggle is the oldest, clearest, and least ambiguous kind of "alternative" radio. During the Second World War, radio was an important propaganda and counter-propaganda tool of both sides, and also a tool of resistance. After the war, when the CIA began regular monitoring of "clandestine stations" throughout the world, virtually every imaginable revolutionary guerrilla group, left and right, had its radio. Some of the examples that turned up on CIA monitors in the 1940s and '50s include the Irgun, the IFA, Slovakian anti-communist nationalists, Spanish Republicans in exile, Basque separatists, and Kurdish rebels.

Frantz Fanon detailed the important psychological role of radio in the Algerian war of liberation: Up until the start of fighting in 1954, radio was considered a tool of colonialism, to the point where lack of ownership of a radio was a mark of resistance among upper-class native Algerians. Then, one day in 1956, leaflets appeared in Algiers announcing the launching of "la Voix de l'Algerie," the Voice of Algeria. Suddenly the situation was reversed, and soon the colonial authorities had to outlaw the sale and purchase of radio stations.

P.O. Box 12204 Eugene OR 97440

REVOLTY

# NEWS FLASH!!!

## BROADCASTERS AND BUREAUCRATS RACE TO SQUANDER GOODWILL. N.A.B. hoards pie from churches!

LAS VEGAS (Reuters) - U.S. Federal Communications Commission Chairman

William Kennard scolded broadcasters Tuesday, accusing them of trampling over local schools and churches in their campaign to block potentially competitive low power FM radio stations.

"Why, amidst all this opportunity for broadcasters, have you chosen to muster your considerable resources to deny churches and schools and community-based organizations just a little piece of the broadcast pie?" Kennard asked a breakfast meeting of the National Association of Broadcasters (NAB).

"Why have you squandered your goodwill to fight churches and schools and community organizations? said Kennard,

Reminding NAB members of his record on their behalf in closing down "pirate" radio stations, the FCC chief renewed a call for the NAB to work with him "to find ways to address your anxiety about the low-power FM service.

Asked about Kennard's warning that the NAB was squandering goodwill over the issue, he said: "Goodwill runs on two streets:

I didn't challenge him for squandering goodwill on the Hill (House of Representatives). "Now we must rely on Congress to be the tie-breaker."

### Capitol Hill To FCC: Stop LPFM Launch

That's the gist of a two-page missive to FCC Chairman Bill Kennard from House Telecommunications Subcommittee members Frank Pallone Jr., Gene Green, Cliff Stearns and Mike Oxley, who point out there is strong support from the House to prevent the launch of LPFM service before a pilot study is conducted. "It is clear there is a veto-proof House majority in favor of [the Radio Broadcasting Preservation Act]," they wrote. "Given this fact ... we call on you to suspend commission implementation of low-power FM. At a minimum, we strongly advise you to modify the rule to maintain existing interference safeguards pending resolution of this matter by Congress."

TIE BREAKER!  
CONGRESS SHOWS 'EM WHO'S BOSS!

Meanwhile, NPR declares CLASS WAR on behalf of poor consumers:

"We think it reasonable and prudent that the FCC, which proposed the LPFM service in part to empower those with limited means, consider the likelihood of interference to what are among the most inexpensive and commonly used radios." "SEIZE THE RADIO STATION!"

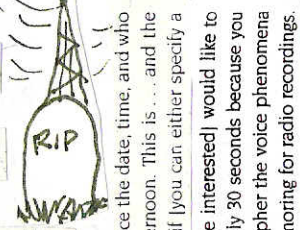
ALWAYS THE FIRST ORDER OF THE NAZI INVADER



# They CAN kill you but they CAN'T (KILL YOUR) SIGNAL

## Radio from Beyond the Grave

I look nothing like the pictures you have of me; I didn't even wear a wig. —George Washington  
Mach die Tür mal auf. —Nietzsche  
A salute and a boot are just about the most effective means of worship. —Adolf Hitler



Above are just a few (of the less serious) samples of information gathered by the many members and affiliates of the American Association of Broadcast Voice Phenomena (AABVP), based in Washington, D.C.

We're 100 members strong and growing. We're not mystics, shamans, prophets, or witches. Our tools are nothing more than the everyday utensils of the modern marketplace: the radio, the tape recorder, and the cassette. Since 1977 we've been compiling a library of tapes sent in by members, tapes recorded right off the radio, of voices heard in the static of AM, FM, and shortwave frequencies, shades of the dead vibrating through the atmosphere. None of our members are endowed with any special powers other than that of listening, yet thousands of tapes have been collected, documenting messages from Homer to Mel Blanc.

These broadcasts from beyond are by no means accidental. Radio waves thread the cosmic fabric, connecting every vibrating molecule with every other vibrating molecule. Radio is a way for those who have something to say to reach those who want to hear, a means for the dead to explain their situations and predicaments in the afterlife to those not yet there.

Messages from the dead have been sought after since the dawn of the electric era. Thomas A. Watson first paired electricity with the occult, Thomas Edison invented the phonograph during his search to record voices of the dead, and inventors Guglielmo Marconi and Nikola Tesla realized the possibility of using the radio as a wireless telephone to the dead.

There's a lot we can learn from the aged, but not nearly as much as we can learn from the dead, who now witness the folly they once played a part in. Around the clock, dollmakers and deviants, philosophers and fakes, chefs and sheiks voice opinions and random thoughts to the air, each trembling electron giving birth to a radio wave. Often the messages are confined to the same frequency; sometimes they scatter across the band and beyond, making their recovery and interpretation difficult.

One of the most prominent otherworldly broadcasters is the German dictator Adolf Hitler. It seems that in the afterlife he exhibits the same traits that characterized him on Earth: self-glorification, persistence in self-advocation, and spiritual depravity. Unfortunately, although many in the afterlife despise Hitler, he still has followers on the other side.

One young composer spoke to Beethoven, Mozart, Chopin, and Liszt, who gave him advice ranging from "One drunk note spoils the whole batch" to "Music comes from, and stays in, your mind. Hear it in your head before you commit it to paper." Mozart, reportedly, is a big fan of rap music. Chopin can't stand it, and Beethoven hasn't heard it.

As radio stations proliferate on the AM and FM bands, popping up overnight, some even calling themselves "educational," they cut us off from the kind of communication the pioneers of radio foresaw. We are badgered by the voices of the living throughout the day, resulting in our ignorance and neglect of those who outnumber the living.

Carola Morales

microphone into your cassette recorder and announce the date, time, and who you'd like to speak to—something like, "Good afternoon. This is ... and the date is ... and the time is ... and I am wondering if you can either specify a particular person or make a general call for anyone interested) would like to speak to me using the radio now." Record for roughly 30 seconds because you will have to play the tape back many times to decipher the voice phenomena over the rushing sound. You'll soon find voices clamoring for radio recordings.

Reprinted from Radiotext (6)

IS IT STILL DEAD AIR?

D.I.Y! Talk to REAL LIVE DEAD PEOPLE!



(excerpt)

# Pirate Radio Pirates

Erwin S. Strauss

By virtue of its long range and resulting anonymity, broadcasting inherently has anti-authoritarian implications. Indeed, many governments (including all the major powers) transmit broadcasts targeted at people whose own governments vigorously object. Aside from occasional (and costly) jamming, however, there is little that can be done to stop them.

These same techniques have also been used by individuals, and not even the largest nations have been able to stop them. The golden age of pirate radio is traditionally thought to have been the 1960s. But the rise of a technologically oriented generation, weaned on computer hacking, is producing a new and much more widely based resurgence.

Pirate broadcasters can generally be divided into two categories: overt and covert (although recent efforts have combined elements of the two, as we shall see). The overt broadcasters use transmitters on ships on the high seas, or similar legal arrangements that allow them to operate in the open. Profit is usually the motive and many have been highly successful. Covert broadcasters typically use low-power, highly mobile rigs. They usually come from the ranks of technical hobbyists, or those with radical political interests.

Although covert broadcasters have probably been active throughout the history of radio, the overt operators burst into prominence in Europe in the 1960s. Up to that time, commercial radio as practiced in the USA was barely known in Europe. The only commercial stations were operated in tiny countries like Luxembourg and Monaco, and beamed to their larger neighbors. The neighbors didn't like it, but there wasn't much they could do. In the early '60s, a ship named *Veronica* dropped anchor off the Dutch coast, with a transmitter beaming the latest in the then burgeoning field of popular music. Advertisers eagerly bought up all the available time at premium rates. Imitators soon followed in the Scandinavian and British markets. There was even a ship off New Zealand.

The governments of Europe were outraged, and applied the term "pirates" to the broadcasters, who enthusiastically embraced its romantic associations (the original Greek word *peirans* simply means "to attempt; to make bold," and has no negative connotations). Brief attempts were made to jam the ships' transmissions, but the public outcry was too great. Telephone service was cut off. A treaty was drawn up to ban broadcasting from ships at sea. But the West African nation Sierra Leone refused to sign the treaty, choosing instead to profit by offering to reflag broadcasting ships for a fee.

The authorities ended pirate radio's (first) Golden Age by forbidding onshore companies from advertising via the pirates, and by establishing onshore pop music radio. But a few pirate ships operate off Europe to this day. An incarnation of Radio Caroline, the most famous name of the Golden Age, went on the air off England in 1983. Advertising comes from overseas branches of multinational concerns.

Large-scale unlicensed broadcasting got a big boost in Italy in the wake of the Golden Age. Italian courts ruled that existing radio licensing procedures were unconstitutional, and the field was left wide open. Anyone who could get some gear together could go on the air, and many did. This included stations with various political points of view, commercial stations, and those whose purpose could perhaps be described as "for the hell of it." While there was some friction at first, a fairly workable common-law system eventually emerged based on who used a particular frequency in a particular place first, and allowing for the claiming of abandoned frequencies. This system is a good counter-argument to those who think that all social order would be impossible without the paternalistic hand of the state. But this is a case of state consent (through the courts) for unlicensed broadcasting; it doesn't strictly fall within the category of pirate radio.

In the United States, the emphasis has been on covert operations. The only overt offshore radio on record is the case of the Rev. Carl McIntyre, who briefly transmitted from ship after his inshore licenses were cancelled on account of unbalanced right-wing broadcasts. Any number of electronic hobbyists have lashed up simple rigs from Radio Shack parts, and gone on the air from their homes. They go by names like "Johnny Lightning," "Gabriel Marconi," and "Raunchy Rick" ("The Voice of Revolutionary Anarchism in North America").

Reprinted from RADIOTEXT(1E)

Pirate Radio Pirates

22

## NEWS FLASH!!! Congress guts low power FM rules!!!

Early this month (May 2000), the telecommunications subcommittee of the House of Representatives added one small but crucial change to the FCC's proposed low power FM legislation. This change, added under pressure both from the National Association of Broadcasters (boo, hiss) and NPR (hiss, boo) was beautiful and simple. They simply changed the "spacing requirement" from "2nd adjacent" to "3rd adjacent".

**This wipes out over 70% of available FM spectrum space in the United States!!!**

Here's how: under the proposed rules, imagine pre-existing stations at 91.1 and 91.9. With "2nd adjacent" spacing, there would be room for a micropower station at 91.5. With the new rules, there's no room at all. The FCC is sharply critical of both NPR and the NAB on its website ([www.fcc.gov](http://www.fcc.gov)) for contributing to the gutting of this flawed although intriguing piece of legislation.

**This change has passed the House with over a two-thirds majority, enough to override a presidential veto. It goes into the Senate at the end of May after the Senate returns from spring recess. For all practical purposes, it seems too late to salvage even a shred of usefulness from this empty facade of public access.**

the News, Go Out  
If You Don't Like  
& Create Your Own

98.5 FM  
FREE KASSAVIA

**RESIST NOW!!!**

LICENSE?  
WE DON'T NEED NO STINKIN' LICENSE.

3

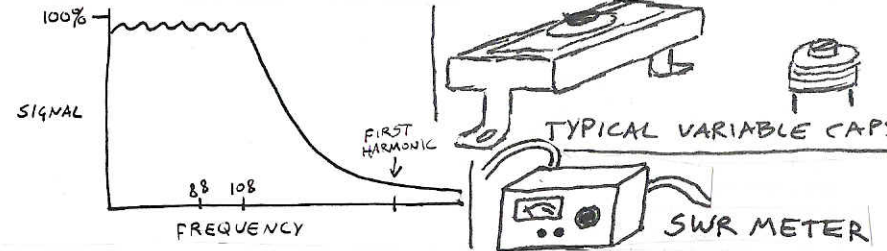
# Reclaiming Mobilization Radio

April 17, 2000: Mobilization Radio, which had been disseminating information throughout the past week about the activities of the IMF/World Bank actions as they have happened, was raided by the DC police, the FBI and at least one official from the FCC. The enforcement squad arrived at about 3:30 PM, without a warrant, and ordered the station closed. A standoff ensued for about two hours, during which time the authorities refused to make any comment or even to explain why they were there. They blocked traffic on the entire road and restricted access for any non-residents into the alleged broadcast building or any of several adjacent buildings on either side.

Shortly before 4 PM, a crowd of about three hundred demonstrators arrived on the scene, a deviation from their march to a jail solidarity action in support of those arrested during World Bank related demonstrations. At that point the police donned riot gear and formed a line in front of the building. What happened next was probably unprecedented in the history of microradio: the police, FBI, FCC and assorted other intelligence left the scene. The crowd immediately took the street in celebration, but almost as quickly gave the street back up to traffic, an indication of their unwillingness to create friction between themselves and the local community. For about a half-hour they allowed themselves to bask in the glow of a decisive victory before continuing back on their path toward jail solidarity. Throughout the course of the entire event there was no violence on the part of either demonstrators or police. In fact, when the police first made a move back to their cars the chant was "Let them through! Let them through!"

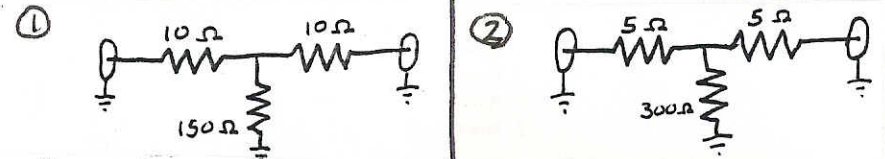
During the course of the week's convergence on the capitol, Mobilization Radio, a low-powered, unlicensed radio station that was set up specifically for this week's events, has been a valuable means of communication for protesters in the street. They had been dispensing information about what kinds of actions were taking place and where help was needed. With the arrival of the law enforcement agencies the station was shut down. After the police left the station was disassembled and carried out as the participants left the building and regained anonymity as members of the crowd.

Now, back to the filter. Place it in line with your RF source and the SWR meter with the dummy load on the end. Turn the radio on and calibrate your forward power to full scale, then switch to reflected power to read the SWR. If its in the red turn the radio off and try squishing the coils closer together. Check the SWR. Still bad? Shut down and try pulling the outer two coils farther apart than they were at first. Try different amounts of squishing, but remain as symmetrical as possible, that is, keep the outer two coils squished the same. At some point you should get an SWR that's not in the red, then you can leave the transmitter on while you mess with the coils with a couple of toothpicks to get the SWR as low as possible. To test your filter try tuning in one of your harmonics on a scanner. Fire up without the filter and see how far away you get the harmonic. Now put the filter back in and verify that the harmonic is weaker. If you have access to some sort of VHF transceiver you can hook it up to your SWR meter and dummy load, transmit, and set your forward power reading to full scale, then put the filter in between the transceiver and the SWR meter and see how much your filter defeats the VHF frequency. If you had access to the tools you could plot the response of your filter on a graph, it would look something like this...

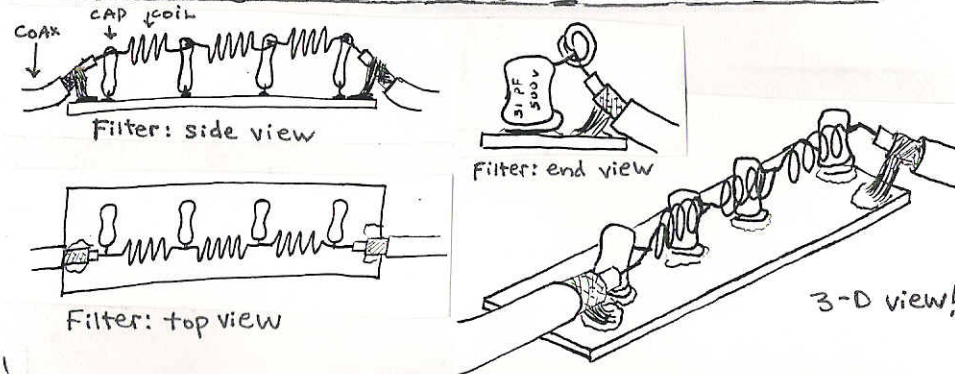


See how it lets your desired signal through with just a little loss but stomps the heck out of the harmonics? Pretty trick.

OK, what if you have to get rid of excess power between amplifier stages. Sure, you could just mistune the stage, but its a bad idea because then the excess power is reflected from the mismatch back into the source amplifier. You need to convert the excess power into heat somewhere other than your delicate transistors, a sort of inline dummy load. The circuit you need is called an attenuator. It is easy to build and presents your exciter with the proper impedance while dissipating some of your power as heat. Build them out of resistors rated for more than the total power of the amp you are attenuating. For example if you are knocking 1 watt down to 1/2 watt, 2 watt resistors would be good. The first of these T-sections will cut your power about in half, the other will cut about a quarter.



You can place one after another for even more attenuation, for example in the not uncommon situation of wanting to drive a BGY 133's 1/4 watt input with a robust 1 watt PLL you could cut it in half, then in half again.



AP



Police say protesters ignored warnings



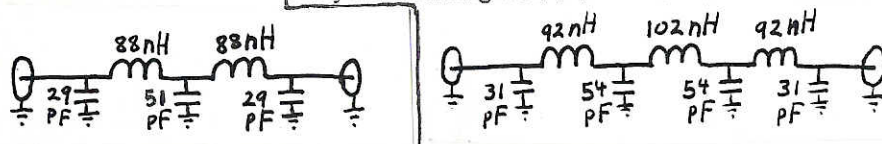
Those arrested were taken away in waiting buses

really like the MFJ 812b SWR meter, actually the folks at MFJ (more fuckin' junk) have a lot of really useful tools for cheap, because it is affordable and will give you an idea of relative strengths of very weak RF powers. The 812 is only about \$30, look for their ads in any of the ham radio magazines (QST, CQ, or 73).

The other thing you will need is a small collection of short coaxial jumper cables with the appropriate connectors installed on each end, probably pl-259's. These are the most common RF connectors and are readily available because they are used in CB applications. You can buy or steal jumpers at Radio Shack or learn to build your own. I would really like to go over PL 259 soldering now but my editor tells me I'm already getting long and we haven't even started on the meat of the article.

So, on to the meat (or tofu if you choose). An amplifier making its primary power at, say, 100 MHz will inevitably produce harmonics, that is, smaller power levels at 2x, 3x, 4x and so on of your frequency. In this case 200, 300, 400 etc. MHz. (Actually some transmitters will even output measurable harmonics on 1.5x, 2.5x etc. of your frequency.) A harmonic filter is a device designed to present a 50 ohm impedance to your desired signal at 88-108MHz (FM broadcast) but present a high SWR to your harmonics, to block and filter them out. The actual math is rather gnarly but I have a couple designs here that work pretty well. If you are running under 10 watts this filter will probably suffice:

If you are running more than 10 watts consider this filter:



For the capacitors get silver micas rated at 500 V, they are available from RF parts (<http://www.rfparts.com/>) or from really well stocked electronics stores in big cities. Get as close to these theoretical values as you can but its not that critical within a couple pf. Remember that capacitors add in parallel (the opposite of resistors) so you could, for example, place two 15's next to each other to get 30 or put a 1 next to these to get 31. If 100 or 200 Volt rated components are all you can get its probably ok if you are running less than 20 Watts.

The inductors can be wound out of wire. I like to get silver plated copper wire from the local hippy jewelry supply store because silver is a really good conductor and it makes the filter really pretty, but copper wire works as well for the non perfectionist. Actually measuring inductance at these small values is rather voodoo, the variables theoretically are the diameter of your wire, the diameter of the coil, the number of turns per inch of the coil stock and the actual number of turns in your coil. If you wind coils on a 1/4 inch x 20 bolt with 22 gage wire, you will have about 500 nH per inch. For the 88 nH make about 4.5 turns, for the 92 nH make about 5, for the 102 nH make 5 or a little more but expect to have to squish it. Be sure to leave ample wire to connect your coils to the capacitors, you can always cut extra off afterwards. If you wind your coils all the same direction they will interact as if they were one big coil. This degrades filter performance. Wind adjacent coils in opposite directions to minimize this effect. Additionally placing each coil in its own shield box will further defeat this "mutual coupling" but is probably overkill except for the artist. Solder the components as close together as possible, even straight wire does have inductance. Connect your filter to a 50 ohm environment with a connector or coaxial cable by simply soldering the in and out points to center conductors and the grounds to the small piece of copper clad board stock on which you build the filter. I like to keep a couple of test cables around with connectors installed on one end which I temporarily attach to a new filter to check it out.

So how do you know if your filter came out right. Well, think about it, what's important to us is that 1) the filter presents a good match (50 ohm impedance) to our desired 88-108 signal and that 2) it presents a very bad match to our harmonic frequencies reflecting them away from the antenna. The first criteria is measurable with the instruments at hand. Connect the transmitter to the SWR meter to the filter to the dummy load (in that order). Now, if you have previously tuned the output of your transmitter to 50 ohms (by patching the transmitter to the SWR meter to the dummy load and tuning your transmitter for maximum FORWARD power with the variable capacitors in its output) then you know that everything in your coaxial system; transmitter output, feedline, dummy load, everything except your filter is 50 ohms.

Despite intensified military mobilization and hostility in recent weeks, thousands of Zapatista women celebrated International Women's Day by marching into the city of San Cristóbal de las Casas and taking over a government radio station in order to broadcast their call for an end to the militarization of their communities. The women, who traveled from the Lacandon Jungle, the highlands, the north of Chiapas and the Guatemala border, braved long journeys through zones which are heavily patrolled by military and paramilitary groups in order to participate in the march. The women marched carrying their young children, as well as banners of protest with drawings of the military airplanes, tanks, and helicopters that constantly harass their communities.

A group of 200 of the marchers peacefully occupied the government radio station Radio Uno and broadcast for one hour during the march. Maria Angelica, a tzeltal woman from the Lacandon jungle explained to listeners throughout the state, "Many of us do not know how to read or write, and for this reason we come so you all can listen to us. We want you all to know that we will not get accustomed to the militarization." The broadcast, conducted in both Spanish and indigenous languages, denounced military and paramilitary violence against indigenous communities and called for respect for the rights of women and fulfillment of the Accords of San Andrés. The Zapatista support bases declared, "The militarization and paramilitarization of our communities is now one of the principal causes of the misery, poverty, sickness and the death of many indigenous people. The military blockade, the daily harassment by land and by air, and the persecution of us by the bad government, has been a grave obstacle for the completion of our daily work, which is the only way we indigenous people can survive."

In the last two weeks, as the women prepared to leave their communities to march, military presence in all three regions of resistance, the jungle, the highlands, and the north, has increased drastically in number and intensity. Community authorities have declared extreme alert and have advised the population to prepare for military attack. The bold military advance into the communities in resistance in all the indigenous territories of the state is marked by an increase in army patrols, checkpoints, troop mobilization and the reinitiation of paramilitary group activities. As the military occupies more and more communal lands, they arrive with heavy machinery to build highways and army bases, thus destroying acres of forest and jungle and contaminating rivers and lakes.

A representative of the tzotzil highlands warned, "The situation is grave. When there is military movement like there is now, it means that at any moment something could

happen." Airplanes and helicopters have been flying over the communities so low that they scrape the roofs of the houses. A teacher reports that in La Realidad, a helicopter hovered so low that it seemed like it was going to land in the patio of the elementary school. From within the helicopter, a soldier videotaped inside the classroom. Similar actions have occurred in other communities in recent days. In Oventic, soldiers shot into the air in the afternoon and the paramilitary groups surround the communities at night.

A community authority explained, "This means that they want to provoke us, threaten us for wanting to struggle peacefully. What the government wants is an armed confrontation. We will make sure that there is no response to the government provocation. But, nor will we accept being humiliated by them because the cause of our struggle is fair and true."

The marchers held a meeting in the public plaza of San Cristóbal de las Casas in which they declared, "We have not given up in our protest against the dirty war of [President] Zedillo and [Governor] Albores. The government continues to promote, protect and finance paramilitary groups, with the clear objective of dividing the communities, provoking confrontation, persecuting Zapatista support bases and assassinating the leaders of the people. The militarization and the paramilitarization has promoted and increased the violence, the division, the murder, prostitution, drug addiction, and alcoholism. All this has gravely damaged our towns and communities."

The women also called for the liberation of the political prisoners of the UNAM, echoing the voices of the jailed UNAM students who once marched the streets of San Cristóbal with the Zapatistas.

Meanwhile, in Mexico City, the women of the UNAM declared that they could not celebrate Día de la Mujer (Day of the Women) when 44 women students are incarcerated for the crime of defending the university. Parents of the 180 students still in jail continue to protest in front of the Rector's Office, symbolically crucifying themselves, sustaining a hunger strike and extracting blood to paint the words "Freedom for Political Prisoners," on the doors of the administration building. The parents demand that the Rector withdraw charges against the students, explaining "we are here, peacefully protesting with the only weapons we have, with all that we have left: our blood, our sacrifice and our hunger." They are learning the lesson that the Zapatista woman announced during the pirate broadcast:

"The more they persecute and jail us, the stronger we become."

## Zapatista Women Take Over Radio Station

•Insurgent•

March 2000

# Morazán

This is an excerpt from Rebel Radio, the incredible story of RADIO VENCEREMOS, the broadcast ARM of the FMLN during the Revolutionary war in EL SALVADOR.



118 REBEL RADIO

In June '83, when Monterrosa came up the Torola River with the Atlacatl Battalion, we had to move to Colorado Hill. We set up a new link to send the signal from there to Guazapa, but at that height the enemy was able to zero in on us right away and they started interfering with both the short wave and the two-metre link. Since the signal they received in Guazapa was fuzzy, they couldn't send it on to the capital. Damn! They screwed us! As Lenin would say, what was to be done? Or rather, what was to be done with Lenin? Because "Lenin" was the code name for the big station that sent the signal from Morazán.

We thought of a trick: broadcast on two different frequencies, one to ring the bells and the other to send off the procession. We continued broadcasting on the two-metre band to Guazapa at six o'clock, the hour of Venceremos's usual programme, but that was only a ghost signal to catch their interference. Before that, at an agreed-upon time, we'd broadcast the same programme on the six-metre band. They'd record it on cassette and then carefully synchronise with us at six o'clock to play it as if they were just bouncing our two-metre signal at that very moment. The *cuilios* were dumbfounded, they went nuts. They interfered here but it still came out clean as a whistle over there, and in the capital people tuned in as if none of this were happening!

We needed a trick like that when we were in the camp at El Pedrero. The September offensive, the BRAZ's tremendous advance, gave us a stable rearguard, so much so that we were no longer satisfied with only having FM in Guazapa. We set up another in Torola to cover the middle of the country, another in Joateca to cover La Unión and the city of San Miguel, and one more in Usulután that sent the signal over to Santiago de María and all along the Chinameca Mountains. The three new repeating stations and the one in Guazapa, right under the enemy's nose, were small, under a hundred watts. With a simple aerial and two *compas* to guard it, you've got a repeating station.

Since the SWR meter is placed before the filter it will indicate any mismatch encountered there (note that the impedance seen at the output of your filter effects the impedance seen at the input so it is important that your filter is terminated into the 50 ohm dummy load for this test). Fire up the transmitter, calibrate the meter and measure the SWR into your filter. You can now tune the filter by squishing and spreading the coils. Your filter is tuned when it is at (or very close to) a 1:1 SWR.

OK, OK Whoa! You're saying, you've got me monkeying with voodoo coils hooked to a live amplifier that I haven't even had the guts to fire up yet! OK, you're right, time to backtrack a little and hopefully get a little closer to this "impedance" concept at the same time. Lets make sure your exciter and amplifier are in fact tuned to 50 ohms. Double check all assembly details and power polarity to your exciter (really! Most problems are solved with close inspection and some common sense). Patch the exciter into the SWR meter into the dummy load. Set the SWR meter to forward and place the knob somewhere in the middle. Tune a monitor setup to your intended frequency. Triple check your hookup. Take a deep breath...apply DC to the exciter.

If this really the first time firing the thing up, watch the circuit, not the meter. Pop? Flash? Smoke? No? Good. Did the monitor suddenly loose the static and become silent with your first carrier? WOW! If not shut off and try to deduce what's wrong. Check any literature provided with your kit. Check the manufacturers website. Email their techs. Most of all go over the board for reversed components and solder bridges. I repeat, it is rare for components to be bad, most problems are just trivial oversights.

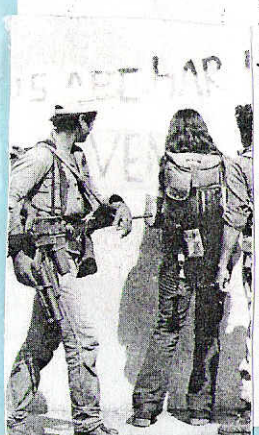
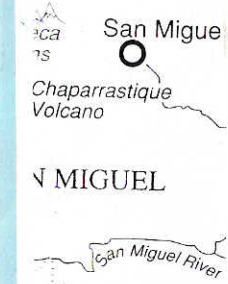
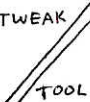
Assuming that your board is locked on frequency and not smoking, check the SWR meter. If the needle is crammed over to the right, throttle back the sensitivity with the knob (counter-clockwise) till it comes off the peg. If the needle is still at zero, twist the knob to the right until you get a reading. If you can't get a reading but you do have your carrier in the monitor you have a problem toward the end of your RF chain. Get a reading in the middle with the knob and then twist the variable caps in your exciter's final to deflect the needle to the right. Most exciters, the venerable and problematic, but great sounding Dunifer 1 watt, the Veronica, the Max 1, have two variables in their final. Turn one. If the power drops turn it the other way. You will find that there is a point where your power peaks. Leave that cap there and try the other one. You will probably find a point on it where you get even more power, in fact you might have to turn the sensitivity of your meter down to read the peak. The capacitors interact so bounce back and forth a few times to get the absolute most out of your exciter. Listen to the monitor while you do this, sometimes the last amplifier stage can sort of wobble out of control and make a lot of power but also horrible noise and interference. Avoid this, even if it means running slightly less power. Congratulations, you have just tuned your first amplifier.

Note that some circuits use transistors that don't need to be adjusted to 50 ohms, the BGY 133

20 watt module is a good example. It operates naturally into 50 ohms, very handy. Its that impedance thing again. Remember that we said that as long as your power sees 50 ohms as it goes along then it will be propagated without much loss? Well that's true, but by building special networks of capacitors and inductors we can kind of fold ourselves into another impedance in an efficient manner. This is called matching, and how good our match is determines how much of our power gets through into the new impedance. Most transistors operate at some other impedance and need to be matched to your 50 ohm environment. Since the best power transfer occurs in a matched impedance we know that your exciter is now tuned to 50 ohms.

If you have an amplifier on hand place it in the line just after the exciter, make sure the dummy load is hooked up after the SWR meter, and try tuning it up in the same fashion. Some amps just have variables on the output, others need their input circuits tuned as well. If you happen to have two SWR meters, one placed between the exciter and the amp can help you adjust the input match, but really just tuning for maximum output power is fine. Be sure to listen to the monitor. Another trick is to place a television near the setup and scan the channels for interference produced by your station, then tweak with the amps to minimize it.

\* IMPORTANT NOTE: USE A NONMETALLIC TWEAK TOOL TO TWIST THE CAPS, YOU CAN GET LITTLE PLASTIC SCREWDRIVERS AT RADIO SHACK, GOOD ELECTRONIC SHOPS WILL HAVE PLASTIC SHAFTS WITH TINY METAL BLADES ON THE END, THESE ARE NICE. WHATEVER YOU DO DON'T SHORT THE CAP WITH YOUR TOOL!



## RADIO TECH corner: TWEAKING and Tuning Circuits

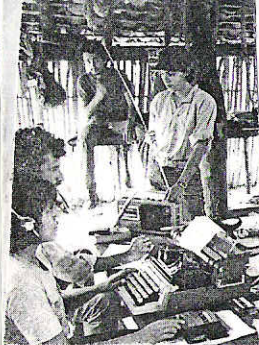
So you've gotten serious about assembling a radio station. You've read what you could find. You've collected a pile of audio sources, a mixer and hopefully a compressor/limiter. You've sent away for a transmitter kit and then taken a deep breath and carefully soldered it together. But now you're stuck. You're afraid to turn the thing on, you're not sure how to tell if it's working right, you can't find the real nuts and bolts information anywhere that would make you feel secure in your ability to proceed from here. Besides, the literature you have read warns most alarmingly not to operate without a harmonic filter but none of it tells you how to build one or how to test one you have purchased or inherited. Or perhaps you have built an exciter and an amplifier but your exciter's literature says it puts out 1 watt but your amp only wants 1/4 watt in. What do you do about the other 3/4 of a watt?

Well, good thing you waited! And good thing you found this zine because right now were going to try to cover a couple of harmonic filter and attenuator designs, and hopefully give you some good hints on troubleshooting and tuning up your new transmitter.

I'm going to digress briefly to try to explain this impedance thing you may have heard of. Impedance, measured in ohms, is a special kind of resistance. It is the load into which your amplifier is running. You may have noticed that stereo speakers are rated in ohms, usually 8 or 4 ohms. This is the impedance into which audio amps like to run. Radio amps are built to operate into 50 ohm loads. If you've come this far you have probably heard that the coaxial cables we use are 50 ohm and that you must match your antenna to 50 ohms. Once you come off your circuit board with your RF output in a coaxial cable you are in a 50 ohm environment, which means that your power will travel without much loss until it encounters a different impedance or is used up in a 50 ohm load. If it encounters a different impedance then some portion of your power will reflect from that point back toward your precious amplifier where it will be expressed as damaging heat. If it travels all the way down your transmission lines without seeing a mismatch and finds a 50 ohm load at the end then the power will be efficiently converted into another form. If this load is an antenna, matched at 50 ohms, then all your power will be radiated into space as an RF signal, this is good. If this load is a 50 ohm dummy then your power will be radiated as heat not radio power, but this heat will be safely away from your final transistor. This is very useful in place of an antenna for testing without transmitting.

Now, there are a few more things you are going to need to get. I know, you've already spent so much on this project, but you really need a couple more tools to move forward. First, get or build the afore-mentioned dummy load, nothing more than a 50 ohm resistor soldered across a coaxial connector or cable, by across I mean from the center conductor to the ground shield. Remember that resistors add in series so two 100 ohmers next to each other (in parallel) will divide to 50 ohms, likewise 4-200 ohmers or 8-400 ohmers and so on. In each case the resultant dummy load will handle twice as many watts as the one before for a given resistor rating (eg. A dummy load built with 4-200 ohm resistors rated at 1/2 watt each will take 2 watts before it starts to melt from expressing your power as heat.) Be sure to get a dummy load going on that will deal with the expected power from your setup. Resistors up to 5 watts are commonly available, 8 of them in parallel will deal with 40 watts, if you're building an amp bigger than that you probably already know where to get a bigger dummy load to test it into.

Another thing you simply must have is an SWR meter. As an aspiring RF tech this is something you cannot do without. SWR stands for "standing wave ratio". It is a way to measure impedance mismatches. If you place an SWR meter in your transmission line between a properly tuned transmitter and a 50 ohm dummy load it will read 1:1, that is perfect. If you were to build a purposefully wrong dummy load, say 100 ohms or 25 ohms, then the SWR meter would read 2:1, get it, a 2 to 1 mismatch. Remember that the reading of an SWR meter is relative to your power output so you must first calibrate your forward power to 100% before reading the reflected power. See? The amount of reflected power only means anything in terms of your overall output, if you are making 10 watts but reflecting 5, the SWR is 3:1, barely usable...if you are making 100 watts but reflecting the same 5 your SWR is some very small ratio 1.05:1, just peachy. Your meter, unless it is of an advanced sort, counts on you to calibrate it to the power level in which it finds itself, simply set it to "forward," fire up the transmitter and twist the knob to make the meter read at the rightmost mark but not beyond, then switch to "reflected" to read your SWR. For our purposes I



Three minutes before broadcast, you could hear the internal communications: "Lenin ready!"

"Hurricane ready!"

"Star ready!"

And the other ready and the other ready. In the central studio we had our own code-name which was "Devil". So when all the FM's were connected up, the final question would come: "And the Devil?"

"The Devil's always ready, *hombre!*"

The countdown would begin: five, four, three, two, one... zero! The national anthem would ring out, and with all the buttons that were clicking you'd think you were in the Challenger.

"Radio Venceremos transmitting..." Santiago's voice would begin.

Suddenly a station would report: "Overmodulating!"

And another: "Overmodulating! Way overmodulating!"

"¡Coño! Chico, wait a minute," his Venezuelanness would come out.

"You're going to give me a heart attack!"

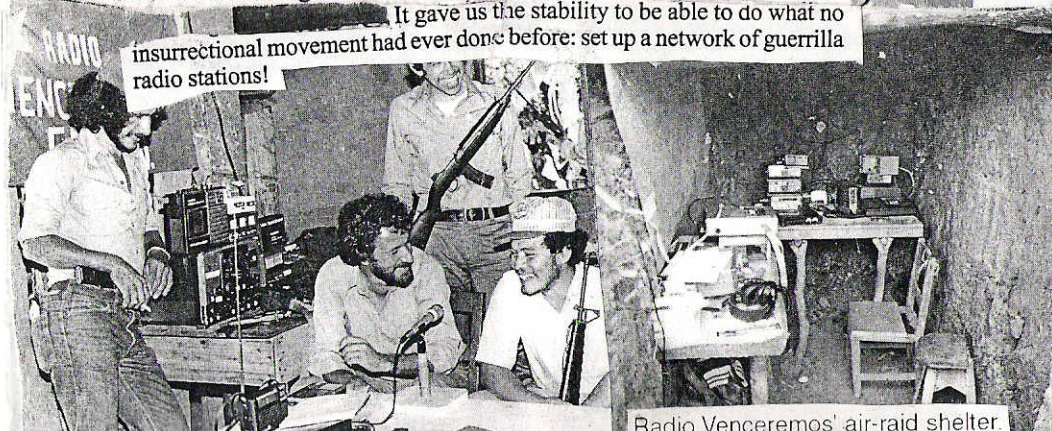
That was really an exciting time. Our little network was taking off, reaching a larger and larger audience.

"Get down, brothers, we read you loud and clear!" the lads in the city would tell us.

You could hear us in the markets in San Miguel, where they put us on loudspeakers. You see, FM has a certain class. With FM you can put it on and start cooking. It's not like short wave where you have to struggle to tune in and it always sounds awful. Besides, by that time they were interfering with the short wave, but they never managed to disrupt the FM, I don't know why. Maybe because we broadcast right next to the frequencies of the commercial stations and it might have messed them up.

It was a great time, but it didn't last long. The station always developed in accordance with the military struggle, right? When we had the FM, we were busting the *cuilios'* ass in the great offensive of '83.

It gave us the stability to be able to do what no insurreccional movement had ever done before: set up a network of guerrilla radio stations!



Radio Venceremos' air-raid shelter.

# RADIO ANARCHY AND QUANTUM PHYSICS

## by Rumpelstiltskin

Radio waves are magic in action. Swirling around us constantly, carrying information ranging from distant stars' radiation to the tree in your back yard. With the proper receiver, you can pick up almost anything. I want to talk about Radio Free Cascadia and how it embodies some anarchist principles in organization, content, and spirit.

RFC began on February 16th, 1998 when the sounds of Fugazi suddenly appeared in Eugene at the frequency of 98.5 FM. Since then, a dazzling array of DJs, wingnuts, magicians, and plain old community members have been broadcasting between noon to midnight every day. Sometimes only for a few hours, sometimes all day and night. The unpredictability is part of the magic. I like being able to turn on the radio and be surprised. The other day, I heard a noise show where the DJ exhorted listeners to detune their radios, make tapes of the static on cheap cassettes, and give them to their friends - INSTEAD of listening to the show! You'll never hear other stations tell people to tune 'em out. One time RFC DJs called up the KNRQ DJs and put them on the air. They asked "If you're the alternative, then what are we?" Again, this is unheard of in the world of "legitimate" radio. You hear the most amazing stuff on RFC. Paranoid rants, out-of-print jazz albums, talk shows on anarchy, drunken tales of bondage, news from Cuba, erotica read over techno beats, and stolen movie dialogue.

One crucial difference between RFC and other stations is the concept of access. We exist to make the radio waves accessible to anyone we can. Our content policy is minimal - no advocacy of violence without a disclaimer, and no threats against specific individuals. We encourage technical ineptitude, bad attitudes, and creativity. People don't have to fill out an application or anything like that. Nobody gets paid, and we stay disorganized enough that nobody can take over. I've noticed that, just like the original 16th century pirates, being part of an autonomous space really brings out people's innate creativity and spirit (frequently people would desert military ships to join up with the supposedly evil pirates, we've also had our share of disgruntled DJs from other stations join us).

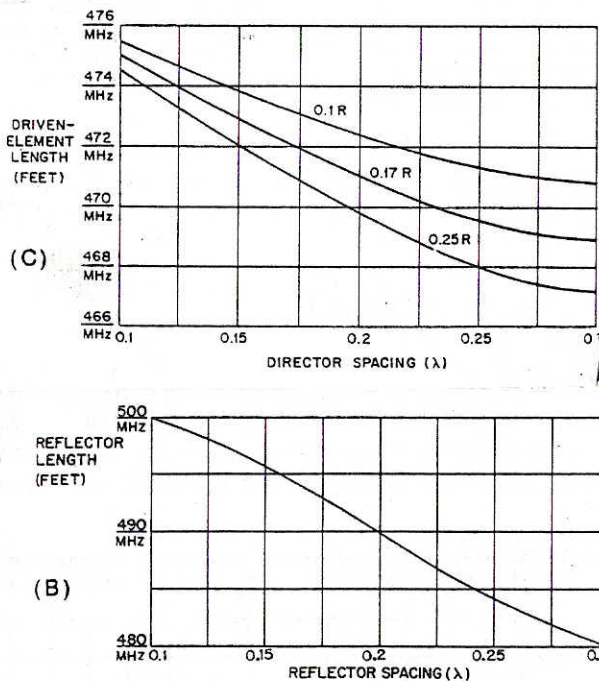
These days, most RFC collective decisions are made by consensus (for example, how we spend our funds). Certain bottomline security issues are dealt with in a more hierarchical fashion - somebody who blabs about a location over the air, for example, would probably be 86'd even if the collective couldn't reach consensus to kick them out. People have been warned or suspended for being drunk and/or threatening as well. This is because the only long-term consensed goal is one of longevity, and that goal supercedes certain other issues like the right of people to be stupid and endanger the collective. So we walk the fine line between a direct action affinity group and a consensus-based community organization. Both have their role in the overall process.

This is a very exciting time for micropower radio, or "pirate" if you prefer. The movement has grown dramatically in the last two years: The FCC is currently considering legislation to create new micropower licenses. RFC's stance on this (along with, I dare say, the majority of currently operational micro stations) is that we will never accept a license to engage in free speech and open communication. It's a right, not a privilege. The easily coopted are flocking to lick the FCC's boots in the hope of obtaining licenses, but we shall continue on as always.

To get RFC, you probably need a real receiver (not a clock radio, and many boomboxes aren't so good either) with an antenna. Most car systems work well, but a digital receiver with an antenna is your best bet. Radio antennas are readily available at thrift stores and electronics shops for a few bucks, or you can email the RFC techies at <radio985@efn.org> and they'll send you info on how to make your own out of old TV antenna wire. If all else fails, try the old coat-hanger-and-tinfoil-ears antenna trick. Make sure you're on "FM mono" if you have the choice, and turn "FM muting" off if you have it. If possible, get your antenna outside and up as high as you can. Since RFC is mobile and moves around, you may get it in better on certain days.

... YAGI ANTENNAS!

Fig 18—Element lengths for three-element Yagis. These lengths will hold closely for tubing elements supported at or near the center.



Liberation of the Airwaves

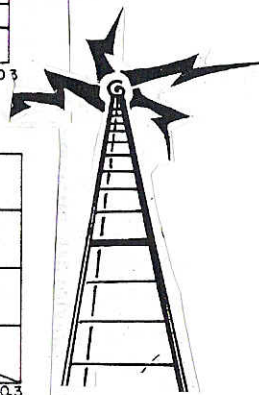


Table 2

Optimum Element Spacings for Multielement Yagi Arrays

No. Elements	R-DE	DE-D <sub>1</sub>	D <sub>1</sub> -D <sub>2</sub>	D <sub>2</sub> -D <sub>3</sub>	D <sub>3</sub> -D <sub>4</sub>	D <sub>4</sub> -D <sub>5</sub>	D <sub>5</sub> -D <sub>6</sub>
2	0.15-0.2 $\lambda$						
2		0.07-0.11 $\lambda$					
3	0.16-0.23	0.16-0.19					
4	0.18-0.22	0.13-0.17	0.14-0.18 $\lambda$				
5	0.18-0.22	0.14-0.17	0.15-0.20	0.17-0.23 $\lambda$			
6	0.16-0.20	0.14-0.17	0.16-0.25	0.22-0.30	0.25-0.32 $\lambda$		
8	0.16-0.20	0.14-0.16	0.18-0.25	0.25-0.35	0.27-0.32	0.27-0.33 $\lambda$	0.30-0.40 $\lambda$
DE to N	0.16-0.20	0.14-0.16	0.18-0.25	0.25-0.35	0.27-0.32	0.27-0.33	0.35-0.42

DE—Driven Element; R—Reflector; D—Director; N—any number; director spacings beyond D<sub>6</sub> should be 0.35-0.42  $\lambda$ .

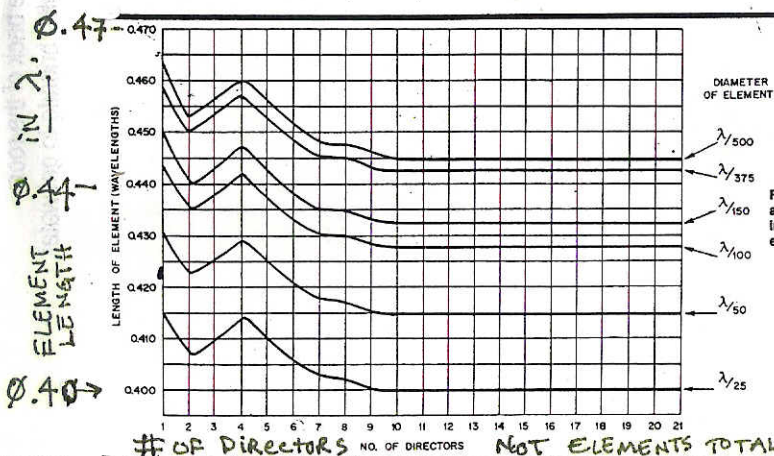


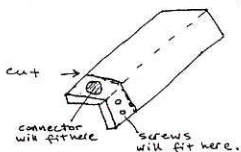
Fig 22—Length of director as a function of its position in the array for various element thicknesses.

# OF DIRECTORS NO. OF DIRECTORS NOT ELEMENTS TOTAL.



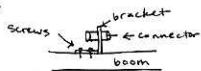
## ..Yagi ANTENNAS CONTINUED

- 8) To hold the connector onto the boom you must use a mounting device. Cut a strip from a stiff piece of aluminum angle with one side large enough to drill/file a hole the right size to accommodate your connector, and the other long enough to put two screws through to your boom.



We are using aircraft aluminum alloy angle cut in a strip sized to accommodate a BNC-type connector

- 9) File down a flat spot on your boom where the mounting bracket will be screwed down. Prepare screw holes on bracket and boom.
- 10) Drill out a hole on bracket for connector. You will probably have to enlarge it with a circular file.
- 11) Attach the connector to the bracket and screw it down to the boom.



### - GAMMA MATCH

- 12) Cut and straighten a piece of plastic shielded copper wire (regular 12 gauge house wire). Start at around a half the length of one side of your DE. Strip the plastic off about 1/2" one end.
- 13) Cut a straight piece of 1/4" interior diameter copper tubing. Lengths will vary for each frequency and you may have to experiment a bit. For a 3M antenna it may be six inches, while for GMR5 (UHF) it may be only 1/2" long.
- 14) Cut a piece of plastic tubing that your 12 gauge wire fits inside, and which in turn fits into the copper tubing.
- 15) Solder a ring terminal onto stripped end of wire, and another onto pin of connector. Terminals are connected with a nut and bolt to couple the wire to the connector in a detachable way.
- 16) Fit wire, tubing, & copper tube piece together in a sliding gamma arm and couple into connector.
- 17) MAKE an aluminum strip holder to attach gamma arm (at copper tube) driven element. Slide to adjust capacitance. (See photos.)
- 18) USE AN SWR METER TO TUNE YOUR ARRAY TO A 50 OHM MATCH. The array is tuned when you have achieved the lowest possible Standing Wave Ratio (SWR). Try for a 1:1 ratio. Do not transmit into a 3:1 ratio or higher!

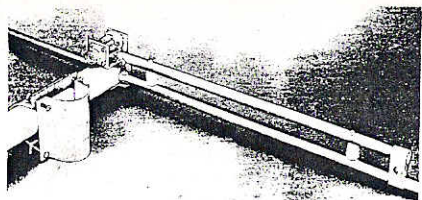


Fig 34—Typical gamma match construction. The variable capacitor, 50 pF, should be mounted in an inverted plastic cup or other device to protect it from the weather. The gamma arm is about 12 inches long for 50 MHz. The same construction technique may be used for 144 MHz, with an arm length of about 5 in.

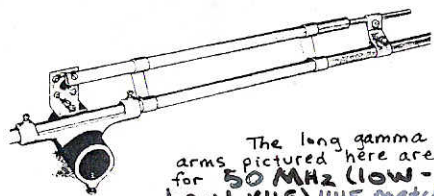


Fig 35—Gamma matching section using tubular capacitor. The sheet-aluminum clip at the right is moved along the driven element for matching. The small rod can be slid in and out of the 15-in. tube for adjustment of series capacitance. The rod should be about 14 in. long for 50 MHz.

Free Radio Cascadia... taking back communication from the corporate media...

## June 2000 Note:

RFC is currently off the air temporarily in Eugene. Expect us to fire back up on 98.5 FM anytime! Most recently we operated an event transponder in Portland for MAYDAY on 97.9 FM.

You can write RFC at Post Office Box 12200, Eugene 97440. You can email them at the address above, and there's also a web page at [www.efn.org/~radio985](http://www.efn.org/~radio985). Two phones have come and gone over the past year, and another number should be in service soon. You can support RFC by listening, attending benefits and fundraisers, telling your friends to tune in, and by telling the FCC to leave microbroadcasters alone (1919 M St. NW, Washington DC 20036, or [fcc.gov](http://fcc.gov)). The local "Compliance Bureau" is in Portland, and you can email their head, Binh Nguyen, at [bnnguyen@fcc.gov](mailto:bnnguyen@fcc.gov). He's the guy who attempted to give a citation to RFC in April 1998 for "broadcasting without a license".

Of course, the best way to support RFC is by going on the air yourself. It's easy and relatively cheap (\$500-600), and there's tons of info on the net. Just don't interfere with other stations or frequencies - you'll be giving them an easy (and legal) excuse to bust you.

On the subatomic level, the distinction between wave and particle disappears. We are literally indistinguishable from the universe around us. This means that in some way, Radio Free Cascadia's broadcasts are affecting every one of you reading this right now. The signals are drifting around you in thin air, subtly altering electromagnetic fields in ways we still don't understand. Everything in this universe is affecting everything else on an instantaneous basis. Those of us who intuit these patterns can use them in magical ways to alter the nature of reality. Radio waves are one powerful way of reaching people's auras and spirits directly on a subconscious level as well as audibly. Just tune in and listen, you'll feel it in your soul...

### Evolutionary Statement of Radio Free Cascadia, 98.5 F.M.:

The capitalist marketplace has put a price on the earth and the very thoughts of citizens, as if these were products to be owned and traded by faceless economic machines. Huge multinational conglomerates, facilitated by the industrial governments of the world, use their profits to control more and more public space, from national forests and city parks to television, print and radio media.

Following this global trend of consolidating private ownership of public resources, channels of mass communication have become less and less accessible to individuals and local communities. The assumption that most of our society desires a spoon-fed version of current political and cultural events, denies the potential for an ever-changing blend of ideas and values to stimulate social change on a local level.

Mass media provides a constant flow of meaningless, consumer-oriented, mass-produced cultural symbols that simultaneously encourage both uniformity and competition. This commercialization of culture is a massive obstacle to the emergence of the creative social interaction and artistic expression that is vital to confront the diverse problems facing civilization.

Citizens around the globe have chosen to respond to this domination of public discourse nonviolently and pro-actively, by simply reclaiming these public spaces, even in the face of violent governmental repression. Micro-power or "pirate" radio is one such response.

Radio Free Cascadia seeks to be only one outlet for the incredible diversity of ideas and



perspectives in our bio-region. Like the water, air and soil, radio airwaves are a public resource, and as such should be utilized for the greatest common good. RFC believes that the public freedoms expressed by the First Amendment to the Constitution should apply equally to micro-power radio, Internet web sites and your local community bulletin board. Perhaps the FCC's insistence on control over the airwaves is best explained by their economically biased regulatory process — hopelessly skewed in favor of corporate interests.

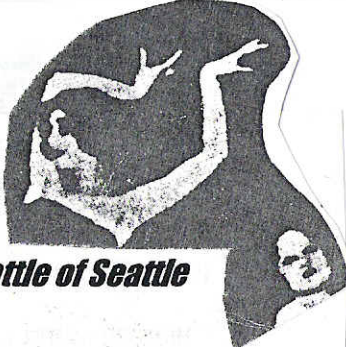
RFC believes that to allow profit-driven corporate entities to elbow out grass roots media channels is to mock the notion of free speech, and suppress the possibility of deeper social interactions in our daily lives. Radio Free Cascadia is prepared to confront this threat to the survival of our civil liberties through continued nonviolent direct action and a constitutionally-based legal defense.



# Aural Assault!

## Free Radio vs. Free Trade in the Battle of Seattle

by miss kreant



While throngs of protestors liberated the streets of downtown Seattle during the World Trade Organization convention, several small, independent pirate radio cells liberated the airwaves on Seattle's FM dial to report on the protest and rouse the rabble with incendiary rhetoric and riotous mood music. Free Radio activists from as far away as Philadelphia's Radio Mutiny converged with creative ideas for covering the protest on the air. One pirate station, Y2WTKO, broadcast into Seattle for five days from a tree on the Olympic Peninsula with music, updates on the demonstration, and relayed news programs from shortwave radio, Olympia's KAOS, and the local television audio frequencies.

The VOS pirate radio collective had already plastered Seattle with flyers and stickers listing the local free FM frequencies by the time my colleague Smokestack and I hit the streets as news correspondents and media contacts for Y2WTKO, the pirate radio station imported by Eugene, Oregon's Radio Free Cascadia (98.5 FM) collective. Y2WTKO started boomin' Monday, November 29, with the most powerful and far-reaching signal of the pirates. We started out on 101.1, but on Wednesday the signal moved to 87.9, inadvertently bumping Free Seattle Radio up to 93.7 (sorry y'all, we could't hear ya). My job as correspondent involved me toting around hundreds of dollars worth of radio equipment concealed under my clothes. We had to be careful not to get arrested or detained. Our only press passes were from the Independent Media Center, not much better than a neon green tag reading "Arrest Me Now!"

Smokestack and I took great pains to look like slick, professional media personnel. We were up before dawn Monday, ironing our disguises. Under my long skirt dangled a dual band VHF/UHF transceiver with a flexible quarter-wave whip antenna that poked up under my shirt to my armpit. Also wired under my shirt were a tiny microphone and a push-to-talk button. In my slick vinyl backpack: the home-hacked four element UHF yagi antenna I had made just for the occasion out of scratch materials, "the Beam". With our briefcases full of sensitive documents, we were ready.

Away across the Puget Sound, high on a hilltop at the end of a logging spur road, nested 65 feet up a Hemlock tree, the other half of our cell positioned the arrays with a line of sight 25 miles straight into Seattle. For correspondence they had a beam like mine, only longer with six elements. For FM broadcast and reception, two huge yagi arrays, one for each end of the dial, were assembled in the tree. The arboreal radio station also had two FM receivers, shortwave receiver, cassette player, compact disc player, mixer with mike input, and of course, the transmitter.

In the wind, rain, and snow, with the bucking and swaying of the tree, installing, maintaining, and operating all this equipment was no simple task. Add to it all numerous heavy deep cycle 12-volt batteries, a gasoline generator with tanks of fuel, random techno-gadgets, a kitchen, food, and a shitbucket and the station was ready. The sciences of radio and treesitting were truly merged and poised for a long-range aural assault on the greater Seattle area. Move over corporate radio!

Monday evening, we were on the air. Smokestack quickly wrote and sent out a press release: "Like the forests and the oceans, the airwaves belong to the public. This resource of the people has been stolen from us by governments and corporations, aided and abetted by the illegal, illegitimate organization that is the WTO. As with so many other aspects of our lives, we must once again struggle to liberate this element of our collective reality."

VINDICATE THE CONVERGENCE



radio free cascadia

the RIGHTFOUS and the MYSTIC bringing on the EVOLUTION...

### - CONSTRUCTION PHASE

- ① Cut boom to desired length.
- ② Cut elements to appropriate lengths. (Leave a tiny margin of error, 1-3/16", for R and DE). Cutting the R and DE a little long and the directors on the short side will give you an array with good bandwidth or a wide range of frequencies at which the SWR is usable. You can fine tune the array by filing a bit on the element lengths. Tuning (adjusting length) is less critical if you build your array for wider bandwidth. Label each element R, DE, D<sub>1</sub>, D<sub>2</sub> etc.
- ③ Measure and mark the center of each element.
- ④ Measure where each element will go on boom and mark the spot of each one. (Remember spacings!) Label each spot for corresponding element.
- ⑤ Drill a straight hole through both sides of your hollow boom where each element goes. File until holes are just big enough for element.
  - ★ Alignment is crucial! Insert your first element before drilling for the next one. Use the element to sight down the boom and check that you are drilling so that elements will be perfectly parallel.
- ⑥ Drill holes for screws through one side of boom, coming at each element at a right angle. Choose a drill bit the size of the shaft of screws, not including the threads.
- ⑦ Insert elements in appropriate order and screw firmly into place. Be sure elements are screwed in at the center.

### - FEED POINT

The feed point is the point at which the RF current enters the antenna from the feed line (coaxial cable). A connector must be affixed to the boom at the center of the driven element. The feed line connects to one side of the connector on the side of the reflector element. The other side of the connector on the side of the reflector element. The other side of the connector has a central pin, which is soldered to a piece of copper wire. The wire is part of the gamma match made in the next step. At this step you just need to make sure the pin of the connector is placed so that the copper wire bent at a right angle, will be alongside (parallel) but not touching the driven element.

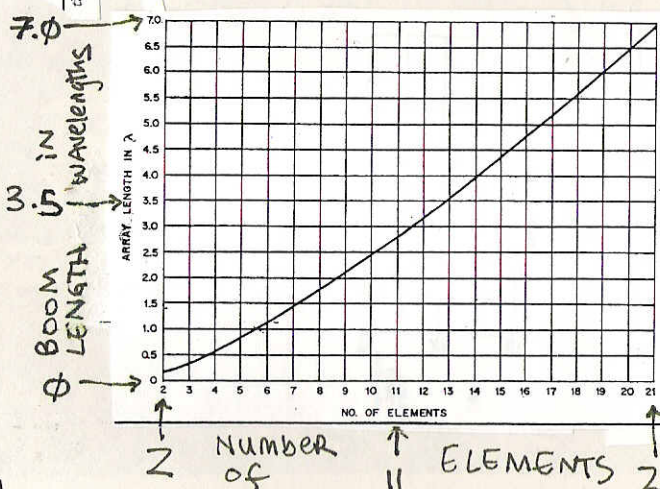
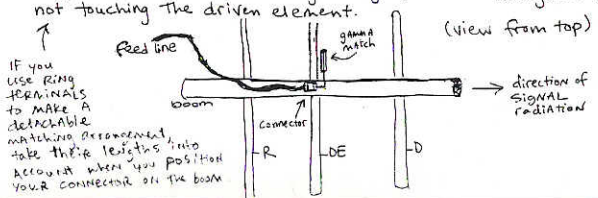


Fig 21—Optimum length of Yagi antenna as a function of the number of elements. (C. Greenblum)

Sorry its so tiny!

# YAGI ANTENNA DESIGN AND CONSTRUCTION

## DESIGN PHASE

1) Determine your frequency of operation in Megahertz. If you are using a range of frequencies, choose one in the middle for your antenna design frequency.

2) Calculate the wavelength ( $\lambda$ ) in feet for your design frequency. Use this equation:

$$\frac{491.8}{\text{Frequency (MHz)}} = \frac{\lambda \text{ (feet)}}{2}$$

Remember: This equation gives you a HALF wavelength, so be sure to multiply your quotient by 2 for the FULL  $\lambda$ .

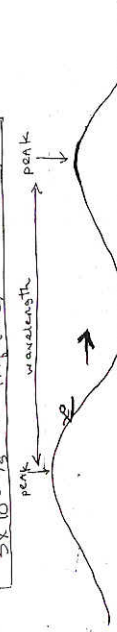
\* Wavelength is mathematically related to frequency by the speed of light, which is estimated at  $3 \times 10^8$  m/s (meters per second). RF (radio frequency) travels at the speed of light in a vacuum. Radio wave will incur some reduction in speed from the medium in which they travel, but in air the reduction is negligible.

Imagine surfing in the radio ocean. You can count the seconds between the peaks of each swell. This is the period, or frequency, of your waveform.

If you know how fast the waves are moving ( $3 \times 10^8$  m/s), you can use the simple equation from your high school physics class to calculate the distance, or wavelength, between each peak.

$$\text{RATE (speed)} \times \text{time (period)} = \text{distance}$$

$$3 \times 10^8 \text{ m/s} \times \text{freq. (MHz)} = \text{wavelength}$$



Fortunately, the equation  $\frac{491.8}{f} = \frac{\lambda}{2}$  has the speed of light and the meters to feet conversion already built in!

3) Next, determine what boom length you want to work with. The boom is the long, thick piece which supports your elements. The boom is not part of the electrical RF situation; the elements do all the work. Length of elements is determined by many precise factors, but boom length is determined by practicality and convenience. Booms can be metal (aluminum works best because its lightweight yet firm), PVC, wood, or any other material that works. Usually they are made of hollow pipe.

When you have your boom length in feet, then determine its length in wavelengths (using the  $\lambda$  in feet for your frequency). Ex: A five foot boom for a 100 ft.  $\lambda$  would render a boom length of  $\frac{1}{20} \lambda$ .

Use this guide to make a directional broadcast antenna for your pirate radio station, or small, mobile beams for a UHF or cell-phone link-up for your station's roving street correspondents. HAPPY BEAMING!

4) Use Figure 21 (from the copied portions of the ARRL Antenna book) to determine your optimum number of elements is relevant to your boom length (or array length) in  $\lambda$ .

5) Use Table 2 to determine your optimum element spacings. Spacing is dependent on the number of elements used. The Table gives spacings in  $\lambda$ , which we must convert to inches.

Ex:  $\lambda = 100$  ft. Spacing =  $.05 \lambda$ .  $.05 \times 100 = 5$  ft.  $5 \text{ ft} \times 12 \frac{\text{in}}{\text{ft}} = 60 \text{ in}$  you need each spacing: Reflector to Driven Element, DE to Director 1, D<sub>1</sub> to D<sub>2</sub>, etc

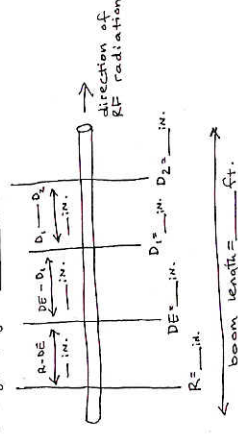
6) Determine your element diameter in  $\lambda$ . You must already have the material you will use to make elements (element stock). We are using  $\frac{1}{4}$ " aluminum rod. The diameter of the element in  $\lambda$  is dependent on the value of  $\lambda$ , which is dependent on your frequency.

Ex:  $\lambda = 100$  ft. element diameter =  $.25 \text{ in}$ .  $\frac{100 \text{ ft}}{360} = 2.78 \text{ in}$  = 300 diam. =  $\frac{1}{300} \lambda$

7) Use Figure 18 to derive the optimum lengths of your Reflector, Driven Element, and Director if you are only using one (3 element beam). The R is longer than the DE, Directors are shorter.

8) Use Figure 22 to determine the lengths of each director if you are using two or more. (4 element beam).

9) Draw and label a diagram for your array which specifies: Design freq. = \_\_\_\_\_ MHz.



D.I.Y. YAGI ANTENNA!

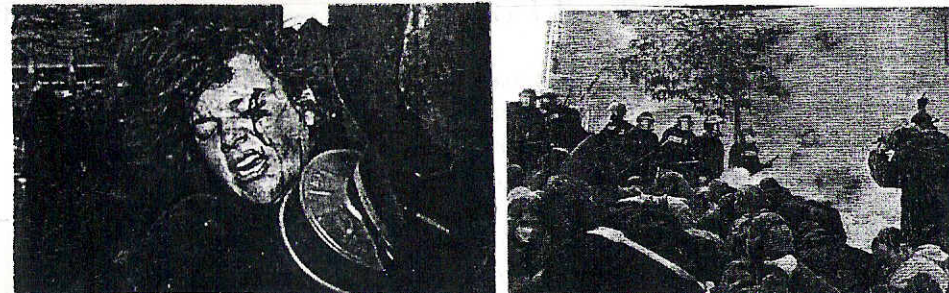
Tuesday, N30: While all our friends were on the frontlines getting gassed, setting dumpsters ablaze, smashing corporate glass and looting the Radio Shack, Smokestack and I hung back, looking like slick yuppie media twerps on the sidelines. It was kind of embarrassing; friends I hadn't seen in years were fukin' shit up and I was hoping no one would see me and wave. Comrades' eyes would meet mine over their balaclavas and I had to give them a quick, cold "Don't talk to me, I'm undercover" look. But the police never questioned us as we roamed around in front of police lines and through crowded streets, gathering information. The problem was relaying it. From deep down between the skyscrapers, my beam and my whip antenna were useless. We had to go way down to the waterfront or up on a parking garage to have clear contact with the station. We would hit the streets and take notes, swing by the Indy Media Center to get the official updates, then go back up on the neighboring parking garage to fire off our report. Then we'd do it all again.

In the streets and on the air, the unrest intensified. Free Seattle Radio had audio commentary streaming live on the internet from Studio X. One comrade from another radio cell cruised around briefly with a low-power transmitter in a suitcase and an umbrella antenna, but the signal had no where to go in the towering urban walls resounding with the noise of the mobilization of thousands and the crash/banging of the teargas grenades. We saw a friend's face get pummeled into the pavement by the Seattle stormtroopers before they dragged him away. While we put in some time on door security at the IMC, a young woman with blood streaming down her face was brought in to be treated by the medics. She had been gashed in the forehead by a teargas canister the police had launched at the crowd. At the waterfront that evening, as we wanted and detailed the successes and horrors of the day, our own voices were relayed on the air, sounding tinny and distant after crossing the sound and back.

Tuesday night I learned what panic felt like when the police locked us down inside the IMC. A hundred or more people were detained in one big room while tear gas seeped in from both ends of the building. The cops guarded the door and parked a "Going to Jail" bus right in front. Weird undercover agents watched us through the window from the deck of the parking garage conveniently located next door. I was sure the police would storm in and arrest us all, confiscate everything. I slumped down in the back of the room gasping for breath while Smokestack launched into emergency mode, joining the bottle brigade to get water to the basement where medics were treating teargas victims, I couldn't reach the tree-station at all on UHF from inside the building. Nervously I wiped out all the frequency memory banks in my radio. I had spent hours programming it! What to do with the secret code book? Destroy it? Hide it under the carpet? After a couple of angst-filled hours the police finally let us go in small groups. Smokestack and I walked out of the "No Protest Zone" that night with a heightened awareness of all we stood to lose if captured. What would happen to our friends in the tree?

Wednesday it started all over again. By afternoon the parking garage attendants were onto us. They locked us out, then men in suits came down the ramp to peer at us through the grate. We went down to the Pike Place Market area to get a clear shot across the sound. On a quiet side street, with Smokestack aiming the Beam, I was just firing a report when Smokestack gave the signal to ditch! An ominous unmarked white van adorned with multiple antennas had just pulled up across the street. They were watching us! We grabbed all our gear and bailed through the Pike Place Market.

No longer safely able to transmit from street-level, we retreated to the strategic heights of Capitol Hill, escaping the Pike Place market in time to miss the nerve gas and the heightening police brutality. If Wednesday was anything like Tuesday, we knew the police would herd the riot right up to our feet. The police performed on cue. Down the street, the Guardian helicopter trained a bright spotlight on the show being staged by the Anarchist Black Bloc on Denny Street. An armored personnel carrier careened around the corner mere yards away from my shadowed position just as I lost contact with the station. How did it happen? In all the excitement, one of us lost the frequency, and we had forgotten to establish a default.



Wednesday night and all of Thursday I stayed put on the Hill, parked by an FM receiver tuned in to Y2WTKO. I tirelessly kept trying to reestablish our UHF link to no avail. Without our street-level input, the station relied on commercial news, live reports by Amy Goodman on Democracy Now, and shortwave news broadcasts on Radio Havana Cuba and Radio For Peace International. They also played a lot of Negativland. Sometimes they would go off the air to recharge the batteries, and when they fired up again I sighed with relief. Without a two-way link, the FM signal was the only way I had to know if my affinity group was okay. If law enforcement assaulted the station, they were counting on me to respond. I was anxious, so I made a couple hundred small flyers for the station and distributed them around the Hill. We also logged several hours of the Y2WTKO broadcast on tape. Smokestack took leave of the operation Thursday evening.

Friday morning I hit the streets one more time to join the big march from the Labor Temple with a microcassette recorder. If we couldn't relay live coverage, we'd at least have tape to work with later. I felt guilty leaving the receiver unattended; small portable receivers weren't receiving from sea level. I stepped off one bus downtown, waited for the transfer. Suddenly my pager went off with an emergency code! I ran the several blocks to the IMC to make the call. An independent radio decryption cell had intercepted some startling signals from a federal helicopter headed in the direction of our radio station! They were tracking our signal. I knew that the crew in the tree had no ground support. Could I get from downtown Seattle to the site across the sound before the feds laid siege?

I had planned to meet a friend at the labor rally. He had access to our affinity group vehicle and he knew the way. A woman at the IMC offered me a ride to the rally. On the spot I deputized a videographer and an RFC comrade from Eugene. At the rally, I found our driver, but our group got split up. It took about an hour to regroup. I was stressing way out; in my head that black enemy chopper kept chopping away across the sound and along the Olympic ridges, triangulating the radio signal. We had no way to warn the station!

Finally we were on our way, having released topographic maps to the site in case anyone felt like leaving the riot of the century, taking a ferry, and driving up to a remote hilltop in the National Forest to face off with the feds and defend a beleaguered crew of radio pirates.

On our way up the mountain, we met a sheriff coming down. Low Dog and I lay flat in the covered pickup bed while our driver pulled off an award-winning improv. "Just drivin' around lookin' for snow, sir!" The award? The sheriff let us go. As we neared the site, however, the road was blocked by law enforcement. Two Forest Service law enforcement officers, more sheriffs, and an ominous unmarked white van with lots of antennas - the FCC! They had zeroed in on the signal.

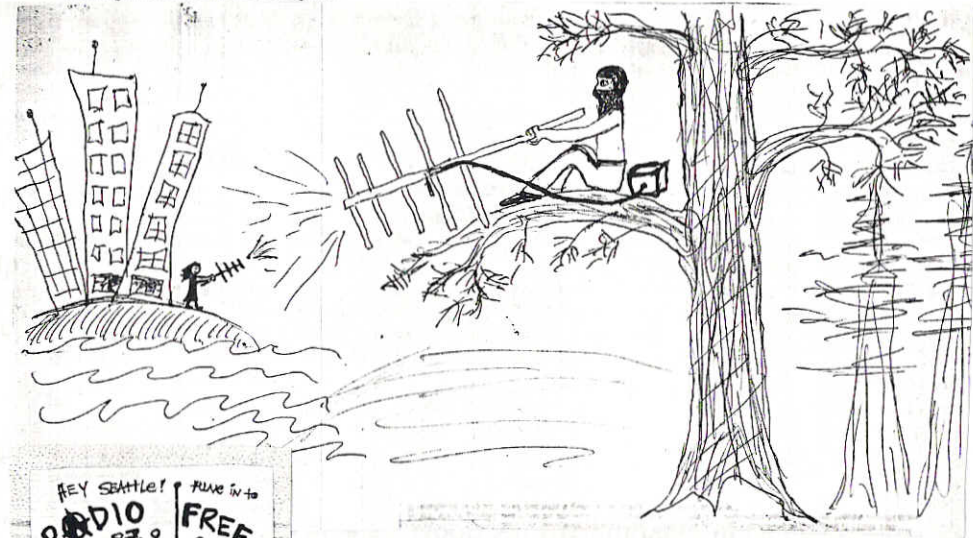
Y2WTKO kept broadcasting the whole time. They seemed to be unaware of the siege. We racked our brains to think of ways to warn them: if only we could fire off an emergency press release to Radio For Peace International! As we retreated from the darkened road block, the cops were struggling up the hill through the thick wet undergrowth, guided by the light and the sound of the generator. Bright flashlights probed the tree for information. Finally the crew in the tree took note of the activity on the ground, just as the cops were retreating! The pirates attempted to dialogue, but the cops wouldn't stay too far from their vehicles. Over the radio we heard them goad: "Why don't you stick around and talk next time, guys?" So the feds didn't want to camp out under the tree all night. I envisioned them tag-team sleeping in their Broncos, the FCC geeks taking turns listening to dead air all night. What would we do, establish a ragtag witness camp by the blockade? I wanted to bushwack around the roadblock straight to the tree and make contact. Maybe we could pull off a middle-of-the-night extraction right under their piggy noses! The driver and the videographer went to get gear and reinforcements, dropping Low Dog and I at the bottom of the hill by a payphone on Highway 101. We called our contacts in Seattle. The IMC was sending the Media 4 crew to cover the story; we had hours to wait for them. We nested down with blankets and an FM radio. Y2WTKO was playing slow, mellow jazz. How could they be so damn cool under pressure? I was pissing my pants! Would the feds send climbers up, or starve them down? Would my friends get a slap on the wrist, or get slapped with class C felonies for broadcasting without a license? Would they go to prison?

Finally, late at night, Media 4 arrived. The driver was the woman who had driven us to the labor rally. She had a high-clearance pickup with no camper. The other two guys I didn't know. One turned out to be from Free Seattle Radio. They were eager to get the story, but I urged them to help us get the pirates out of the tree. Media 4 was down. After a brief circle in which we forged a hasty affinity, we piled into the truck and headed back up the mountain to face the enemy.

The enemy was nowhere to be seen. Had we taken a wrong turn? I checked and rechecked my map, and as we reached the last intersection, the station dropped carrier. Maybe the feds were all camped out on the landing. I decided to walk the rest of the way up with Low Dog, rather than have us all blunder into a government camp, vehicle and all.

Low Dog and I reached the landing. It was a miracle! Not a bronco to be seen! Nary an ominous white van with antennas. Only the forest and the rock road, and the view! The dark sparkling water of the sound, the shaken city spread far below us, quiet, peaceful. We tentatively approached the tree. It was dark. I hooted. No answer. I called out my name. Tarps rustled, then earnest hoots resounded. Contact at last! We went back for the truck and the others. We couldn't fit everything in the truck, but we got all the gear and recovered the crusty, stubbly radio pirates who had managed to keep it all going through storm and several-hour siege while the city rocked with the uprising of the masses. It was a long, cold, exhausted happy ride in the back of the truck down the 101 that night. And not a fed in sight.

Did the feds go back up the mountain early in the evening with reinforcements, only to find the birds had flown? We'll never know. But later we learned that our signal had been heard loud and clear as far south as Tacoma and as far east as the Snoqualmie River. With only 17 watts out, those home-hacked antennas must've busted out some gain! Y2WTKO broadcast for five days during the WTO protest, from Monday afternoon until Friday night. We pulled it off and pulled out by the skin of our teeth, and lost no one and nothing. I can't wait to do it again!



### MORE RADIO + TREESIT HISTORY...

• may 14, 1998 • eugene weekly

Free Radio Berkeley has the technical capability to reach 500,000 people in the Bay Area, and is on the air most of the time. On the other hand, Radio Free Cascadia's 20 watt transmitter (compared to KUGN's 100,000 watts and KODZ's 50,000 watts) doesn't get that station's signal out very far. Still, says Static, the RFC's mix of music, political commentary, talk radio and live broadcasts has attracted a sizable audience. He says that over 50 people have broadcast from the station, and "hundreds of hours of programming" have gone out on the airwaves.

It's one of those live broadcasts, Static says, that brought the notice of the FCC to the small

micropowered station. Soon after a link-up to the tree sitters who are currently inhabiting a hemlock tree at the Clark Timber Sale on Fall Creek, Radio Free Cascadia received a notice from the FCC (dated 4/30) that the station was in violation of law, since it was operating without a valid license. (The FCC found no evidence that the station was interfering with the signal of any other station.) Since then, RFC has cut down its hours of operation and has gone mobile, avoiding any one place that the FCC can track.



### Federal Communications Commission NOTICE OF UNLICENSED RADIO OPERATION United States of America

You are hereby notified that operation of the transmitting apparatus without a valid radio station authorization or permit constitutes violation of the above mentioned sections of the Communications Act of 1934, as amended, and could subject the owner, operator, or both, to the severe penalties provided. Unlicensed operation of this radio station should be discontinued immediately.

RADIO FREE CASCADIA

GO AWAY F.C.C.