Proceedings of

THE RADIO CLUB OF AMERICA, INC.

Founded 1909, New York, U.S.A.

Fall 1996

Model fireboat controlled by the word storage relay

In this Issue:

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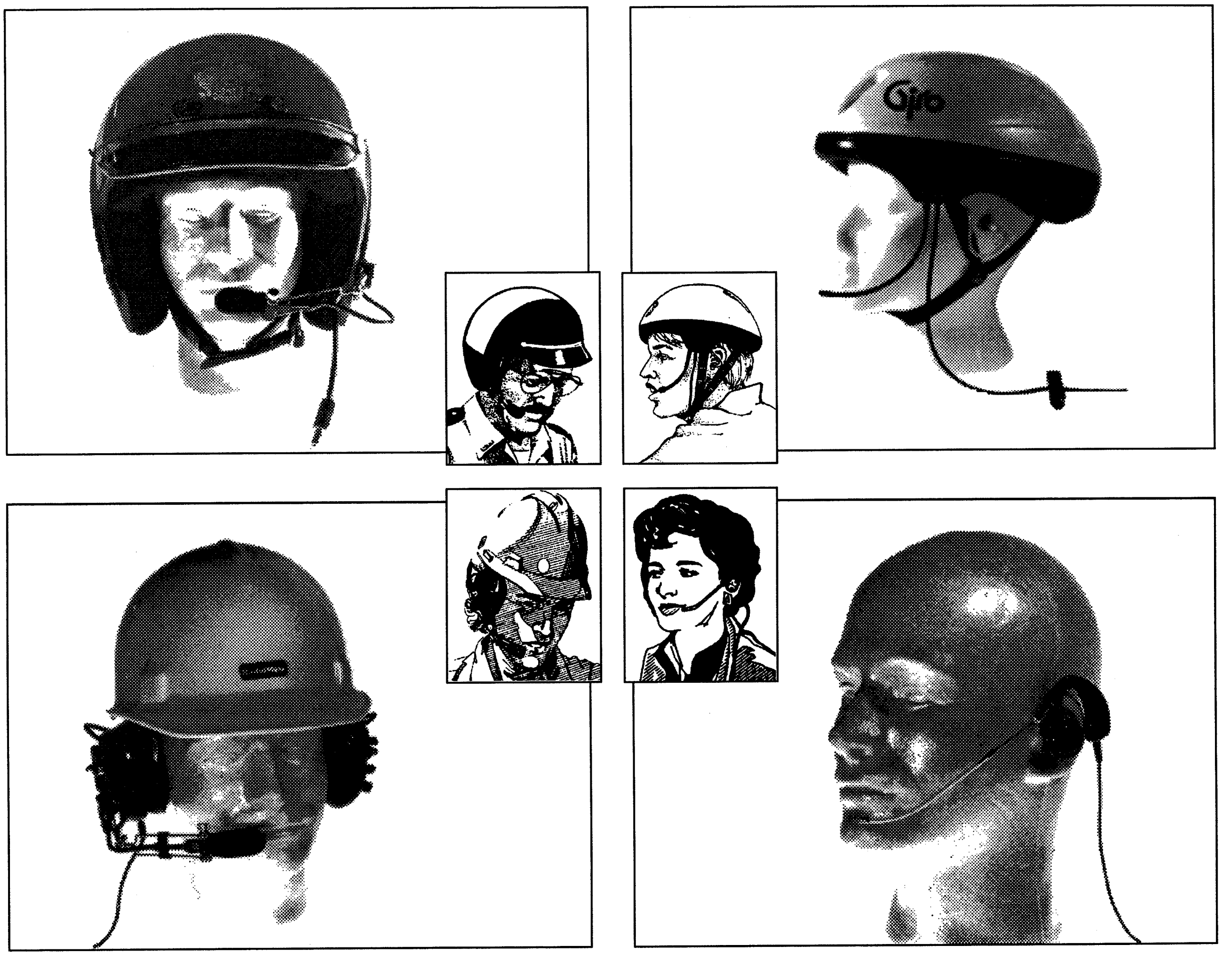

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Volume 70, No. 3

Fall 1996

THE RADIO CLUB OF AMERICA, INC.

Founded 1909, New York, U.S.A.

Headquarters office: 1620 Route 22, Union, NJ 07083
Tel. 908-687-3090 Fax 908-687-0977 E-mail radclubam@aol.com

Contents:

Proceedings Editors:
Don Bishop, P.O. Box 4075, Overland Park, KS 66204-0075. Tel. 913-967-1741; Fax 913-967-1905; E-mail don_bishop@intertec.com
Jane Bryant, 1201 Seven Locks Road, Suite 300, Potomac, MD 20854. Tel. 301-340-7788 ext. 2730; Fax 301-424-4297; E-mail jbryant@phillips.com
Newsletter Editor:
Darren Sextro, P.O. Box 12901, Overland Park, KS 66282-2901; Tel. 913-967-1836; Fax 913-967-1898.

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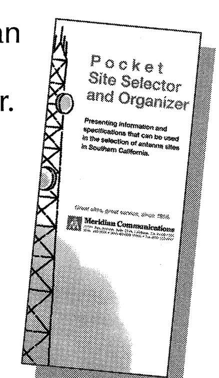

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By Don Bishop, Proceedings *Editor*

Editorial Comment

Normally, there wouldn't be an opportunity to pass along news from the November board of directors meeting in the Fall issue. The publication schedule has been set back, though, because of some of my other assignments, and that makes it possible to report some of the actions taken by the board and announcements made by individuals at the meeting.

Vivian A. Carr, a long-time director who has served as membership committee chairman for 20 years, announced that she is giving up the chairmanship. Raymond C. "Ray" Trott, who has been elected president for 1997, has named another director, Robert Gunther, to chair the committee. Vivian made note of the fact that during her first eight years as chairman, she had the advantage of secretarial help in her business office. For the past 12 years, though, she has handled the task herself at home. Together with other projects, her club work has accounted for 111,610 copies made on her photocopier.

Hardly anyone displays more enthusiasm for the club than Vivian. (None has more vocal power to back up their enthusiasm, either!) She has been very helpful to me in passing along information about new club members to use in prospecting for contributing writers and for the occasional welcome letter. I sure thank you, Vivian, for all the assistance you've provided to the publications, and the club has benefited from your many years of service as membership committee chairman.

(Vivian remains on the board of directors and the executive committee, and Ray has named her as counsel to the membership committee for 1997.)

The board named Gerri Hopkins to replace Howard Henry as executive secretary, reflecting the fact that normally Gerri, not Howard, attends meetings to record the minutes and handles most of the club's administrative tasks that are carried out at the headquarters. Both are employees of Meredith & Henry, the company hired to assist with the club's administration.

That's about all of immediate interest that might be usefully reported in this space. I'd like to publish a list of all of the committee assignments either in the next issue of the magazine or perhaps in the newsletter so you will know with whom to communicate for various purposes (and to volunteer your skills?).

In the space remaining, though, I'd like to comment about some visits I made prior to the scheduled club events of Nov. 22, just because the people involved represent the extraordinary membership of the club. On Nov. 14, I attended the lunchtime meeting of former employees of the Radio Corporation of America radio communications facilities that were built at Rocky Point and Riverhead, NY. Along with some amateur radio enthusiasts who live in the area, they meet each second Thursday at the Riverboat Restaurant in Riverhead. I mention the time and place, because if you're in the neighborhood at the right time, you'll want to stop by.

Some of these individuals had been with the Radio Corp. since the 1930s. For those who are interested in the use of longwave and shortwave radio, conversations with people who were in the vanguard of the development and commercialization of the medium are fascinating.

John Marshall Etter, W2ER, was in charge of closing the shortwave facility in the late '70s when it had been rendered obsolete by earth-orbiting satellite transponders and other communications media. I visited Marshall's home after lunch, and he showed me his collection of photographs of the longwave and shortwave transmitting and receiving stations as they were built and modified through the years.

Many of the photographs have been converted for 35mm slide projection, and Marshall has presented a program of slides and narration to various groups. I'm hinting here, that if you have a meeting in the Long Island area, that Marshall might be persuaded to make a presentation for you.

I had visited Marshall last year, and he told me that I should come again when I could attend the lunchtime meeting and when I could visit the museum of Atwater Kent radios owned by Ralph O. Williams (F), W3VT. I allowed enough time to include both on this visit. Ralph was presented with the Ralph Batcher Memorial Award in 1991 for his preservation of the history of electronic communications. He maintains a collection of radios at his home at the eastern end of Long Island, in the town of Orient.

Ralph doesn't advertise the museum. You have to find out about it through word of mouth or through publications such as this one. It does neither Ralph nor the typical summer visitor to Long Island any good to open the museum to casual tourists because the display means little to people unacquainted at all with radio history. I called ahead, and Ralph was kind enough to spend several hours in the museum with me, explaining the equipment on exhibit and detailing the story of Atwater Kent: the person and the manufacturing company.

I mentioned "summer" visitor. It was a cold day when I visited. The museum is in a large room that is part of Ralph's house—and it was unheated on that day. After about an hour in the museum, we took a break to warm ourselves in the main part of the house. Before returning to the museum, I retrieved some winter clothes from the car and spent the rest of the afternoon more comfortably attired with more layers of clothing, a hat, scarf and gloves! Summer would be a better time to visit. In fact, my original plan was to visit in June at the time of the summer RCA board meeting, but ... in November, I arrived.

Ralph has been collecting Atwater Kent radios, along with other early broadcast receivers, for 35 years. The Kent company made radios from 1922 to 1936, if I remember the discussion correctly, and millions were manufactured. The arrangement of the radios in the museum tells a story of marketing and manufacturing expertise along with technological development. The "Voice of the Twenties" museum, as Ralph calls it, is another reason to visit Long Island.

In Manhattan, Leonard R. Kahn (LF), WB2SSP, made time for a Saturday visit to his office opposite the Ford Foundation near the United Nations building. Leonard is an active engineer who continues to pursue the commercial development of patentable technologies. Ten years ago, I interviewed him for a commercial magazine article about compatible single-sideband, which was used at the time by a company then called Airfone for the radio connection between ground stations and public telephones on commercial aircraft. Leonard has forgotten more about amplitude modulation (AM) and single-sideband (SSB) than most people ever knew.

He made me promise not to mention in print the details of some of his current projects, darn it. I can say that a growing number of AM broadcast stations are reaping the benefits of his transmitting development, sold under the trademark of Powerside, which helps to overcome fading, interference and receiver fidelity limitations. Another development that boosts transmitting

Continued on page 40

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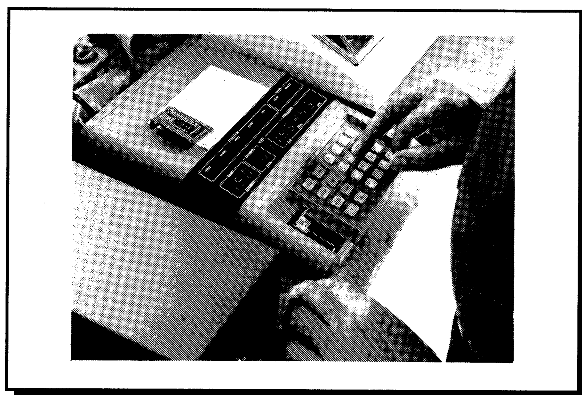

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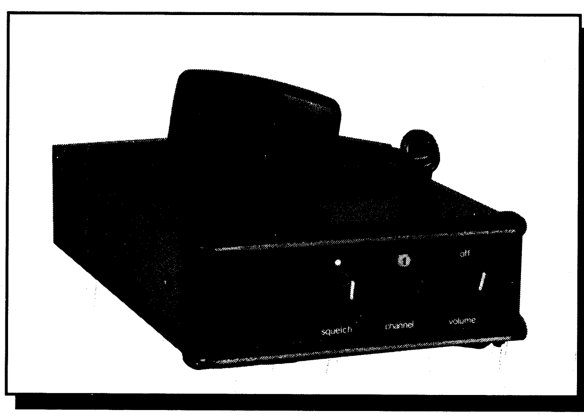

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By Pat West, P.E., W7EA

The Word Storage Relay (WSR)

One of the more complex systems developed during the Cold War was the BOMARC missile system developed by Boeing and the University of Michigan. (*BO* stands for Boeing, and *MARC* stands for Michigan Aeronautical Research Center.) Boeing built two versions of the BOMARC, the first one designated "IM99A" and the second "IM99B." The *A* version used a liquid propellant boost system with a range of about 250 miles, and the *B* used a solid propellant for boost and had a range of at least 400 miles. The BOMARC was a pilotless aircraft, developed and deployed to counter the Soviet massed bomber threat. An artist's version of a BOMARC missile is shown in Photo 1.

One of several electronic systems on the BOMARC was the command system. Photo 2

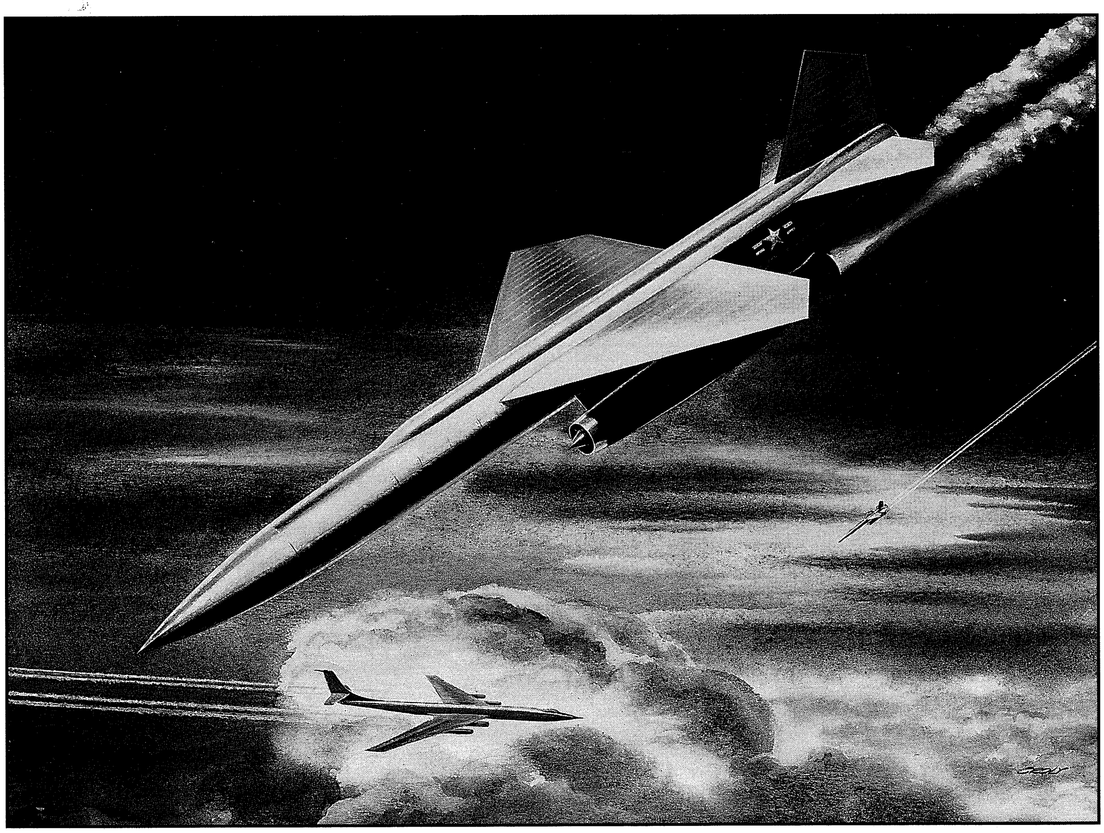

Photo 1. An artist's version of the BOMARC missle. Courtesy of Boeing, Seattle.

shows the largest part of the command system, ready for installation in missile Section 41. The UHF receiver was mounted separately and is not shown in the photo. The command system responded to UHF radio commands, to control the launch, boost, cruise and terminal dive time phases of the missile. I believe the command system was an element of the first ground-to-air digital control system.

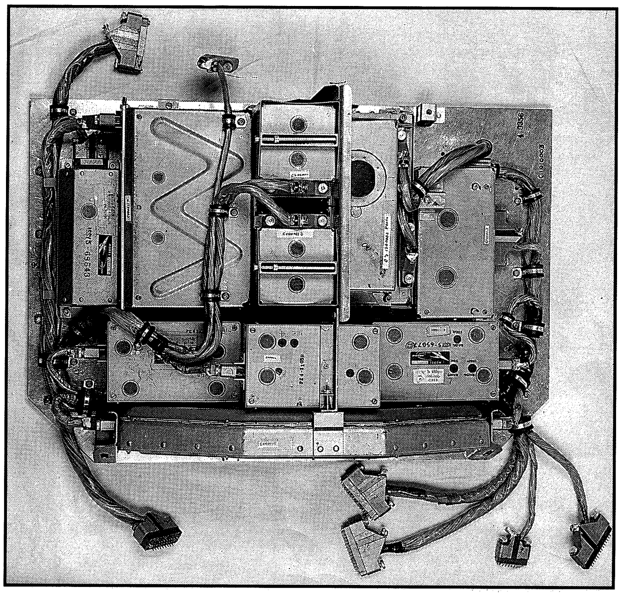

Photo 2. The BOMARC Command System hardware. Courtesy of Boeing, Seattle.

A brief summary of the role of the command system in a missile follows. Please refer to Figure 1. A Semi-Automatic Ground Environment (SAGE) system used control centers at strategic locations in the United States. Each control center received radar target reports via a radar network. If hostile aircraft, such as a bomber raid, were identified by a control center, computers at the control center would generate digital control messages and would transmit them via landlines to a supporting BOMARC missile base.

The control center would supply data to a selected missile that would include takeoff azimuth and dive timer setting. This information would be updated until a launch command was given.

At the missile base, the flight control data would be transmitted to the missile by a low-power UHF transmitter via a coaxial distribution system. The UHF receiver in the missile would detect the data and pass the information on to the Word Storage Relay (WSR). Each command ultimately would reach the missile flight control system.

When the liquid propellant booster was activated, the missile would follow a boost phase as controlled by a transducer in the command system. It would take off on the azimuth set by the

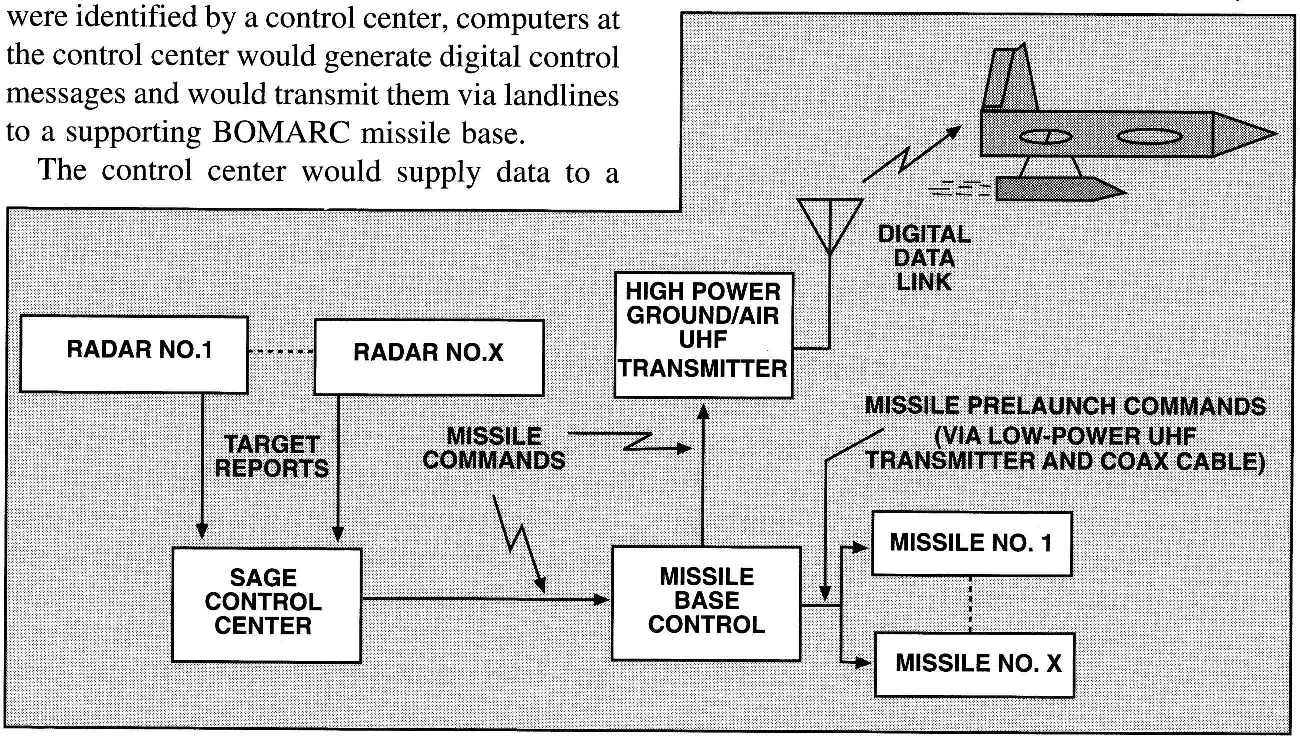

Figure 1. SAGE control of BOMARC.

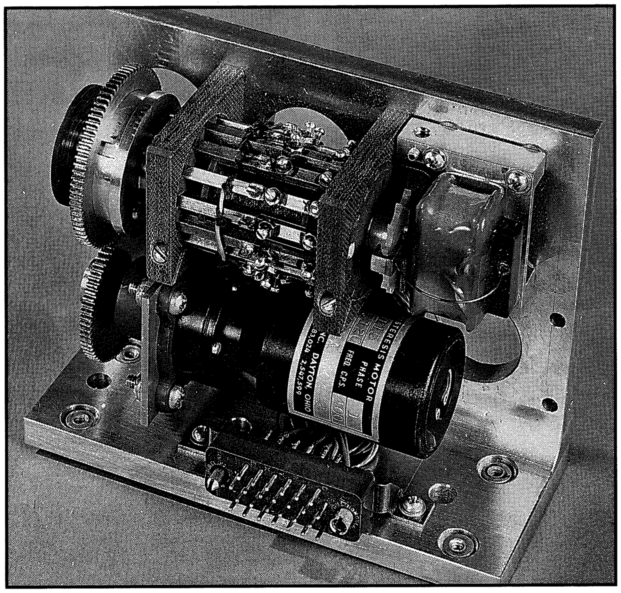

Photo 3. The Perkins-Reynolds Selector Relay, which was called Word Storage Relay on the BOMARC Command System. Courtesy of Boeing, Seattle.

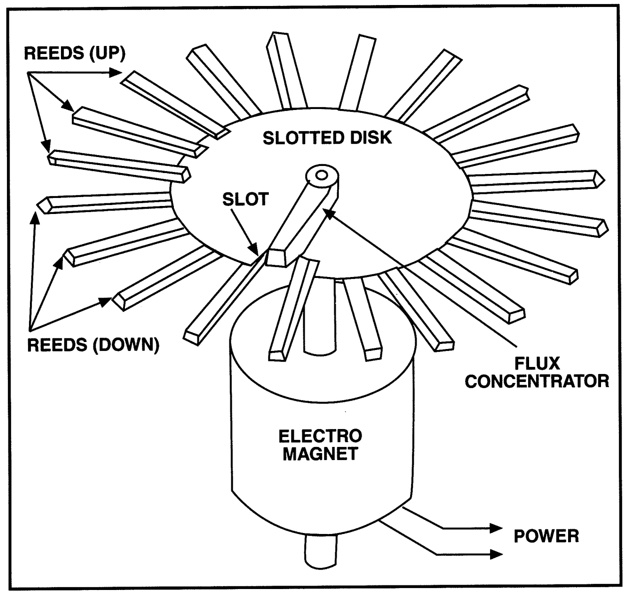

Figure 2. An illustration for explaining Word Storage Relay operation. See text for details. Courtesy of F.D. Reynolds.

control center computer. Commands from the control center during cruise phase would control the missile. These commands were transmitted to the missile from a high-power UHF transmitter located on the missile base. When the dive timer was activated by the control center computer, the missile would dive on the target, and the terminal guidance radar would lock on the target and control the remainder of the flight. At a certain distance from the target, the fuse system would be activated to ultimately ignite the payload ordinance.

The digital datalink from ground to air was a 14-bit system using a 4-bit address, a 9-bit position command for the addressed transducer and a 1-bit parity. Each bit took 10ms, and a complete word was 140ms. A 460ms period was allowed for transducer positioning before the next word was transmitted. Total cycle time was therefore 600ms—really slow when compared to today's digital systems!

Each command system receiver on a missile contained a unique subchannel module, which was the technique used for missile selection. The leading edge of a transmitted word would trigger the WSR, and the word would be stored for 460ms until the next cycle.

The command system's brain was the Perkins-Reynolds Selector Relay, Patent No. 2,795,773 as illustrated by Photo 3. This unit, as used on the BOMARC "A" missile, was referred to as WSR. The WSR was conceived and developed in 1950-1951 by L.C. Perkins and F.D. Reynolds, engineering managers at Boeing. They developed the unit for a hobby, for the radio control of a complex model fire boat. The WSR was used only on the IM99A missile.

Figure 2 shows the principle of operation of the WSR. The figure shows 20 reeds as used on their model boat, whereas the BOMARC "A" WSR contained only 14. A non-ferrous metal disk with a slot in the edge of it is mounted on a ferrous shaft. Surrounding the edge of the disk are a number of spring steel reeds or fingers, whose outer ends are fixed to the frame of the device. The inner ends of the reeds are located so that they may pass through the slot, one at a time, from one side of the disk to the other when the slot is aligned with the reed. At all other times, each reed is trapped on one side or the other of the disk.

A trapped reed supplies ground to its associated relay. Every 600ms as synchronized by the command system receiver, the WSR would be rotated a complete revolution in 140ms. (The drive motor is not shown on the figure.) Reeds would be activated or released synchronously. The WSR would be idle for 460ms until the next cycle.

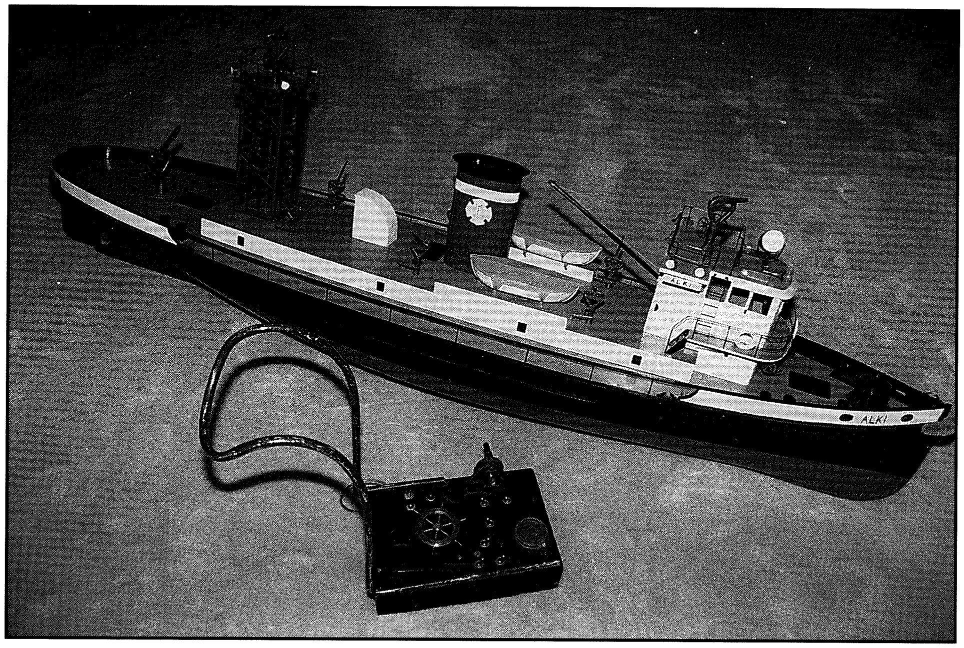

Photo 4. Model fire boat with controller. Courtesy of F.D. Reynolds.

A magnet coil surrounds the shaft. An arm that is fixed to the shaft extends close to the slot in the disk. When the coil is energized, this arm concentrates the magnetic flux on the one reed which is at that time aligned with the slot, thereby pulling the end of the reed through the slot. In their free positions, the reeds are on the side of the disk away from the flux concentrator arm and do not touch the disk. When the reeds are attracted through the slot, they become trapped on the concentrator-arm side of the disk (as a result of the rotation of the disk) and make electrical contact with the disk.

It is therefore evident that once per revolution, we have the choice of closing any reed switch or a combination of them, leaving any or all closed that already are closed, opening any or all or leaving any or all open. At all times when the slot does not line up with a particular reed switch, the switch remains in the position it was left in the last time the slot passed it. Any configuration of open and closed switches representing any binary number, therefore, may be set up on the device in one revolution and retained as long as desired.

It is, therefore, obvious that the slotted disk must be rotated in a timed relationship with respect to the information pulses applied to the reed switching coil so that the proper reed switches will be closed. The rotation is controlled by a governed motor (not shown on Figure 2) so that the slot in the disk is aligned with each reed in turn at the exact time that the pulse intended for that reed actuates the magnet.

The command system included a box containing relays and a network of resistors. Certain relays would be activated depending on the transmitted word contents. A transducer would be selected, and a transducer position would be derived by the relay-resistor bank. The existing transducer position would be represented by a 900Hz voltage magnitude as picked off the transducer rheostat. This voltage and the 900Hz voltage from the resister network would be fed to a servo amplifier. The voltages would be compared and the transducer would be repositioned to the commanded position.

The WSR ultimately was replaced with an all-solid-state unit developed by Motorola. The BOMARC bases no longer exist, and deployed missiles were used for other purposes, including their employment as targets for other missile types.

There is an interesting story dealing with the invention of the Perkins-Reynolds Selector Relay. It appears that the inventors, as Boeing employees, were required to advise Boeing of their patents. Boeing told them that the company had no requirements for a device to control a toy boat, and the patent was theirs. Ten years later, the inventors took the model boat to England and won a world championship with it. The model fire boat is illustrated in Photos 4 and 5.

In the meantime, back at Boeing, the company was having trouble coming up with a good system for radio control of the BOMARC missile. The inventors made a pitch to Boeing management. Management bought the idea and directed the Boeing patent staff to reacquire the rights to the model-boat control invention. The inventors signed a contract with Boeing, and Reynolds became the manager in charge of the Boeing version of the device. According to a study, the use of that "toy boat" invention in the guided missile saved 350 vacuum tubes per missile. (This was before the availability of transistors and integrated circuits.)

Reference

Some of the information in this paper comes from F.D. Reynolds' book *Crackpot or Genius*, published in 1993, a complete guide to the uncommon art of inventing. The book is available from Chicago Review Press, 814 North Franklin Street, Chicago, IL 60610.

About the author

C.P. West, P.E., W7EA (S) is a retired Boeing engineer who was a lead missile test engineer on the BOMARC "A" development program and who later was involved in system engineering on the BOMARC interface with the SAGE system. He is a senior member of Radio Club of America and a life senior member of IEEE. He has been a licensed radio amateur for 59 years, and his current license is Extra class. In 1981, he led the initial amateur radio delegation to Communist China and played a significant role in getting them back into amateur radio.

Photo 5. Model fire boat with all hoses working and controlled by the WSR. Courtesy of F.D. Reynolds.

By Gerald A. Berman

Shortwave Broadcasting: Past, Present, Future

This paper identifies some major developments in international shortwave broadcasting. It presents a brief history of events, focuses on the current worldwide situation and makes predictions for the future. It is written from a technical perspective, drawing liberally from experiences and examples at the Voice of America (VOA).

The earliest radio was code transmission, basically static turned on and off, that blanketed wide stretches of the spectrum. Generated by spark gap transmitters, it was mainly wireless telegraphy, but there were a few instances of its use for quasi-broadcasting.

In the 1910s, President Woodrow Wilson's 14-point peace plan was transmitted by the United States via code. The Bolsheviks also employed such transmissions during and after their revolution.

During the 1910s and 1920s, both voice transmission and shortwave were developed. While the first use of voice in international broadcasting seems to have been a Soviet transmission aimed at Bessarabia in 1926, the first permanent international shortwave voice broadcasting was associated with empires.

The Dutch electric company Philips was a pioneer of shortwave technology, and thus it was the Netherlands that had the first shortwave broadcasting service in 1927, transmitting mainly in Dutch to its overseas territories.

The French and British followed by the early 1930s with broadcasts to their respective empires. Meanwhile, the Italians, Germans, Japanese and Soviets became involved, originally to speak to fellow-countrymen abroad, but soon enough as an accompaniment to their international expansion ambitions.

Approaching World War II

The Italians began broadcasts in Arabic, then in Spanish and Portuguese to Latin America. They provided recordings to stations, a precursor of today's practice by many broadcasters of sending tapes. The Germans followed with broadcasts in English and added a number of other languages by the middle of the 1930s, along with some aggressive audience relations, including contests and mail participation.

The (future) Allies were slow to react to German and Italian initiatives. BBC countered the propaganda with a balanced news service, initially in Arabic, and eventually adding other languages. The French also added languages, but stuck to a culturally oriented service.

The U.S. international broadcasting was in private hands during the 1930s. A half dozen or so stations were owned by radio and electric concerns, including Columbia Broadcasting System, Westinghouse Electric, General Electric and Crosley Radio.

Transmitter power was in the 50 kW category, and a typical "two" transmitter installation often consisted of three complete RF sections and two modulators that could be switched between them. This allowed one of the RF sections to be tuned while the others were in service, so that "instant" frequency and program changes could be made. Modern autotuned transmitters and computer-controlled audio routing and antenna matrix switches accomplish the same.

Private ownership of shortwave stations was a reflection of domestic broadcasting, and the hands-off attitude of the U.S. government toward broadcasting and commerce. International broadcasting was a piecemeal effort, and only a limited number of languages, mostly English and Spanish, were used. There were hopes of commercial applications and profit. These stations started to realize their responsibilities as Axis broadcasting intensified, but there really was no coordinated effort until World War II, when the VOA was formed.

The 1930s marked the beginning of other types of international broadcasting. Religious international radio began in 1931 with the establishment of Vatican Radio, and the United States owned HCJB in Ecuador. Broadcasting by international governmental organizations began also, specifically the League of Nations, "Radio Nations," from Switzerland, a precursor of U.N. Radio.

World War II

Prewar broadcasting was marked by attempts to secure neutrality of non-warring participants, or to secure their support. Thus, the tone would be friendly and reassuring. After the war began, it became noticeably more nasty and demoralizing.

VOA began a few days after World War II by consolidating the several U.S. private shortwave stations and securing overseas facilities. Part of the Office of War Information, the VOA, broadcast in German and Italian and other key languages of the war. It started with the promise to broadcast the truth.

The Allied approach to international broadcasting was to transmit the truth, in the hope that the truth would eventually support the Allied cause. It was extremely effective in attracting listeners throughout the theaters of war searching for accurate news. Jamming and threats of punishment to listeners were employed to counter it. Thus, truth and jamming became the two main strategies of international broadcasting. However, there were exceptions.

One exception was clandestine broadcasting, where the station's location was not revealed. Clandestine stations purported to be one thing but were entirely something else. The Germans had stations claiming to be the voices of Scottish or Irish nationalists, or of workers in Britain.

The British operated a station representing itself as belonging to a pro-Goering faction within the Nazi regime, in an attempt to confuse and demoralize listeners. Other stations were also aimed at German soldiers.

Another exception, similar to clandestine broadcasting but never really concealing their origins, were the various personalities broadcasting to enemy soldiers or civilians. These included Tokyo Rose and Axis Sally.

Cold War Period

The period just after World War II was an important period in international broadcasting. U.S. interest in international broadcasting receded quickly after the war. The U.S. government was not entirely certain it needed or wanted to retain its international broadcasting efforts. Almost all of the U.S. companies involved in pre-war shortwave broadcasting no longer were interested. Their attentions then were turned to TV and FM.

The Soviets, through Radio Moscow, maintained their commitment to international broadcasting and even expanded their efforts. Other communist countries also developed their international radio voices. The United States, Britain and other western countries could not ignore this, and international broadcasting remained a major force in international political communication.

By the late 1940s, a number of nations already were involved in some sort of international broadcasting. It seemed that most countries saw a need to have an international radio voice, even if just a modest effort, and by the end of the '50s, virtually every industrialized country had some sort of international radio service.

The Smith-Mundt Act of 1948 gave permanency to U.S. State Department international information activities. In 1953, the United States Information Agency was formed, with VOA a part of it.

Two other U.S. stations had their beginnings in the early 1950s: Radio Free Europe and Radio Liberation, later to be Radio Liberty (for the Soviet Union). Ostensibly, they were independent of the U.S. government and financed through private donations. In the earliest years, they had more of a "liberation" purpose and tone. This changed in 1956, when it was apparent that the United States was not going to intervene militarily to influence change in Eastern Europe.

Radio Free Europe was accused of encouraging the uprising in Hungary that caused a bloodshed but had no chance of succeeding. After this, the stations became "surrogate home services," focusing on the domestic affairs of the countries.

The CIA funding of these stations was a poorly kept secret, and by the late 1970s funding became overt, via the Board of International Broadcasting, and the two stations were merged into a new RFE/RL, Inc. Studios remained in Munich, with headquarters in Washington. The studios were moved to Prague in 1995 as a cost-saving measure.

By the 1960s, there was even more expansion of communist and western broadcasting including Duetche Welle, Radio South Africa, Kol Israel, Radio Moscow, Radio Beijing and Radio Havana. Third-world broadcasting began with Radio Cairo and Radio Ghana. The BBC developed its World Service and a number of key relay stations. VOA continued development of its "Ring Plan" to overcome Soviet jamming. The plan, which emerged from studies coordinated by MIT's Research Laboratories, called for a large number of high-powered transmitters to be located in the most strategic places for ionospheric propagation into the target areas to provide the maximum strain on the Soviet jamming system. It eventually resulted in the construction of relay stations in Greenville, N.C.; Delano and Dixon, Calif.; Tangier, Morocco; Colombo, Sri Lanka; Kavala and Rhodes, Greece; and Poro and Tinang, The Philippines. Several of these stations were equipped with both shortwave and medium-wave transmitters.

Toward the end of the 1960s, most shortwave transmitters being installed by VOA, and others were in the 250 kW class, up from the 50 kW and 100 kW levels of prior decades. Medium-wave transmitters for international broadcasting were in the 500 kW to 1 MW class.

Most shortwave antenna installations were "new" curtain arrays that provided higher power gain through more tightly controlled beam shapes. Some had the capability of having their beam directions slewed electrically to cover various target areas.

The medium-wave installations often were multitower arrays that allowed for targeting listening areas with greater precision. Many could have their beam directions switched to several targets.

All VOA stations up to this point were equipped with special "communications" transmitters and separate isolated receiver sites. This arrangement was used for feeding program materials among stations from VOA's Washington studios, for re-broadcast. The program materials modulated independent sidebands on the communications transmitters. Sophisticated receivers used spatial and frequency diversity to provide the cleanest signals possible. Telephone line feeds were common.

The transmitter power race continued through the 1970s, and more third-world countries began international broadcast activities, including Nigeria, Turkey, Chile, Iran and Uganda. The growing availability of inexpensive transistor radios that began during the 1960s made shortwave listening widely accessible in developing countries.

The 1970s were lean years for the VOA. Operating and construction funds began to dry up, making it difficult to maintain reliable operations. Fuel and spare parts were scarce, and many stations improvised and manufactured their own spare parts to stay on the air.

Without a real constituency in the United States, there were not enough lobbying or political resources to overcome the budget squeeze. The two stations in California, Delano and Dixon, were consolidated, and Dixon went into caretaker status. It was reactivated in 1983, closed a couple of years later, and ultimately sold in 1993. The site now is used by Globe Wireless for a shortwave communication service to ships at sea.

There were still many trouble spots in the world in the early 1980s, and the Soviets and Chinese still were jamming western broadcasts. More countries added their international voices, and there was a revival of private religious and commercial shortwave broadcasting from the United States.

Transmitter power wars continued with 500 kW transmitters becoming commonplace. These transmitters employed step modulation techniques and dynamic carrier control for improved efficiency.

More and more broadcasters began to use broadband electrically steerable curtain array antennas of modern design for better beam shape and direction control. They began replacing old-style modulation limiters with modern audio processors that increased the density and added punch to their signals, as was a common practice employed by many domestic medium-wave and FM stations.

Congress provided VOA with much needed funds to modernize and expand its network. New stations were added in Morocco, Thailand, Sri Lanka, Belize, Botswana and Sao Tome. Feeding programs to these and all other stations in the VOA network was accomplished by a satellite interconnect system that all but replaced the shortwave feed techniques of previous decades. Most receiver sites were closed. Similar satellite feed techniques were adopted by other international broadcasters.

Routine monitoring and band scans helped to identify frequencies where there was interference, and use of an advanced propagation model helped to identify the most reliable broadcast bands.

The model, known as VOACAP, was perfected by VOA from a prediction program started in the 1950s by the U.S. Department of Defense but never thoroughly or accurately completed. This model rapidly is becoming recognized as one of the premier prediction tools available and currently is used for broadcast planning by many international broadcasters, military organizations and even serious amateur radio operators.

Ever-changing world events throughout the 1980s and early 1990s resulted in changes in the VOA modernization plan. Stations planned for Israel and Puerto Rico never were built. Glasnost brought a notable change in the content from Radio Moscow, and both it and Radio Beijing led a less strident and more professional approach to Communist international broadcasting.

Major new competition to shortwave broadcasting began to emerge from domestic broadcasting, TV activities and VCRs.

The shortwave bands remained extremely cluttered during the 1980s and 1990s, and there was fierce competition for broadcasting frequencies. The shortwave broadcasters received band extensions at a major radio conference in 1979 hosted by the International Telecommunication Union (ITU), the UN specialized agency for telecommunications, but the extensions were made contingent upon approval of an "a priori" plan governing their uses.

Despite the ITU's inability to approve such a plan, the 1979 extensions were released in 1996. An ITU radio conference in 1992 approved further extensions to become effective in 2007. These too were subject to restrictions, including the approval of a plan for their use and a constraint for single-sideband modulation only.

Another ITU radio conference scheduled in 1997 will consider relaxing these limitations. Meantime, anticipating the possible need for single-sideband operation, all new transmitters being manufactured have the capacity for this mode of service.

Present

The end of the cold war in the 1990s redefined international broadcasting. Radio Moscow was renamed the Voice of Russia and reduced its operations. Most other formerly communist international broadcasters did the same. A bipartisan Board of Governors was formed by Congress to oversee U.S. international broadcasting and to help to shape its mission in the post cold war era. The technical facilities and engineering staff of RFE/RL and VOA were merged, and the least effective stations were closed, including some in the United States, Germany and Portugal.

Placement and leasing have become important aspects of international broadcasting. Many broadcasters have entered into arrangements with "local" AM and FM stations willing to carry their programs. The VOA alone provides more than 1,000 such affiliates with program material made available by satellite feed and simple receiving systems located at the affiliate's facility. TV activities have expanded, especially CNN, BBC World TV, Commercial ventures and USIA Worldnet TV.

The Soviet Union's breakup and the fall of the Berlin Wall have resulted in the easing of many of the tensions with the West. For some, the breakup was successful.

Lithuania, Latvia, Estonia, Hungary, Poland, Czechoslovakia (now the Czech Republic and Slovakia) and Romania are adjusting to a market economy and are developing modern, free telecommunication infrastructures. State control of radio and TV is no longer a monopoly.

For others, the road has been difficult and arduous. Bosnia, Croatia and Serbia are engaged in conflicts started hundreds of years ago. Russia, Ukraine and some former southern republics are having their problems. The Middle East continues as a trouble spot, where in most cases, state control of the media still exists.

In light of this backdrop, most international broadcasters are re-examining their roles. There are some who are convinced that shortwave broadcasting is dead. Audience surveys seem to support this contention in certain listening areas.

Indeed, in many parts of the world, shortwave listening has declined in favor of AM, FM and especially TV, where these media are available.

In general, shortwave listening remains viable only where there are limited domestic alternatives, such as those that still exist in China, the Middle East, Central and Southern Asia, Africa, Cuba and a few spots in Latin America, or in times of crises.

International broadcasters realize that to remain viable, they must target these troubled and media-denied areas with signals having good technical quality and attractive programming.

The consolidated VOA/RFE/RL network is doing just that through about 15 overseas and two domestic stations. It operates 150 transmitters and 800 antennas broadcasting about 1,300 program hours per week in some 46 key languages. This is down from a high of 2,600 program hours in the early 1990s.

For comparison, China broadcasts about 1,600 program hours per week, which is pretty much a peak. Russia broadcasts about 750 program hours per week, which is significantly lower than the Soviet peak of 2,100 hours in 1980. The BBC remains at an all-time high of about 900 program hours per week.

Future

The future of shortwave broadcasting is cloudy. Its continued use as a means for international communication rests with world events, politics, budgets, media choices and technology.

The world is in rapid change driven by both "geopolitical" events and the technological advances of the "Information Age." Shortwave broadcasters are caught in a bind. On one hand, they are not willing to immediately abandon a medium that is universally available and in which they have significant investment. The fact remains that shortwave can propagate long distance, cover large areas, is relatively free from regulations and is relatively cheap, even with its problems of fading, noise, congestion and often poor quality. Hundreds of millions of listeners have shortwave radios, which will neither be replaced nor abandoned quickly.

It is a medium that listeners often turn to when there are no other media alternatives, and in times of crises. This was demonstrated even in the United States when shortwave receiver sales rose dramatically during the Gulf War.

It is also a medium that can provide an outlet to many special interest voices. This is evidenced by the renewed interest in commercial shortwave broadcasting from the United States. Private broadcasters have found they can have profitable ventures, not on the sales of commercial advertisements, but rather on sale of time to those wishing to air their voices to the public, regardless of how small the segment.

Placement of international broadcasts on local AM and FM stations and networks, as affiliates, within a country of interest can be an effective way of reaching large audiences, but such arrangements are always risky because the broadcaster has, in effect, relinquished control.

Rebroadcasters may selectively pick and choose only what they wish, or not even use the given material at all. Verification is difficult. The political landscape may profoundly affect what is or can be broadcast, and there is always the potential for gatekeeping.

Direct broadcasting from satellite to mobile or portable receivers using digital techniques is a new technology with great interest and potential. There are several commercial efforts currently under way to implement direct digital broadcast services, both on a subscription and free basis.

The VOA funded efforts to explore the medium through a contract with the Jet Propulsion Laboratory and NASA. A so-called narrowband satellite receiver system that shows a great deal of promise was developed and demonstrated using a NASA tracking and data relay satellite.

One U.S. company, Worldspace, with what is reported to be substantial foreign backing, plans to launch three satellites beginning in 1998. Using spot beams, the planned system will cover most continents of the world between ±40 degrees latitude. This system is narrowband.

Although no firm prices have been given, Worldspace officials say the receivers will be affordable. The VOA has an option to lease time on Worldspace satellites when, and if, the system becomes viable.

The Europeans, Canadians, Australians and a few others are opting toward a wideband digital system, basically Eureka 147, that operates on a different principle than narrowband systems. Plans are to implement domestic broadcasting, terrestrially at first in urban areas, followed by satellite broadcasting for complete country coverage. This will be a domestic service, and international broadcasters will have to lease time, if permitted.

Direct broadcast satellite services may not be the complete panacea for the replacement of shortwave international broadcasting, for several reasons.

The first is technical and is associated with propagation and coverage. Like shortwave, or even AM, FM and TV under certain circumstances, signals from satellites frequently will be unable to penetrate buildings and will be subject to blockage. This could be a serious impediment to mobile listeners and those with portable radios not in direct view of the satellite.

A second reason has to do with regulatory matters. Unlike shortwave, there are severe restrictions on the placement of satellite beams into a country without its permission. Without its approval, broadcasting can be denied. Beam spill over from an approving country into an adjacent non-approving country will cause special problems for negotiators to resolve. The radio regulations pertaining to shortwave broadcasting have no such restriction. Broadcasters are free to use the "airwaves" and beam their signals beyond national boarders contingent only on registering the frequencies with the ITU and avoiding interference to others.

A third reason is gatekeeping, a concept mentioned earlier. For satellites, this is related to regulatory matters but is somewhat more subtle. Simply put, this means a satellite provider may be given permission to place a beam in a country contingent on what is carried. For example, countries planning domestic services may well reject the programming of others deemed unacceptable for their population.

A consortium of international broadcasters known as Digital Radio Worldwide is attempting to monitor and guide digital broadcasting activities worldwide. A goal of the consortium is to provide input to emerging satellite providers on the needs of international broadcasters and exert influence for their mutual benefit.

As a related issue, a great deal of interest is developing to see whether digital modulation schemes can improve service in the shortwave bands. If digital broadcasting can be established, and many believe that it can, it would be a boon to international broadcasters who have significant investments in their physical plants.

To be successful, the digital system would have to be easily adapted technically within existing broadcast chains, be robust enough to overcome the vagaries of ionospheric propagation, be compatible with the existing AM service and be sufficiently simple so that affordable receivers could be produced.

At least four activities are currently under way. The Jet Propulsion Laboratory is exploring the possibility of adapting the VOA satellite receiver to shortwave operation.

Engineers at the Duetsche Telekom are conducting experimental broadcasts using a standard shortwave receiver front-end in conjunction with a PC having sophisticated digital signal processors.

Engineers at the TeleDiffusion de France are experimenting using similar principles, and Thomcast is performing simulations of a system it has named "Skywave 2000," which digitally modulates the upper sideband of an AM signal, while analog audio is carried on the lower sideband. Information on all efforts is scant, but the race is on.

Finally, there is the Internet, which may represent the new revolution in broadcasting. Many broadcasters have developed Web sites where information about their stations is provided and where actual audio broadcasts can be heard. This practice is becoming quite popular worldwide, and literally hundreds of Web stations, including many international broadcasters, have gone on line with live or packaged programming.

VOA provides information on broadcast schedules, correspondent news reports, scripts, technical data such as VOACAP and live audio programs.

So, what is the bottom line for shortwave broadcasting?

Unfortunately, nobody really knows with certainty! The saga still is unfolding. Those who believe that it is dead say it is a matter of time, ranging from a few years to a couple of decades at most, before it is completely gone. Others remain optimistic, particularly if simple digital modulation schemes with readily available receivers can improve the service.

Shortwave broadcasting's fate rests with the availability of alternatives. That is, in times of crises and when listeners or viewers have no other alternatives, such as credible AM, FM, TV or even print media, they will turn to shortwave. Accordingly, international broadcasters will not totally abandon the medium as long as there are "denied" audiences. They will scale operations to meet perceived world needs—and possibly keep some broadcasting assets in caretaker status in the event of a crisis.

The broadcasters will experiment reaching audiences using new technologies but only will abandon traditional shortwave when these become widely available and have proven their worth as a means for delivering unfiltered and uncensored information.

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About the author

A university professor for more than 20 years, Gerald A. Berman, Dr. Eng., joined VOA in 1983, where his responsibilities with the International Bureau of Broadcasting, Office of Engineering and Technical Operations, involve coverage analysis, network planning and assessing new technologies as applied to international broadcasting.

An author of more than 35 published technical papers, Dr. Berman is past president of the Institute of Electrical and Electronic Engineers Broadcast Technology Society, a Fellow of the American Society for Testing and Materials and a registered professional engineer.

The views expressed in this paper are those of the author. They do not represent the official position of the International Broadcasting Bureau or VOA.

By David M. Raley, P.E.

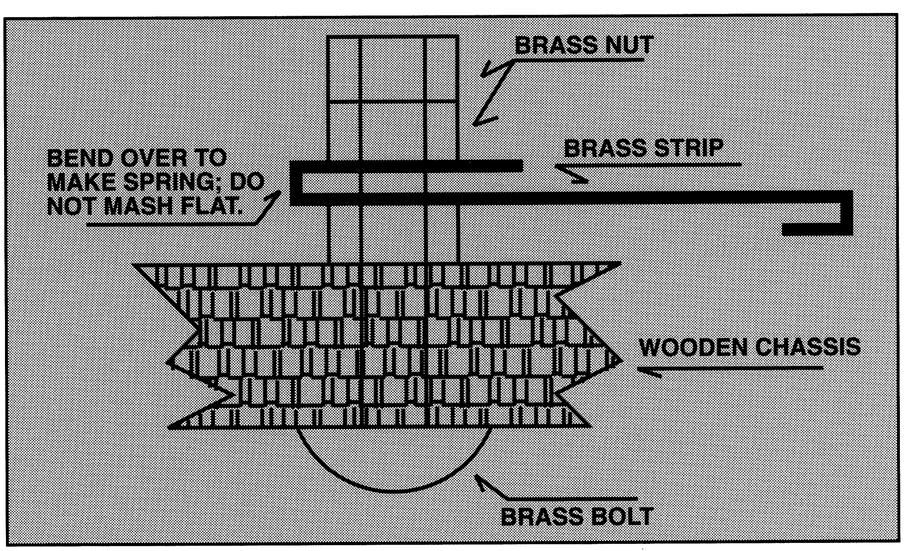
Build a Crystal Radio

It occurs to me that, with so many people wanting to get back to basics, some might want to have a primitive radio. You probably have heard old-timers talk about winding a coil on an oatmeal box and making a crystal from a piece of rusty barbed wire. Here's your chance to get in on the fun. You can use modern components as you wish, but you can build it entirely with materials that were available 100 years ago. The first time you pick up a really distant station on a radio you have built from scratch, you will feel 10 feet tall, 4 feet wide and completely covered with hair.

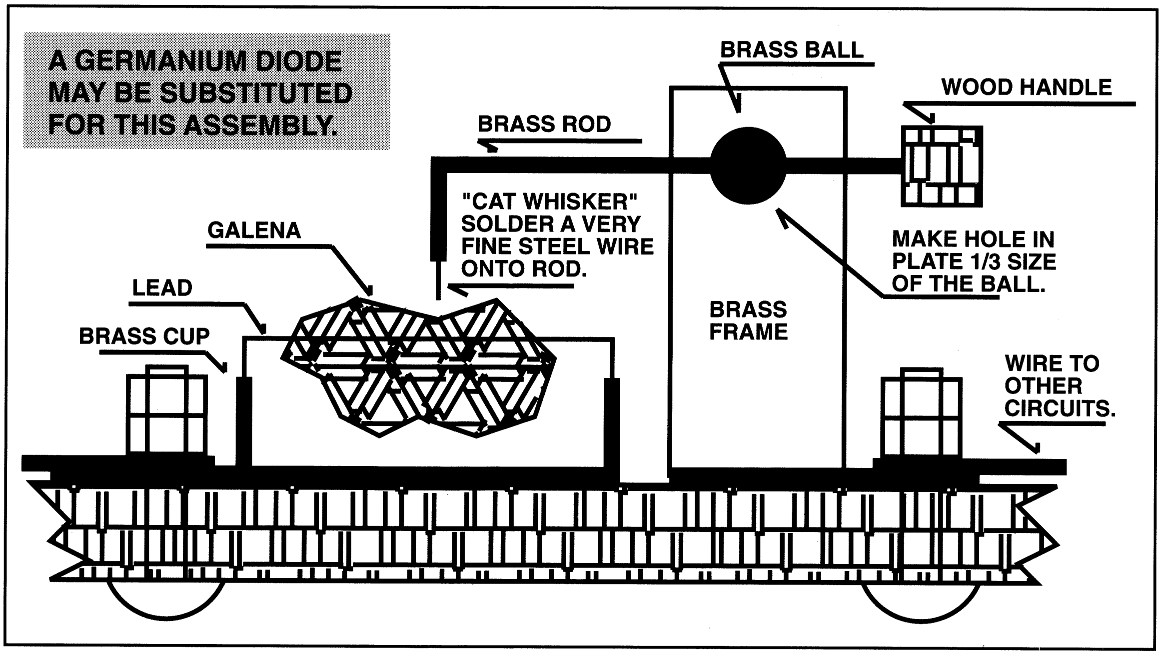
First the coil. You can be a purist and use an oatmeal box or a cylinder of wood, or if you want to go slightly modern, a piece of 3-inch plastic sewer pipe. The outside diameter of a 3-inch pipe is 3.5 inches, which is the size for which the number of turns was calculated. Electronics experts will recognize that there is no tuning condenser. That is because the coil is designed to have enough distributed capacitance to be self-resonant. Its operating resistance is 1,000 ohms. Tuning is accomplished by changing taps on the coil. Brass thumbtacks work pretty well for the taps, but the slider (detail A) should be built with nuts and bolts.

If you do not want to build the switch, you can use an alligator clip to go from tap to tap. Do not wimp out and use store-boughten switches. Be sure to scrape the enamel or varnish off the tails (detail D). After the coil is wound, you can varnish it or shellac it. Do not paint with metallic paint.

Galena is the best material for the crystal, if your druggist will get it for you. Take a small chunk, and pour lead around it. In operation, you must explore the surface of the galena for a sensitive spot. The reason that galena excels is that it has a zero bias. Other materials either pass current in both directions to some extent and cancel part of the audio, forward bias, or have



Detail A.



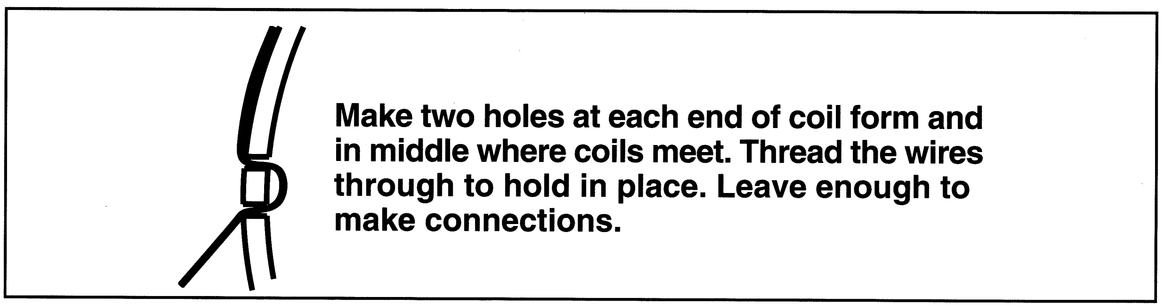
Detail B.

a "dead zone" where current will not pass in either direction (reverse bias). Other materials that will work to a lesser degree are rusty steel (a Gillete Blue Blade works better than most) or carborundum.

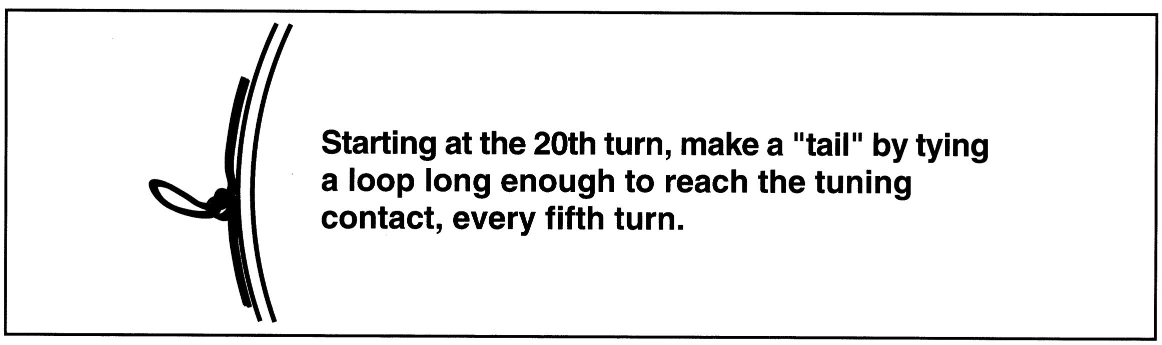
You may want to use a germanium diode or a hot carrier diode for initial testing even if you plan to make an authentic detector assembly. Silicon diodes require a signal higher than you likely will ever encounter to even start conducting.

The integrating capacitor (detail E) can be bought rather than made. Use anything from a 0.005μF to a 0.02μF. The voltage rating is not important.

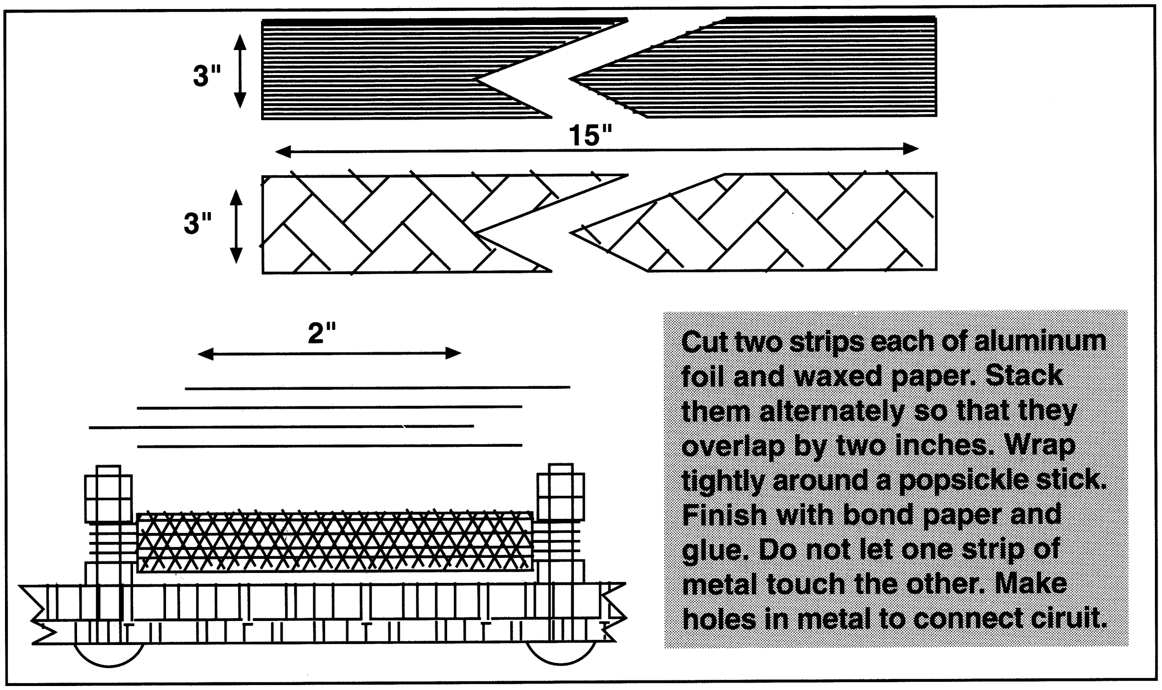
Connectors can be anything you want to use. Fahnestock clips are the classic part. Nuts and



Detail C.



Detail D.



Detail E.

bolts are acceptable, if inconvenient to use.

Make connections with No. 18 wire. Scrape the ends clean, and solder all connections.

To be really pure, make your own earphone. (Unlettered detail). If you buy one instead, get one with 1,000 ohms or higher impedance. Modern 8-ohm headphones will not give satisfactory results, if any at all.

The ear portion of an old telephone will work fairly well. Should you use one, you may want to wind your coil differently. Using 59 turns, 2 inches long on each side of a 2.5-inch diameter cylinder will make the coil 600 ohms to match the earphone. The radio will not be quite so sensitive, but the loss will be less than if you connect a 600-ohm load to a 1,000-ohm source.

Piezoelectric, or crystal, earphones are more sensitive. They have a high impedance but will not work with this set unless you place a 10,000-ohm resistor across the terminals. The elements from a piezoelectric tweeter are essentially the same elements as from a piezoelectric earphone.

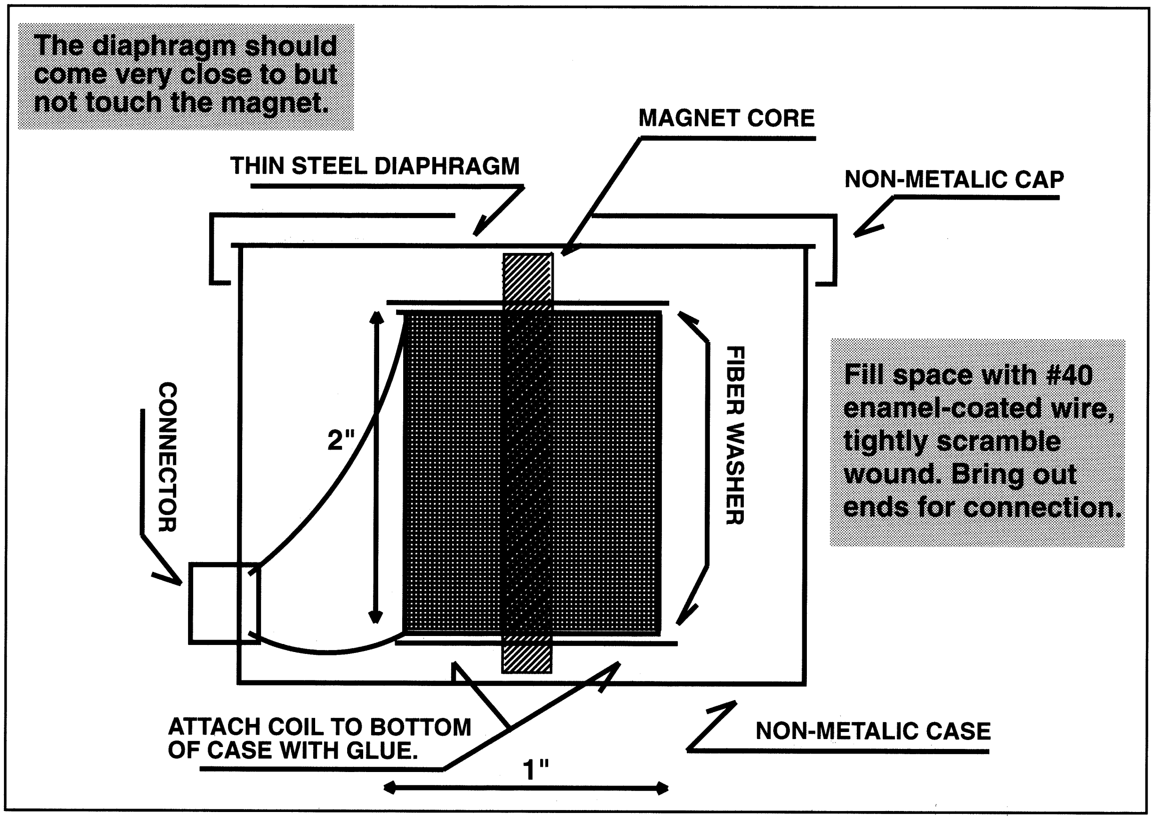
The chassis can be a piece of 1 × 8-inch board, a wood shingle or, if you must, a piece of plywood or plastic.

Once you have built the set, attach the ground connector to a metal cold water pipe or other known earth ground. A 10-foot ground rod will do nicely. Attach the antenna connector to a long high wire that does not touch the ground, a metal clothes line perhaps. A bedspring has been known to work. The finger stop on a rotary dial telephone makes an excellent antenna, assuming it is connected to the telephone line. Do not monkey around with electrical outlets. You could end up dead.

Now attach the earphone. Run everybody else out of the house, and turn off everything that makes a noise. If you have a germanium diode, you should hear one or more stations from the gitgo. By adjusting the taps of the coil, you should be able to get the one you want to hear to be louder than the ones you do not want to hear.

If you have built the detector shown in detail B, move the "cat whisker" around until you find a sensitive spot. Some will be better than others.

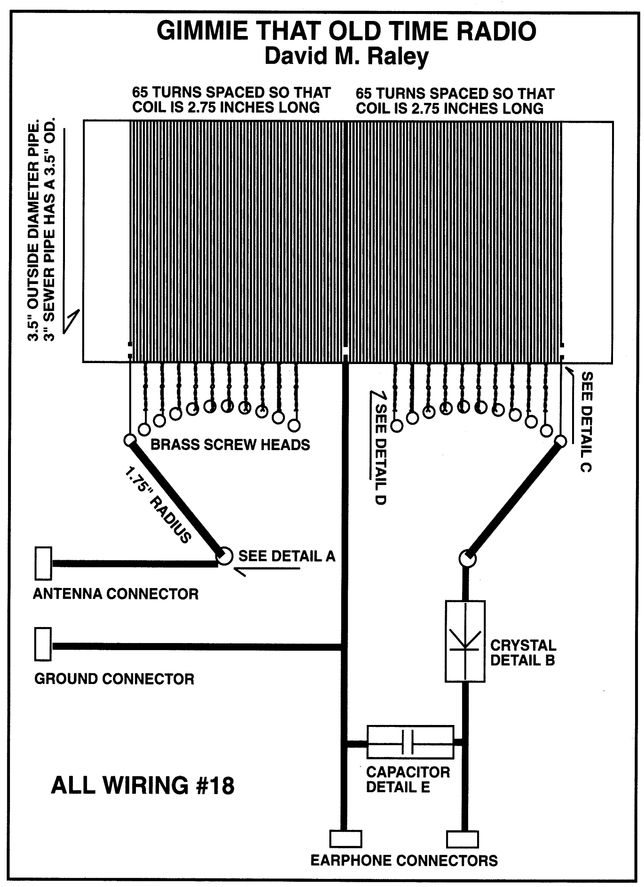
You will find that every guest who learns that you have a crystal radio will want to listen to it, and the guests will all want to know whether you can pick up some program or the other from the good old days. Mess up their minds good by having such a program running on a low-power oscillator.



Earphone.

About the author

Through the end of his teenage years, David M. Raley, P.E., picked cotton, helped carpenters and tinkered with radios. He has been involved with commercial broadcasting ever since then, and along the way, he served in the Navy, maintained non-federal aids to air navigation and taught radio-TV broadcasting in high school. He designs airports, navigational aids and public works controls, and works as a broadcast consulting engineer. He is the author of *The Rising Fawn and Noccalula* and has an unpublished manuscript, *Whenever Was Maurice Kelvinator.* He has built church organs, computers, radio stations, medical devices, lighting systems, radio guidance systems and industrial controls, and he writes software.



Main Layout.

By Carole Perry, WB2MGP

Hams With Class

"Welcome Aboard!" is the official Navy greeting. With it, I was in vited to be a guest speaker at the U.S. Naval Academy in Annapolis, MD. After my wonderful experience in August 1995, addressing the cadets at the West Point amateur radio club, how could I not visit Navy? I accepted the invitation of Lt. Commander Herb Elkins, A3FDO, and Midshipman 1/C Trevor Bast, KA8ZUO, and I was on my way.

The ride over the Chesapeake Bay Bridge is a real experience. The view of the sun going down over the myriad boats in the water was simply breathtaking. My tour of the "Yard," which is the traditional name of the Naval Academy's campus, was enlightening and impressive. The architecture is a combination of French Renaissance and contemporary style. The campus has expanded to 338 acres.

Monuments throughout the Yard commemorate the bravery and heroism that are an important part of the academy's heritage. Buildings and walkways are named for graduates who have contributed to the naval history and to the nation, graduates such as Admirals Chester Nimitz, William "Bull" Halsey and Hyman Rickover, President Jimmy Carter and 40 astronauts.

The brigade-size student body of 4,000 midshipmen participate in a 140-semester-hour program that incorporates a core curriculum of required courses, plus a choice of 18 principle fields of study, a wide variety of elective courses, and advanced study and research opportunities for highly motivated students.

Classes are taught by 600 highly qualified faculty members. About half are civilian scholars, and half are experienced military officers.

My tour guide for most of the day was Bast, president of the amateur radio club. It was a pleasure to be in the company of such high-caliber students as he. One of the highlights was watching the "formation" for lunch outside Bancroft Hall. It is not often that I get to see 4,000 young men and women line up with such precision. It is even less often that I get to eat lunch with such an outstanding group.

W3ADO

While visiting the ham station, I got to meet with Bob Bruninga, WB4APR, who is a retired Navy commander and trustee and technical coordinator for the station, W3ADO. Although the station I visited was in small quarters back in August, the club plans to move to a larger facility. It may have been tight quarters, but the view of the bay was spectacular.

The amateur radio club is the Naval Academy's oldest extracurricular activity, dating back to 1928. For many years, it has provided midshipmen with the opportunity to become licensed, to upgrade their present licenses, to enjoy a relaxing hobby or to pursue specific technical interests within the hobby. The club station is available to all members at any time. In recent years, midshipmen have attempted to communicate via moonbounce, satellite and packet.

The club is well equipped for HF communications. It has a Kenwood TS-440S transceiver, an ICOM IC-701 transceiver, a Cushcraft R-5 vertical antenna and a G5RV antenna. Three mobile VHF-FM transceivers, two Kenwood TM-251A transceivers and a Kenwood handie-talkie give excellent 2-meter capabilities. Two personal computers, an MFJ407B and an AEA Packratt, support VHF and HF packet operations from the station. The many technical resources of the academic departments are often available for the club's use. In the past, that avenue has provided them with the use of a satellite dish and all-mode VHF capabilities.

The ever-popular and traditional Army-Navy football game provides the club with a reason to set up a special events station every year. On Saturday, Dec. 2, 1995, club members operated from the stadium in Philadelphia for the duration of the game. The normal routine is to operate SSB in the General license class portion of 20 meters and 40 meters.

Last spring, the club had the privilege of operating during a shuttle mission as part of the SAREX program. Club members, as well as interested faculty, were able to communicate with the astronauts for approximately half an hour. The exchange between the *Atlantis* and the midshipmen included each sending the other a short video presentation.

"Yeah, I've got color!" Lt. Col. Cameron said upon receiving the academy's video. "Man, great pictures." The exchange represented the first time that a space shuttle successfully has received video from the ground. Usually it is the astronauts who are sending the pictures.

Later that evening I addressed a group of midshipmen who were considering joining the club and who wanted to learn more about ham radio. I cannot describe how exciting it was for me to look out at a "sea" of white uniforms in the auditorium.

With all the demands put on the midshipmen's time, it was nice to see such a good turnout of students interested in pursuing radio. We spoke about the possibility of my lending assistance to those club members who were considering setting up classes in local schools as part of their community service.

The ham radio operators at W3ADO seemed receptive to the idea of scheduling contacts with younger school children. They are an enthusiastic, bright and extremely hospitable group of young adults.

I thank my hosts for a most enjoyable weekend, and I look forward to some outstanding contacts.

Carole Perry is a Fellow of the Radio Club of America.

By Rikki Lee

Celebrating a Personal Communications Pioneer

What is past is prologue.
Those small, sleek personal wireless hand-held pocket phones, the cordless telephones and those fancy multicolored radio pagers are echoes from the past. Let's take a look at Al Gross, a radio pioneer, and his contributions to personal wireless.

From his first radio experiments as a 9-year-old in his garage in Cleveland during the 1930s and much later, his life-saving ground-to-air radio equipment developed for U.S. intelligence in World War II, his efforts to equip firefighters and maritime agencies with the latest two-way technology, his early radiopaging systems that created an industry and through his current work in aerospace systems, Gross stands as a beacon in the wireless community's never-ending quest for reliable and universal personal communications devices.

Now senior staff engineer at Orbital Sciences Corp., Gross is modest about his early work in paging or personal two-way communications.

"I didn't have the foresight to look into the future; I was interested in the personal applications of two-way radio. I wanted radio to be portable, personal. It was the aim of my work, and today, the whole industry is moving that way."

During World War II, as a member of the Office of Strategic Services—forerunner to the Central Intelligence Agency—Gross introduced and manufactured a small 250 MHz hand-held walkie-talkie that was used by field agents on the ground to communicate with pilots in high-flying aircraft. The project, code-named "Joan/Eleanor" or "J/E," included radios deployed in Europe during the war. The successful clandestine operation was declassified in 1976. A similar hand-held radio was used in June 1995 by downed pilot Scott O'Grady to effect his rescue from Bosnia.

Before the end of the war, Gross was called upon to demonstrate his OSS hand-held transceivers to the FCC chairman and commissioners. Later, "Phone Me By Air," an article by FCC Commissioner E.K. Jett, was published in the July 28, 1945, *Saturday Evening Post,* and personal wireless was born.

After World War II, the FCC granted Gross two experimental licenses to develop emergency radios for use by the U.S. Maritime Commission and the War Shipping Administration. Three years later, the U.S. Coast Guard contracted Gross Electronics Corp. to manufacture small, hand-held 415 MHz transceivers, designated model TRC 156.

The embodiment of personal communications perhaps belongs to the fictional character Dick Tracy, whose two-way wrist radio illustrated in the early 1950s still is seen as a distant but attainable goal for the wireless industry. However, a working prototype of that device actually had already been developed in 1948 by Gross.

Gross's first paging system came about at the suggestion of a medical supply salesman who was laid up in the hospital in 1939 for about two months. Nearly 10 years later, the salesman went to see Gross in Cleveland. In 1952, Gross developed one of the first practical one-way radio paging systems for hospitals. However, the technology that was designed to help doctors to receive important alerts immediately was considered non-essential at the time.

When the paging system first was demonstrated at a 1954 convention, some doctors criticized that the pager would interfere with their golf games or interrupt visits with their patients.

Nowadays, of course, the pager has become the ultimate personal communications device, worn by doctors, cable TV installers, salespeople, waiters, parents and teenagers.

In recognition for his pioneering work, the wireless industry recently has given credit to Gross. Here are only a few of the awards he has received in the past year:

▶ During its Personal Communications Showcase '96 in San Francisco in September, the Personal Communications Industry Association presented Gross with the Pioneer Award for "landmark contributions to the wireless industry."

▶ The Veterans Wireless Operators Association, a fraternal organization of maritime and military telegraphy and radio operators, in May presented Gross with the VWOA Marconi Memorial Gold Medal of Achievement.

▶ In March, the Amateur Radio Club at the Institute of Technology and Higher Education in Monterrey, Mexico, gave Gross an honorary award. He also presented a speech on the "History of the Walkie-talkie, the Cordless Telephone, the Cellular Telephone and Radiopaging" at the institute's annual symposium.

▶ In 1995 in Geneva, he was made an honorary member of the International Telecommunications Union.

Although this is certainly his year for awards, Gross says, "It's great to see the contributions that my patents and inventions have made in the personal wireless indsutry. Radio and wireless have been my life's work and a stepping stone to knowledge."

Rikki Lee is a Radio Club of America member and news editor with *Wireless Week*.

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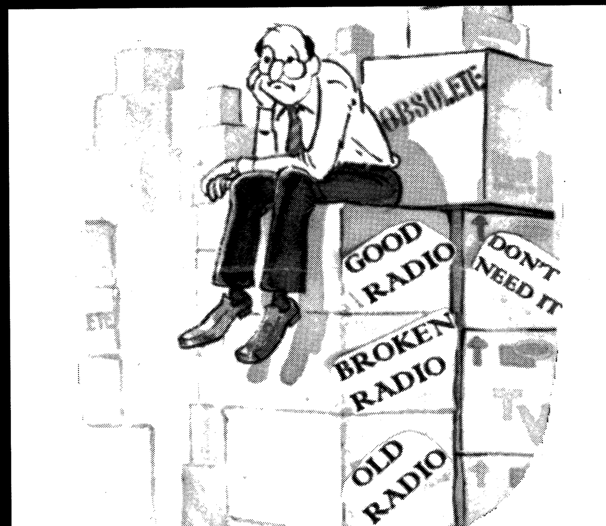

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By William R. Gary

The Puzzling Misdeeds of George Rogers

As was noted in the February 1988 issue of ENTELEC News, *the Southwestern Chapter of the Radio Club of America (RCA) had been formed not long before. Members seized an opportunity during ENTELEC 1988 and had a breakfast meeting. As was normal at ENTELEC and RCA functions that year, the Club's then-president, Fred M. Link, was present. As also was normal, the master storyteller spun another of his fascinating tales.*

At about the same time, the Institute of Electrical and Electronics Engineers (IEEE) recognized three "milestones in mobile radio." Not surprisingly, Link, an illustrious ENTELEC Honorary Member, was involved in all three. Regardless, this is not a story about Link—at least not exactly. This is Link's breakfast meeting story of Vincent Doyle, a cruise ship named Morro Castle, *a radio operator and technician named George Rogers, and some misdeeds that border on the unimaginable.*

The first two-way FM mobile radio system approved for installation in the United States was in Bayonne, New Jersey, where Vincent Doyle was head of police communications. The radio equipment was built by Frank A. Gunther, another famous name in our business. George Rogers was a somewhat peculiar individual, and not just because he weighed 300 pounds. In addition to being a radio operator, Rogers aspired to work in radio in Bayonne. He also was interested in building bombs.

Vince Doyle would not hire George Rogers, so he signed onto the *Morro Castle* as the ship's radio operator. For a variety of reasons, probably good ones, the captain of the Morro Castle decided as he neared the end of a cruise to fire Rogers, and told him so. Angered, Rogers settled upon a dangerous course of action. He poisoned the captain.

The captain of the *Morro Castle* had apparently run a rather sloppy ship. His crew was undisciplined, no fire drills were held, and fire hoses were not functioning. In the midst of this, Rogers hid a timed incendiary device in one of the ship's compartments. Unknowingly, he placed it near where gunpowder used in firing emergency lines was stored. Rogers' plan was to ignite a small fire, "discover" it, send an SOS and then rush in to put out the fire. In this way he would become a hero.

Rogers' plan did not reckon with the size of the fire ignited by his device and the gunpowder. The undisciplined crew, hampered by useless fire hoses, could not control the fire—and neither could Rogers. He sent his SOS, and the ship was run aground off Asbury Park, New Jersey, burning in full view of people onshore. The fire claimed the lives of 250 passengers and crew, but Rogers survived. His active role concealed, he became something of a hero and toured the country on a personal appearance tour.

Later, a politician friend got Rogers a job in the Bayonne police department radio shop under Doyle. It wasn't long before trouble began brewing between the two. For reasons unknown, Rogers confessed to Doyle his role in the *Morro Castle* fire and then set out to get rid of Doyle. A package with a typed note appeared on Doyle's desk. The note said: "Broken fish tank heater; please repair." Curious, Doyle opened the package. Inside was a fish tank heater which exploded in Doyle's hands. Doyle lost a hand and suffered other serious injuries.

The note was traced easily to the only typewriter in the radio group. Rogers was indicted, tried, convicted and sentenced to prison. That should be the end of the story—but it isn't.

Rogers' politician friend got him paroled and out of prison. During World War II, Rogers served as a military radio operator.

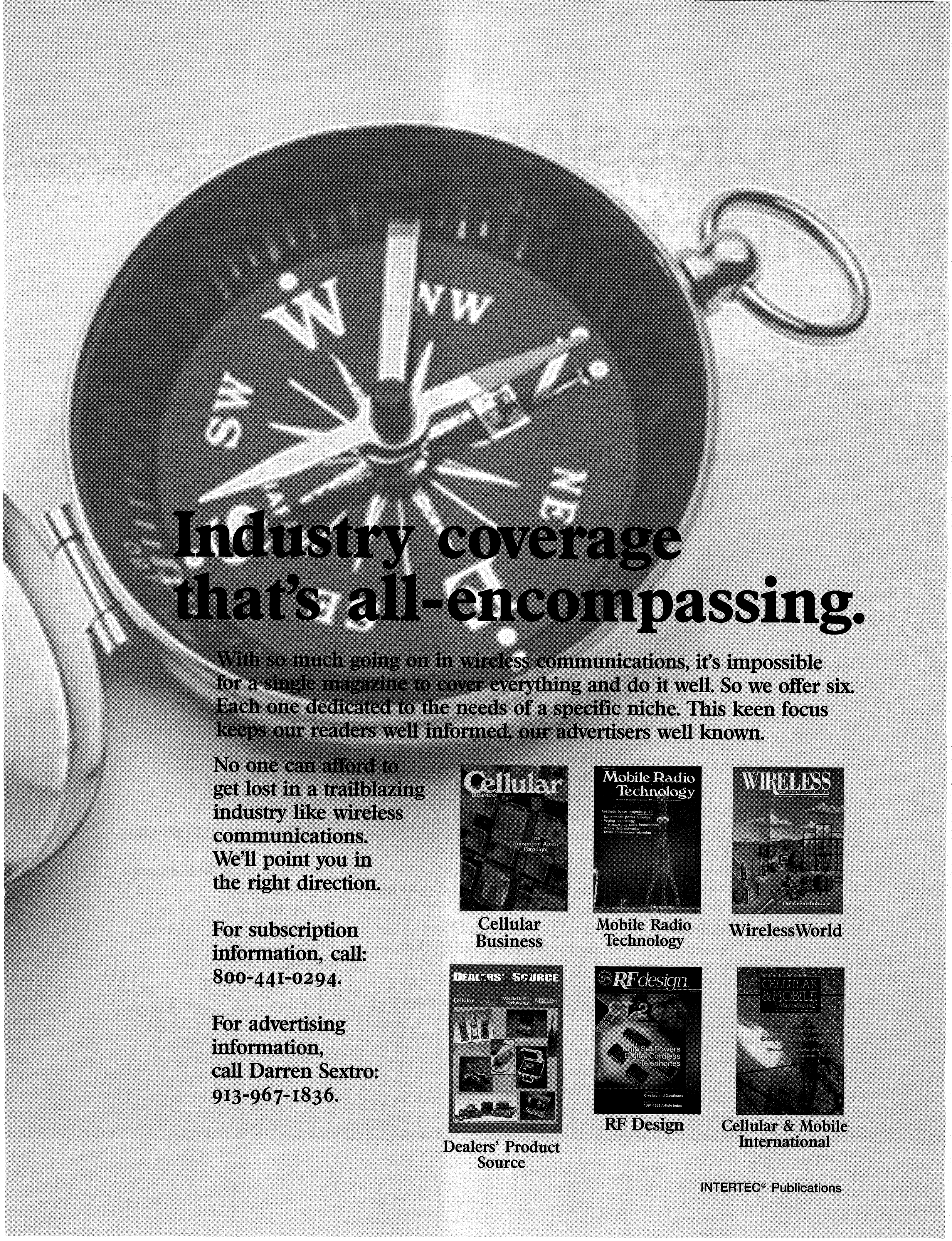
After the war, he returned to Bayonne, but he could not find a job in radio. He became a "handyman," fixing or painting things around various people's homes. While working for an elderly man living in an old house with his daughter, Rogers ingratiated his way into an invitation to live with them and keep their house up. Inevitably, he began to borrow small sums of money from them and never repaid any of it.

After being separated from several thousands of dollars, the man and his daughter grew fearful of 300-pound Rogers. The only solution they could think of was to sell the house and move to Florida where they could be near friends. They paid Rogers to board up the house, put it up for sale, and notified their Florida friends of their pending arrival. They never got to Florida.

When the travelers failed to arrive in Florida, worried friends notified the Bayonne police. Not surprisingly, two bludgeoned bodies were found in the boarded-up house. The house had been ransacked systematically, and the furnishings sold or hocked. Rogers again was indicted, tried, found guilty and sentenced to prison. Again, his politician friend attempted to get him paroled, but Rogers eventually died in prison. Doyle never fully recovered, physically or emotionally.

The Link business was formed in lower Manhattan in New York City in 1931, first building consoles for remote radio broadcasts. One of its earliest employees, one which did not last long with Link Radio, was—you guessed it—Rogers. Why did Fred Link fire Rogers so quickly? Because Rogers walked in one day and asked: "Do you know how to build a bomb?"

Bill Gary is a Radio Club of America Fellow and editor of *ENTELEC News*.



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EDWARD A. ALF
RF Systems Consultant
400 S. Flower, Suite 84
Orange, CA 92668
714-978-2940
714-978-2503 (FAX)

GAETANO (TOM) AMOSCATO
Communications Consultant
150-47A 12th Road
Whitestone, NY 11357
718-767-7500
718-767-9858 (FAX)

GENE A. BUZZI
Public Safety Communications Engineering/Consulting
930 Thomasville Road, Suite 200
Tallahassee, FL 32303
904-224-4451
904-224-3059 (FAX)
E-mail: omnicom@polaris.net

MERCY CONTRERAS
Publisher, Trade Journals
5660 Greenwood Plaza Blvd.
Suite 350
Englewood, CO 80111
303-220-4245
303-793-0454 (FAX)
E-mail: mercy_contreras@intden.ccmail.compuserve.com

HAROLD C. (HAL) DAVIS
Wireless Communications Business Consulting
8 Winged Foot Court
Cheshire, CT 06410-2354
203-272-3891
203-272-4812 (FAX)
E-mail: hcdavis@ix.netcom.com

JOHN DETTRA
Consulting Engineer
805 25th St. NW
Washington, DC 20037
202-965-4664
202-965-4666 (FAX)

JAMES A. DOUGLAS
Portable Computing Solutions and Products
22432 Goshen School Road
Gaithersburg, MD 20882-1410
301-253-6445
301-253-5772 (FAX)
E-mail: jadco@ix.netcom.com

GARY EISENBERG (WB2EQX)
NY Tri-state & Central California Antenna Site Consulting
10500 Saddle Road
Monterey, CA 93940-6637
408-373-7742
408-646-0595 (FAX)

ROBERT I. ELMS P.E.
Land Mobile Communications Consultant
72 Smithtown Road
Budd Lake, NJ 07828
201-347-9300
201-347-4474 (FAX)

JOSEPH J. FAIRCLOUGH, WB2JKJ
Educational Consultant
P.O. Box 1052
New York, NY 10002-0912
516-674-4072
516-674-9600 (FAX)

ROBERT B. FAMIGLIO ESQ., K3RF
Patent Lawyer & Trial Attorney, Technical Writer
201 N. Jackson St.
P.O. Box 1999
Media, PA 19063
610-566-6800
610-565-6666 (FAX)

JEFFREY L. FULLER
Communications Consulting
7521 Culwells Place
Lincoln, NE 68516-3784
402-484-8642 (Voice+FAX)
E-mail: jfuller@transcrypt.com

MAL GURIAN
Telecommunications and Management Consultant
14 Old Farmstead Road
Chester, NJ 07930
908-879-5076
908-879-9376 (FAX)
E-mail: malgurian@aol.com

LAWRENCE M. HOLLINGSWORTH
Telecommunications Consulting
2888 Lee Road
Silver Lake, OH 44224-3731
216-923-4337
216-923-7747 (FAX)
E-mail:
75334.24@compuserve.com

GEORGE JACOBS P.E., W3ASK
Regulatory, Frequency & Engineering;
International Broadcast Consultant
8701 Georgia Ave., Suite 410
Silver Spring, MD 20910-3713
301-587-8800
301-587-8801 (FAX)
E-mail: g.jacobs@ieee.org

JACK M. JANICKE
Magnetics Consultant
122 Bellevue Ave.
Butler, NJ 07405
201-838-3668

LEONARD R. KAHN
Professional Engineer;
Communications, Broadcasting and Satellite
320 E. 42nd St. (Mezzanine W)
New York, NY 10017
212-983-6765
516-222-2221

JOEL I. KANDEL
Communications Consultant
601 NW 71st Ave.
Plantation, FL 33317-1122
954-791-4275
954-791-7461 (FAX)
E-mail: jkandel@ix.netcom.com

SEYMOUR KREVSKY P.E., DEE, W2JBI
C4I Consultant
69 Judith Road
Little Silver, NJ 07739-1559
908-842-6606 (Voice+FAX)
E-mail: skrevsky@ix.netcom.com

AUGUST J. LINK
Preservationist of Military Electronics
2215 Faraday Ave., Suite A
Carlsbad, CA 92008-8818
619-438-4420
619-438-4759 (FAX)

JOHN B. MACLEOD
Wireless Communications Gateway
8911 Balboa Ave.
San Diego, CA 92123
619-654-9000
619-654-9002 (FAX)
E-mail:
jmacleod@ndcwireless.com

WILLIAM C. MARGIOTTA
Digital/Analog Microwave Specialist
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DONALD C. NORDENHOLT
Telecom and Fiberoptic Consulting
1509 Cliffbrook Drive
Plano, TX 75075-8725
214-424-1950 (Voice+FAX)
E-mail:
72254.3371@compuserve.com

CAROLE J. PERRY
Beeper and Cellular Phones Sales
P.O. Box 131646
Staten Island, NY 10313-0006
718-761-5733
718-983-1416 (FAX)

ÅKE S. PERSSON
Radio Systems Marketing and Sales
AB Torshamnsgatan 23, S-164 80
Stockholm, Sweden
+46 8 404 40 95
+46 8 404 48 60 (FAX)
E-mail:
era.eraakpe@memo.ericsson.se

TOLBERT V. PROWELL, W3URG
Collector
Early Battery Radios & Tubes
413 N. York Road
Mechanicsburg, PA 17055-6016
717-697-5227

JACK REICHLER
Antenna Site Development and Management
23501 Park Sorrento, #213A
Calabasas, CA 91302-1355
800-400-SITE
818-222-2857 (FAX)

STAN REUBENSTEIN
Manufacturers' Representative
2018 S. Pontiac Way
Denver, CO 80224
303-758-3051
303-758-6630 (FAX)

CHANDOS A. RYPINSKI
Patents and Product Development
Radio ATM LAN/telecom/network
655 Redwood Highway, #340
Mill Valley, CA 94941 USA
+1-415-389-6659
+1-415-389-6746 (FAX)
E-mail: rypinski@netcom.com

JORGE SAAD
Two Way Radio Business
Av. 20 de Noviembre 805
31000 Chihuahua, Chih.
Mexico
52+(14)15-25-25
52+(14)16-42-98 (FAX)
E-mail: syscom@chi.icanet.net.mx

TOM SMITH
Manufacturers Representative
8300 Killian Drive
Miami, FL 33156
305-253-3289
305-255-0523 (FAX)

JAMES L. STEVENSON, N.C.E.
Consulting Communications Engineer
2465 Johnson Mill Road
P.O. Box 340
North Branch, MI 48461-0340
810-688-2633 (Voice+FAX)
E-mail:
james.laraway.stevenson
@industry.net

RAYMOND C. TROTT, P.E.
Radio System Design
1425 Greenway Drive, Suite 350
Irving, TX 75038
214-580-1911
214-580-0641 (FAX)
E-mail: trottgroup@aol.com

STEVE UHRIG
Manufacturer of Electronic Surveillance & Intelligence Gathering Systems
1300 Boyd Road
Street, MD 21154-1836
410-879-4035
410-836-1190 (FAX)
E-mail: swsuhr@ibm.net

GARY P. WALLIN
Direct Marketing Consulting
P.O. Box 1030
Manchester, NH 03105-1030
603-623-1212
603-627-0029 (FAX)
E-mail: gary@wallin.com

ROBERT P. WALSH ESQ., WA8MOA
Attorney
142 W. Van Baron St., Suite 109
Battle Creek, MI 49017-3088
616-962-9693
616-962-9592 (FAX)
E-mail: rpwalsh@voyager.net

ROBERT B. WHITE
Executive Recruiter Wireless Industry
65 S. Main St., Building B
Pennington, NJ 08534
609-737-8500
609-737-8576 (FAX)

Business Directory

Gerald L. Agliata, President, AirWave Strategies, Inc.
271 Main St., Eastchester, NY 10707-2901
914-779-3676, 914-633-9315 (FAX)

Gaetano (Tom) Amoscato, Systems Consultant
Amtol Radio Communications Systems, Inc.
150-47A 12th Road, Whitestone, NY 11357
718-767-7500, 718-767-9858 (FAX)

George Badger, President
Svetlana Electron Devices, Inc.
3000 Alpine Road, Portola Valley, CA 94028
415-233-0429, 415-233-0439 (FAX)
E-mail: 103243.242@compuserve.com

Roger R. Block, Chief Technology Officer
PolyPhaser Corporation
2225 Park Place
Minden, NV 89423-9000
702-782-2511, 702-782-4476 (FAX)
E-mail: @polyphaser.com

Jane Bryant, Editorial Director
Wireless Business & Technology
Phillips Business Information, Inc.
1201 Seven Locks Road, Potomac, MD 20854
304-340-7788 ext.2730, 301-340-0542 (FAX)
E-mail: jbryant@phillips.com

Alan Burton, President, 911 Dispatch Services Inc.
P.O. Box 1153, Benicia, CA 94510-4153
707-747-0540, 707-747-5682 (FAX)
E-mail: dispmag@aol.com

Keith B. Bussman, President
Ukiah Broadcasting Corporation
P.O. Box 77766, Stockton, CA 95267-1066
209-946-7900, 209-946-7902 (FAX)

Gene A. Buzzi, President, Omnicom, Inc.
930 Thomasville Road, Suite 200
Tallahassee, FL 32303
904-224-4451, 904-224-3059 (FAX)
E-mail: omnicom@polaris.net

Mercy Contreras, Group Publisher, Intertec Publishing
5660 Greenwood Plaza Blvd., Suite 350
Englewood, CO 80111
303-220-4245, 303-793-0454 (FAX)
E-mail:
mercy_contreras@intden.ccmail.compuserve.com

John Dettra, President, Dettra Communications, Inc.
P.O. Box 18864, Washington, DC 20036-8864
202-965-4664, 202-965-4666 (FAX)

Daniel L. Duryee, Manager, Gateway Electronics
2525 N. Federal Blvd., Denver, CO 80211
303-458-5444, 303-458-6988 (FAX)

James A. Dwyer, President, Qualicom, Inc.
2100 Electronics Lane, Fort Meyers, FL 33912
941-481-8700, 941-489-1928 (FAX)

Gary Eisenberg (WB2EQX), General Manager
American Site Locations
10500 Saddle Road, Monterey, CA 93940-6637
408-373-7742, 408-646-0595 (FAX)

William E. Endres, President, Tele-Measurements Inc.
145 Main Ave., Clifton, NJ 07014-1078
201-473-8822, 201-473-0521 (FAX)
E-mail: tmcorp@aol.com

John Facella, President, Telequip Corporation
20 Trafalgar Square, Nashua, NH 03063
603-598-1300 ext. 250, 603-598-6724 (FAX)
E-mail: jfacella@telequip.com

Joseph J. Fairclough, President
The Radio Club of JHS 22 NYC, Inc.
P.O. Box 1052, New York, NY 10002-0912
516-674-4072, 516-674-9600 (FAX)

E. Carl Fishel, General Manager–Africa
International Wireless
1 Kendall Square, Building 200, Suite 202
Cambridge, MA 02139-1562
617-576-9192, 617-494-9422 (FAX)

Jeffrey L. Fuller, President & CEO
Transcrypt International
4800 NW 1st St., Lincoln, NE 68521
402-474-4800, 402-474-4858 (FAX)
E-mail: jfuller@transcrypt.com

F.G. 'Spike' Fuson, President, Vista Telecom
3430 E. Flamingo Road, #242
Las Vegas, NV 89121
702-434-9610, 702-433-5950 (FAX)

Rafael A. Garcia, President, Teletrol, Inc.
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James R. Hargenrader, President, Hark Systems, Inc.
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Carroll L. Hollingsworth, Vice-President
Denwalt-Hollingsworth, Inc. dba D H Marketing
6015 Lohman Ford, Suite 101, Lago Vista, TX 78645
512-267-7747, 512-267-7760 (FAX)

Lawrence M. Hollingsworth, Owner
Lawrence Hollingsworth Co.
2888 Lee Road, Silver Lake, OH 44224-3731
216-923-4337, 216-923-7747 (FAX)
E-mail: 75334.24@compuserve.com

George Jacobs P.E. (W3ASK), President
George Jacobs & Associates, Inc.
8701 Georgia Ave., Suite 410
Silver Spring, MD 20910-3713
301-587-8800, 301-587-8801 (FAX)
E-mail: g.jacobs@ieee.org

Leonard R. Kahn, President
Kahn Communications, Inc.
320 E. 42nd St. (Mezzanine W), New York, NY 10017
212-983-6765, 516-222-2221

Antoinette P. Kaiser, President/CEO
STI-CO Industries, Inc.
11 Cobham Drive, Orchard Park, NY 14127
716-662-2680, 716-662-5150 (FAX)
E-mail: mkaiser@disguiseguys.com

Joel I. Kandel, President, Kandel and Associates
601 NW 71st Ave., Plantation, FL 33317-1122
954-791-4275, 954-791-7461 (FAX)
E-mail: jkandel@ix.netcom.com

Gary W. Kimmerle, Manager, Major Accounts
Ericsson – Private Radio Systems
7051 Village Drive, Building 100
Buena Park, CA 90621
714-670-3254, 714-670-3260 (FAX)

Peter J. Kovaleski, General Partner
Skyline Communications
93 Delphi Road, Stafford, CT 06076
203-684-4444, 203-684-9459 (FAX)

Jonathan C. Kummer, District Sales Manager
Microwaves & RF Magazine
611 Route 46 West, Hasbrouck Heights, NJ 07604
201-393-6271, 201-393-6297 (FAX)
E-mail: jon@pcnet.com

John H. Levergood, President
Broadband Communications Group
Scientific-Atlanta, Inc.
4261 Communications Drive, Norcross, GA 30093
770-903-5017, 770-903-6299 (FAX)

August J. Link, President, Surcom Associates, Inc.
2215 Faraday Ave., Suite A, Carlsbad, CA 92008-8818
619-438-4420, 619-438-4759 (FAX)

John B. MacLeod, Chairman & CEO
The National Dispatch Center, Inc.
8911 Balboa Ave., San Diego, CA 92123
619-654-9000, 619-654-9002 (FAX)
E-mail: jmacleod@ndcwireless.com

William C. Margiotta, Chief Executive Officer
Wavelynx International Inc.
5575 Magnatron Blvd., San Diego, CA 92111
619-576-9380, 619-576-9075 (FAX)

Stephen M. Meer
VP Systems Engineering & Integration
SCC Communications Corp.
6285 Lookout Road, Boulder, CO 80301
303-581-5600, 303-581-0900 (FAX)

Mitchell S. Mohr, President, Celluphone
6681 E. 26th St., Los Angeles, CA 90040
213-727-9131, 213-727-7004 (FAX)

Thomas R. Morrison Esq., Proprietor
Morrison Law Firm
145 N. Fifth Ave., Mount Vernon, NY 10550
914-667-6755, 914-667-7178 (FAX)
E-mail: tompatent@aol.com

Thomas L. Morrow, Vice President North America
E. F. Johnson Company
438 Gateway Blvd., Burnsville, MN 55337-2564
612-882-5532, 612-882-5656 (FAX)

Paulla A. Nelson-Shira, President
Radio Resource Magazine/Pandata Corp.
14 Inverness Drive East, #D-136
Englewood, CO 80112-5604
303-792-2390, 303-792-2391 (FAX)

Donn R. Nottage, President
NRM Marketing Group, Inc.
7 Fennell St., Skaneateles, NY 13152
315-685-8991, 315-685-6199 (FAX)
E-mail: 102363.2200@compuserve.com

Åke S. Persson, Vice President, Marketing & Sales
Ericsson Radio Systems AB
Torshamnsgatan 23
164 80 Stockholm, Sweden
+46 8 404 40 95, +46 8 404 48 60 (FAX)
E-mail: era.eraakpe@memo.ericsson.se

June Poppele, Corporate Secretary
Tele-Measurements, Inc.
145 Main Ave., Clifton, NJ 07014-1078
201-473-8822, 201-473-0521

Scott D. Prather, RF Engineer, AT&T Wireless Services
110 110th Ave. NE, Suite 200, Bellevue, WA 98004
206-990-4209, 206-990-4200 (FAX)
E-mail: scott.prather@attws.com

James 'Ronnie' Rand, Executive Director
APCO-International, Inc.
2040 S. Ridgewood Ave.
South Daytona, FL 32119-8437
800-949-APCO ext. 224, 904-322-2501 (FAX)
E-mail: randr@apcointl.org

Jack Reichler, President, Meridian Communications
23501 Park Sorrento, #213A
Calabasas, CA 91302-1355
800-400-SITE, 818-222-2857 (FAX)

Stan Reubenstein, Aurora Marketing Company
2018 S. Pontiac Way, Denver, CO 80224
303-758-3051, 303-758-6630 (FAX)

Tony Sabino, President, Regional Communications, Inc.
E 64 Midland Ave., Paramus, NJ 07653-0144
201-261-6600, 201-261-6304 (FAX)
E-mail: sabino@radiomail.net

Carolyn M. Servidio
President, RadioMate Corporation
4030-A Pike Lane, Concord, CA 94520
510-676-3376, 510-676-3387 (FAX)

Herschel Shosteck Ph.D., President
Herschel Shosteck Associates, Ltd.
11160 Veirs Mill Road, Suite 709
Wheaton, MD 20902-2538
301-589-2259, 301-588-3311 (FAX)

Calvin D. Smith, Owner/Mgr., RF Products
1930-D Murrell Road, Rockledge, FL 32955
407-631-0775 (Voice+FAX)

Tom Smith, Owner, Marketing Masters
8300 Killian Drive, Miami, FL 33156
305-253-3289, 305-255-0523 (FAX)

Carl E. Smith P.E., Owner
Carl E. Smith Electronics
8200 Snowville Road, Brecksville, OH 44141
216-526-4386, 216-526-9205 (FAX)

James L. Stevenson, C.E.O.
Twin Oaks Communications Engineering, P.C.
2465 Johnson Mill Road, P.O. Box 340
North Branch, MI 48461-0340
810-688-2633 (Voice+FAX)
E-mail: 104153.2772@compuserve.com

Eric D. Stoll Ph.D., P.E., Sr. Staff Engineer
AlliedSignal Aerospace
Guidance and Control Systems Div.
M/C-1/J12; US Route 46 East
Teterboro, NJ 07608-1173
201-393-2534, 201-836-2351 (FAX)
E-mail: 73134.2772@compuserve.com

Dr. Gregory M. Stone, Principal
Dr. Gregory M. Stone & Associates
P.O. Box 25693, Alexandria, VA 22313
703-684-8548 (Voice+FAX)
E-mail: stoneassoc@aol.com

Raymond C. Trott, P.E., President
Trott Communications Group, Inc.
1425 Greenway Drive, Suite 350, Irving, TX 75038
214-580-1911, 214-580-0641 (FAX)
E-mail: trottgroup@aol.com

Steve Uhrig, President, SWS Security
1300 Boyd Road, Street, MD 21154-1836
410-879-4035, 410-836-1190 (FAX)
E-mail: swsuhr@ibm.net

Judy Wachs, President, Mobility
286 Spring St., Suite 502, New York, NY 10013
212-691-2491, 212-691-1670 (FAX)
E-mail: jwachs8609@aol.com

Gary P. Wallin, Chairman, Wallin Group, Inc.
P.O. Box 1030, Manchester, NH 03105-1030
603-623-1212, 603-627-0029 (FAX)
E-mail: gary@wallin.com

Roger D. Webster, W8QFX, President
Webster Associates, Inc.
115 Bellarmine, Rochester, MI 48309-1204
800-521-2333, 810-375-0121 (FAX)

William L. Wilson, President, Arva-Hudson, Inc.
18915 – 142nd Avenue, NE, Suite 140
Woodinville, WA 98072-8502
206-489-5700, 206-483-5444 (FAX)
E-mail: 71021.2774@compuserve.com

Cross References

911 Dispatch Services Inc.
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Gerald L. Agliata

AlliedSignal Aerospace, Guidance and Control Systems Div.
Eric D. Stoll Ph.D., P.E.

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Dr. Gregory M. Stone

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Editorial Comment...continued from page 4

efficiency through improved impedance-matching (trademark: Flatterer) is a fairly new technology from Leonard that is being used with success by initial stations. But about Leonard's very latest: mum's the word.

You've read articles in these pages written by Carole Perry (F), WB2MGP. She received the Barry M. Goldwater Award, given for major contributions to the amateur radio service. Carole teaches amateur radio as part of the curriculum at a middle school in Staten Island, a borough of New York City. We met for lunch in Manhattan the day before the RCA event, and I learned firsthand about her experiences with the children and the people with whom her teaching and operation of the school radio station has brought her in contact.

Carole's students, about 400 of them each year, learn enough about amateur radio to take the license test, although obtaining a license is not required. Along the way, they learn Morse code, a process similar to learning another language and which introduces some of them to a further interest in foreign languages. Through conversations over the radio with students in other schools, they learn about life in other parts of the country and the world, exchanging photographs and crafts with the people they meet.

Carole's adventures in connection with the classes have brought her friendships with astronauts first reached over the air, and visits to the Houston, TX, and Cape Canaveral, FL, space facilities to see astronauts train and to see shuttle launches. Other radio contacts led to a tour of the Pentagon and a visit to its communications facilities.

She gave me a jewelry case. (I blushed, but it's difficult to tell through my beard). When I opened it, I found it contains a heavy-duty audio oscillator, amplifier, speaker and button for use as a code-sending key. It's what each student receives for practicing Morse code. Students send code to one another, many of them at the same time, adjusting the audio frequency to differentiate the sounds—and learn about concentration in class as part of the effort.

Well, that's my little travelogue. I get a lot out of visiting RCA members. So many of them are involved in such wonderful pursuits. One of the benefits of membership is the opportunity to associate with interesting people who might otherwise be unknown to us.


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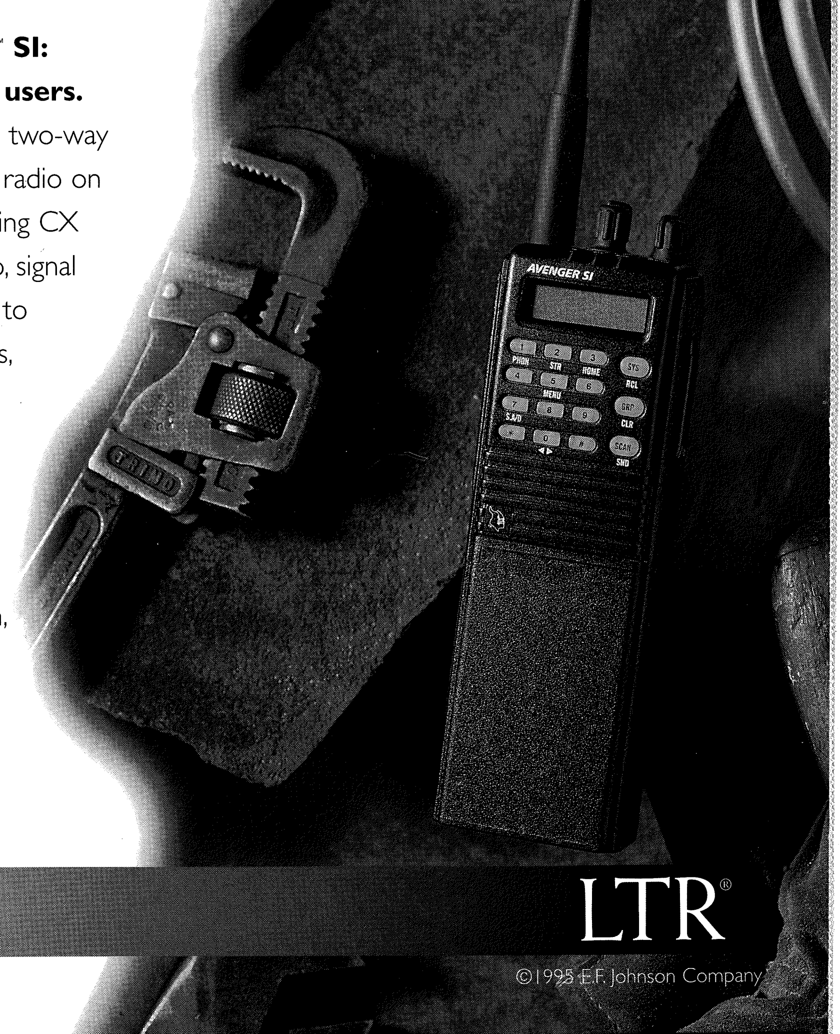

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