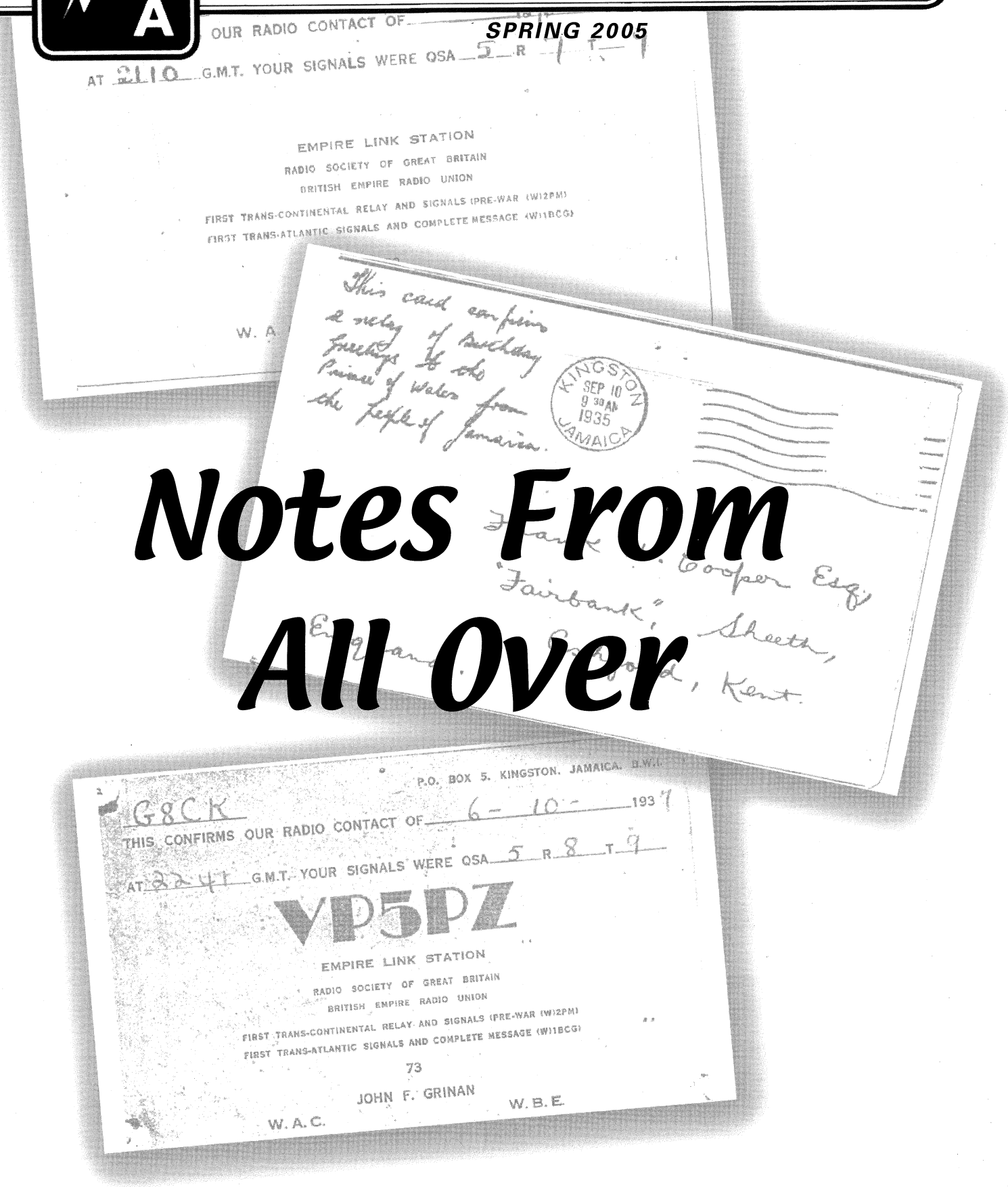
PROCEEDINGS of

THE RADIO CLUB OF AMERICA, INC.

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

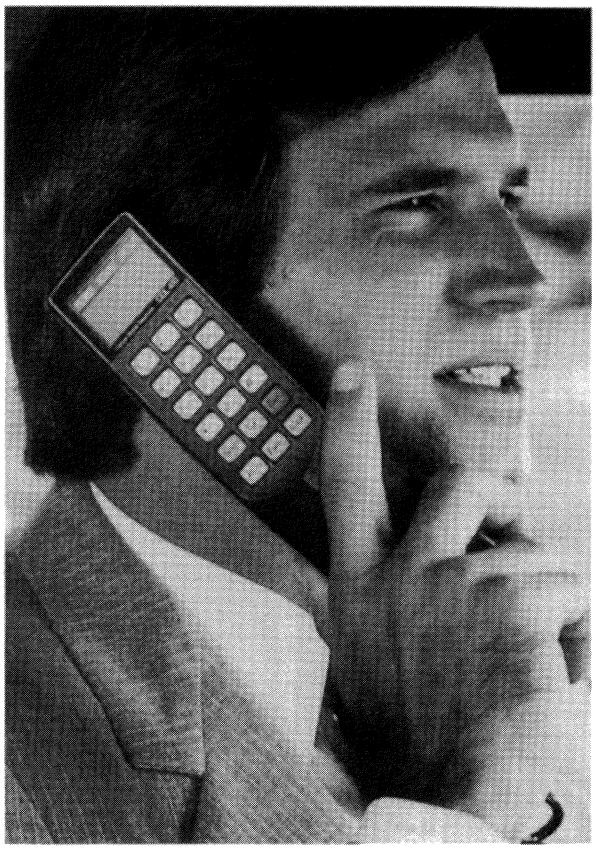
SPRING 2005

Notes From All Over



mtol

A Company for the Future



Experts in Design, Installation and Service of Landmobile Radio Systems

WHEN YOU THINK COMMUNICATIONS
– THINK SMART
– THINK mtol

718-767-7500
Fax: (718) 767-9858

TOM AMOSCATO
SYSTEMS CONSULTANT

AMTOL RADIO COMMUNICATIONS SYSTEMS, INC

150-47A-12th RD.
P.O. BOX 93
WHITESTONE, N.Y. 11357-0093

MANUFACTURERS' REPRESENTATIVE
SALES and SERVICE

718-767-7500
Fax: (718) 767-9858

MARTIN AMOSCATO
SYSTEMS CONSULTANT

AMTOL RADIO COMMUNICATIONS SYSTEMS, INC

150-47A-12th RD.
P.O. BOX 93
WHITESTONE, N.Y. 11357-0093

MANUFACTURERS' REPRESENTATIVE
SALES and SERVICE

mtol RADIO COMMUNICATIONS SYSTEMS, INC.

150-47A 12th. road, p.o. box 93, whitestone, n.y. 11357 • 718-767-7500

Volume 79, No. 1

SPRING 2005

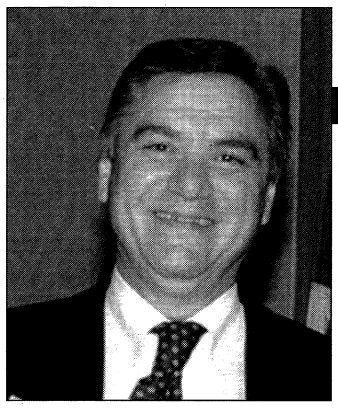
THE RADIO CLUB OF AMERICA, INC.

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

Headquarters Office: 10 Drs James Parker Blvd - Ste 103
Red Bank NJ 07701
Tel. 732-842-5070; Fax 732-219-1938
E-mail: info@radio-club-of-america.org
Website: http//www.radio-club-of-america.org

CONTENTS

Editor: **Debra Wayne**
Access Intelligence LLC, 1201 Seven Locks Road, Potomac, MD 20854
Tel: 301-354-1801; Fax: 301-279-7219; E-mail: dwayne@accessintel.com
For Advertising Information Contact: **Karen Clark**
Tel: 303-979-0621; E-mail: kjclark33@comcast.net
Designed by: **Shawn Warren,** Little Fish Creative, LLC
Tel: 866-222-5173



A Message From Tony

As your new president, first and foremost, I would like to recognize all of the members of the Radio Club of America who volunteer their services, time and treasures and say thank you so very much! It is only through your unselfish provision of these valuable recourses are many of the Club functions made possible.

While at IWCE in Las Vegas recently, I had the opportunity to help staff the Radio Club booth for a little while. It always is a pleasure meeting and speaking with other members, and this time was no exception. Many are longtime friends and the Club functions are always great opportunities to see each other. While at the booth, we handed out Radio Club member ribbons that were attached to the badges, letting everyone know who our members are. Many members already were wearing their Radio Club pins. A great visual reminder to all attendees, the Club was well-represented at this industry trade show and attendees could see who their fellow members were. We even signed up a few new membership applicants while working the booth. It not only was fun but also productive.

On to my main message: I have been tasked by your board of directors to reverse the slowly declining membership numbers. In order to do this, I need your help. That means all members are hereby commissioned and challenged to sponsor one new member each. That's all it will take to make this the best recruitment year in our history and you — our members — can do it.

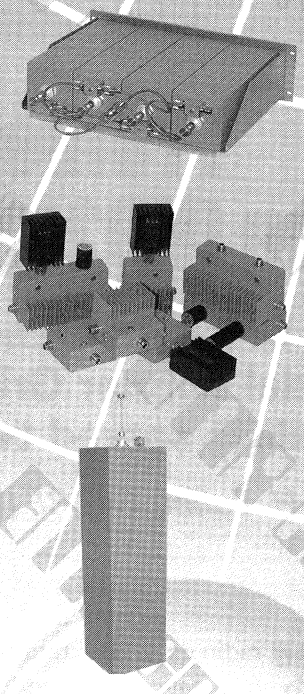
At the Radio Club breakfast at IWCE in Las Vegas, Ray Trott was kind enough to let me say a few words. I issued the same membership challenge to each and every member attending. Like knights of old, they have been sent out on a quest to find and sponsor one new member. I remind those members who attended the breakfast, that I have access to the list of breakfast attendees, and I will be reviewing the new application sponsorships as they come in. I have faith that their efforts will help to reverse our membership decline.

Bob Schwaninger, a Club Fellow, was our guest speaker (*read his speech in this issue*). I did not prompt nor did I encourage Bob to cover any particular subject that morning. Low and behold, as part of his talk, he summed up for all of us why he is a Club member. He was very appreciative of the fellowship aspect, belonging to a fraternal organization where you are among friends. He was right on target and said the Club was like a big family for him. Little did I know that his talk would support my challenge to all the members to be sponsors. Bob amplified one of the best reasons you could possibly have to sponsor someone: an invitation to become part of the great family of wireless fellowship that the Radio Club of America represents.

Someone mentioned to me that one of the reasons we don't get a lot of new applicants is that interested potential members believe the Club is "exclusive," and an applicant will most likely not get in. Having served on the Membership Committee, I know that that viewpoint is way off target. Maybe the best way to dispel that belief is to invite non-members to attend one of the Club's affairs as a guest as an opportunity to meet with some of the nicest around, and then offer to sponsor their membership. A personal invitation to join an "exclusive" club will help overcome that form of resistance.

West Coast members have the opportunity to attend the second annual Spring Gathering in Concord, Calif. Thanks to the dedicated effort of the Spring Program Committee, we can look forward to a Club function in the West each and every year. I will forewarn any attendees that I will be there, looking to see who brings a potential new member along as a guest.

For many years, Fred Link expanded the Radio Club one member at a time, one man doing the work of many. Become one of Fred's Knights by encouraging and sponsoring one new member. Many sponsors will make the work a little lighter. I'm no Fred Link, but he did show me — and many of you — the basics of how to grow this Club. Just do it!



Services and products in the LMR, Paging, Cellular, PCS, Maritime, Aeronautical and Broadcast industries.

Antenna Site & Filtering Equipment
Site Management
Site Consulting

Isolators
Duplexers
Cavities
Multicouplers
Combiners
Signal Boosters
Power Amplifiers

Wireless internet hardware, engineering and installation.

EMR corp.

Web: emrcorp.com e-mail: info@emrcorp.com

&

EMRInternet.com

A full service Internet provider

Offering Internet & Web Related Services:

Web Hosting
National Dial Up
eCommerce
DSL Services
Server Collocation
Web Site & Database Programming
Wireless and Broadband Internet Access services

22402 N. 19th Avenue Phoenix, Arizona 85029 Tel: 623-581-2875 Toll: 800-796-2875

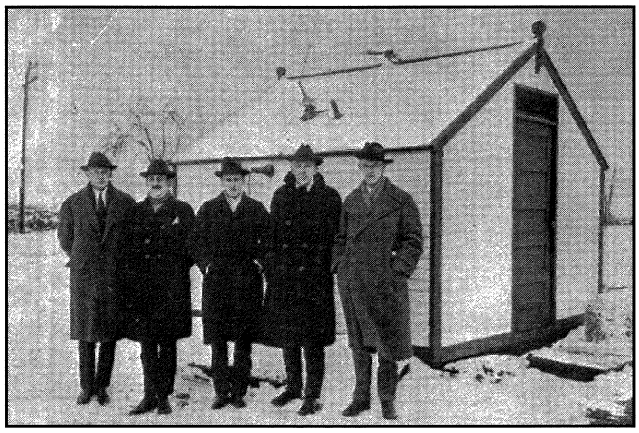
Profile: John F. Grinan (W)2PM, NJ2PZ, VP5PZ

A Radio Club of America member since 1910, Armstrong Medal winner Grinan's distinguished career in wireless served two countries well.

By Gordon H. Fuller, G4DRF (Ex-W4JJR/VP5FR)

In my youthful wanderings as a young radio engineer and enthusiastic amateur, my fascination with the early years of the science was ever present. On this particular occasion, employed as I was to Pan American Airways, the Sikorsky S42 flying boat brought me to the island of Jamaica, so very peaceful and beautiful as we circled to cut the calm, azure waters of Kingston Harbour on that September afternoon.

My purpose in being there was to make improvements to Pan Am's air-to-ground and point-to-point radio installations; however, curiosity soon compelled me to inquire of the station staff about local amateur radio activity. I was more than excited to be informed, "Oh, yes. There's a radio amateur in the island who is quite famous." Later, when the opportunity arose, I visited and introduced myself to the gentleman concerned...and so unfolded this story.



The operating staff of station 1BCG (left to right): Amy, Grinan, Burghard, Armstrong and Cronkhite.

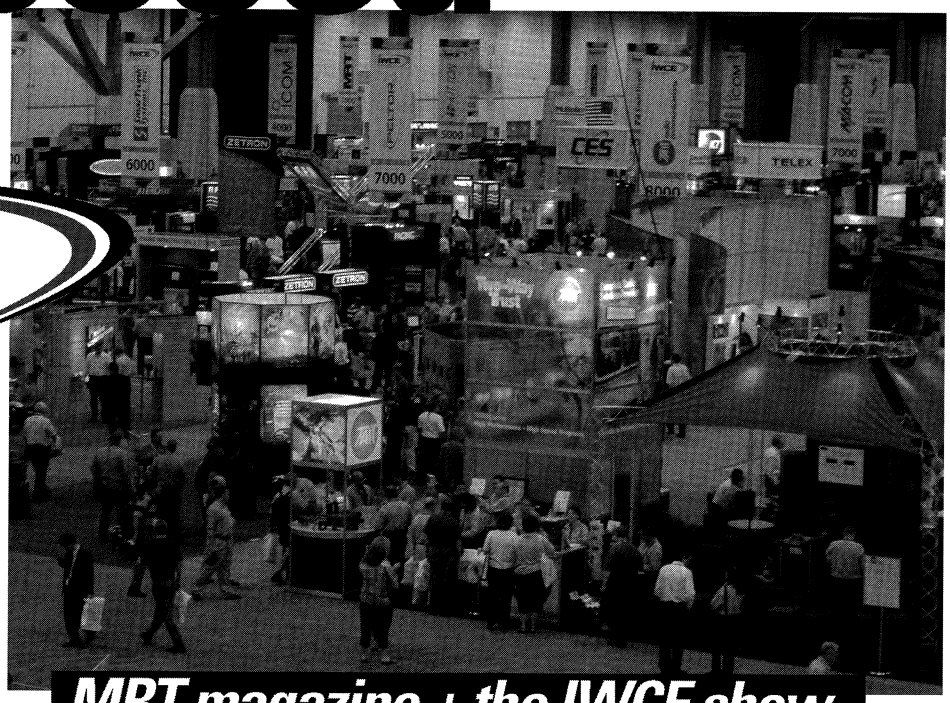
John Francis Grinan, son of a Jamaican sugar planter family, was born in Jamaica in 1894. Following his early education, he was sent to New York for further studies, including a period at the New York Military Academy. Grinan followed a passionate pursuit of "wireless," as it was then called, and in 1907 while still at the Academy, he constructed and operated his own experimental transmitting and receiving station in New York City. By 1911, he had secured his Commercial Operator's Certificate and, subsequently, he worked in that capacity with some of the most famous companies in the wireless telegraph world of that time, including Marconi Wireless, United Wireless and Tropical Radio; and at the Telefunken Trans-Atlantic station at Sayville, N.Y. He was, from all accounts, exceptionally competent.

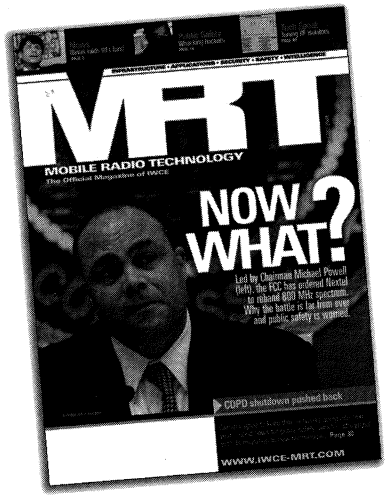
Enter The Radio Club Of America

At this point, I will divert a little as John's story is really inseparable from that of the Radio Club of America. When considering the state of wireless in America circa 1910, we see an emerging new science - little understood, with crude apparatus, and a chaotic and uncontrolled situation wherein powerful commercial and military interests, together with amateur experimenters, were all competing for air space. Broadband spark signals from ever-increasing numbers of ships and shore stations were producing a near impossible interference situation, particularly where traffic was dense. Around New York Harbor,

The critical information you need to succeed

2005 IWCE
The Wireless Marketplace
INFRASTRUCTURE • APPLICATIONS • SECURITY • SAFETY • INTELLIGENCE





MRT magazine + the IWCE show

a powerful combination for critical information you need to succeed in an ever-changing industry.

→ **www.iwce-mrt.com** to subscribe

FOR MORE MRT INFO CONTACT:

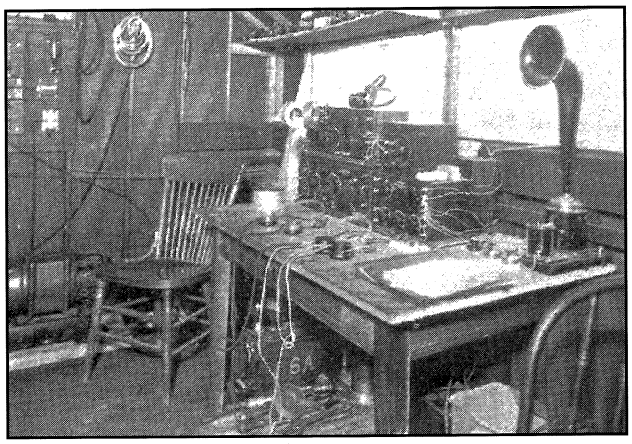
DENNIS HEGG
Western Regional Sales Manager
Ph. 707-526-4377
dhegg@primediabusiness.com

THOMAS MORROW
Eastern Regional Sales Manager
Ph. 312-840-8417
tmorrow@primediabusiness.com

FOR MORE IWCE CONTACT:

RENIE FUSELIER
Ph: 720-489-3137
rfuselier@primediabusiness.com

KATHERINE LEON
Ph: 203-358-3709
kleon@primediabusiness.com



The receiver at station 1BCG in Greenwich, Conn., in 1921.

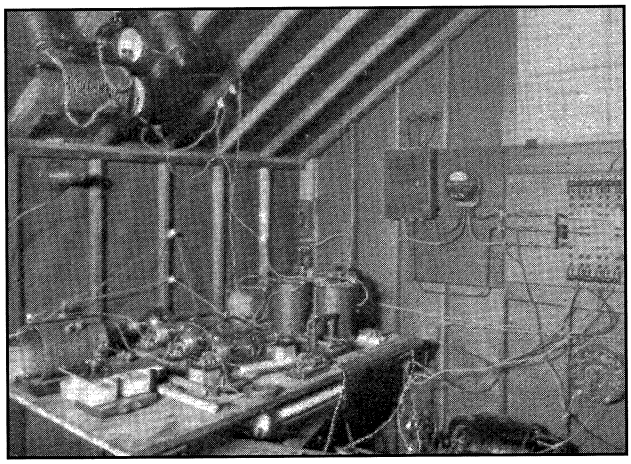
for example, American amateur experimenters, caught up in this melee, were generally disapproved of and unfairly condemned as the chief cause of the interference problem. Clearly, government regulation was essential and, in 1910, the "Depew Bill" was introduced into the U.S. Senate to deal with the problem. However, it rung the death knell for these amateur experimenters.

In 1909, a small group of enthusiastic New York City schoolboys formed the Junior Wireless Club, which grew and shortly afterward changed its name to the Radio Club of America. Rejecting the Depew Bill, this club sent a deputation to the U.S. Senate in Washington, D.C., to argue the case for amateurs. Incredibly, these four schoolboys, led by their chairman, Buster Stokes - 14 years old, only 4' 5" tall and still in short pants - appeared undaunted before the U.S. Senate and presented the case for amateur experimenters so effectively that the bill was withdrawn. Amateur radio in the United States owes its survival and prosperity to these courageous young boys. Creativity blossomed, technology expanded and a whole new era of radio communication was born.

With the publicity and success the case created, support for the young Radio Club of America grew rapidly, drawing into its ranks over the years not only transmitting amateurs, but many of the most respected professional names in radio science, industry and commerce: Armstrong (regeneration, superhet, FM), Beverage (aerials), DuMont, Dubilier, Hammarlund, Hazeltine, Heising, Meissner, Pupin and Sarnoff — just a few who come readily to mind.

From its inception, the schoolboy Radio Club aspired to the highest technical standards; the minutes of its inaugural meeting in 1909 list the renowned Professor R.A. Fessenden as the club's technical consultant, and its Proceedings over the many years have produced some of the most advanced technical material of the times, its expertise being increasingly called upon in major technological issues of the day. But the Radio Club, claiming to be the oldest radio club in the world, has remained ever loyal to the amateur...those among us who are dedicated to the radio art by natural calling.

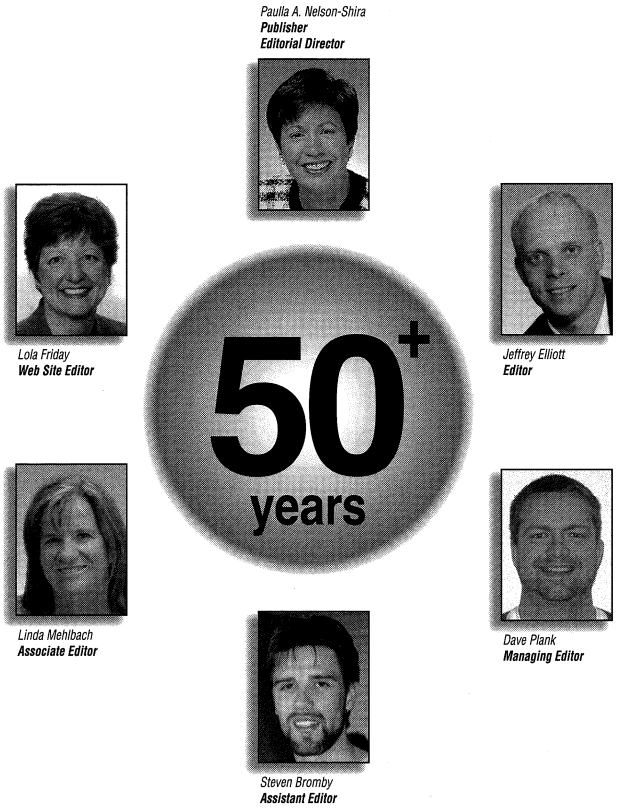
Grinan's membership in the Radio Club of America commenced in 1910, shortly after the club was founded. By 1911, there were 25 members. Knowledge and experience was growing, and from short contacts across the city, ranges of 50 miles and more now were being obtained. By 1916, Grinan's station became the most famous and successful, making the first relay contact between New York City and the West Coast, followed almost immediately by the first coast-to-coast direct contact of 2,500 miles. His station was modern for the time, a 1-kilowatt rotary spark with a two-tube regenerative receiver. It was following this period that Grinan carried out pioneer radio research assignments in Brazil and Argentina.



Transmitting apparatus at station 1BCG, an official Radio Club of America station, that established two world records in the amateur transatlantic tests in 1921. The station transmitted a 12-word message to Ardossan, Scotland, and three messages to Catalina Island, Calif.

Transmitting Across The Atlantic

The idea of transmitting amateur signals across the Atlantic had arisen in the club prior to World War I, but it had not been developed. In 1921, however, the American Radio Relay League (ARRL) decided to run tests, including sending an American amateur to England to receive the signals. Paul Godley, a prominent member of the Radio Club of America, was



Experience is Golden.

With more than 50 years combined experience in wireless voice and data, the editorial team of *MissionCritical Communications* magazine, *Public Safety Report,* and *RadioResource International* knows the industry inside and out.

Subscribe online at www.rrmediagroup.com

To cover the industry, you have to know the industry.

RadioResource MissionCritical COMMUNICATIONS

PUBLIC SAFETY REPORT

RadioResource INTERNATIONAL

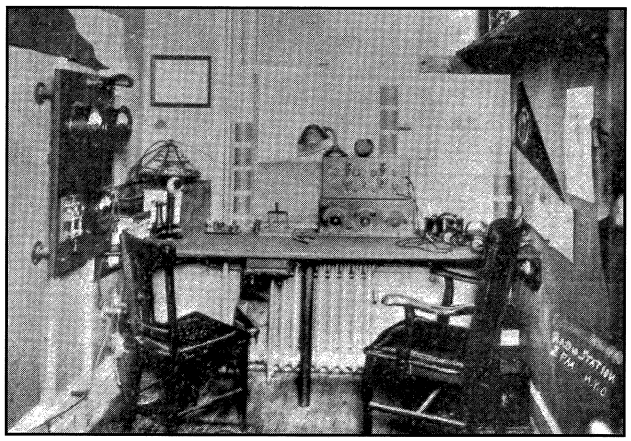
Pandata Corp. • 7108 S. Alton Way, Building H • Centennial, CO 80112 • Tel: 303.792.2390 • Fax: 303.792.2391 • www.rrmediagroup.com

selected as the logical man, and six members of the club offered to construct a station that could be received in England. These members included Edwin Armstrong, Grinan, Walker Inman, E.V Amy, Minton Cronkhite and George Burghard.

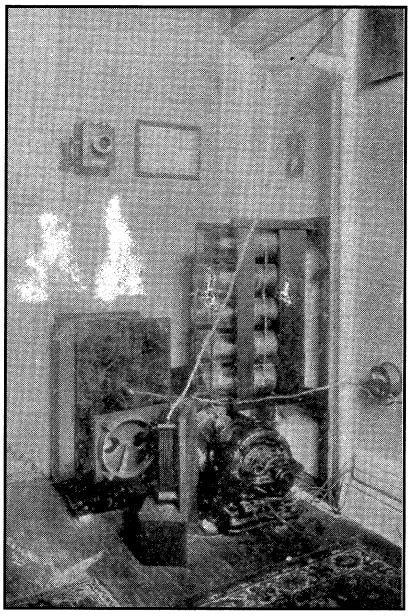
It was decided to use the site of Cronkhite's own station, 1BCG at Greenwich, Conn. The transmitter, then of the most modern design, used four UV 204 Radiotron tubes, with one as master oscillator driving three in parallel in the final amplifier, running 990 watts input power at 2,500 volts on the plates on a wavelength of 230 meters. The radiating system was a "T-type" cage with 100-ft. flat-top and downlead, 75 feet high with a counterpoise.

At the appointed time, Grinan transmitted the following message to Godley, who was in Ardrossan, Scotland: "NR1 de 1BCG words 12. New York December 12 1921 To Paul Godley, Ardrossan, Scotland. Hearty Congratulations Burghard, Inman, Grinan, Armstrong, Amy, Cronkhite."

This message was repeated at intervals during the day, because there was no way of knowing whether it had been received at Ardrossan; however, subsequent checking of Godley's log confirmed that he had received it from the first transmission. Thus, was established a record for transatlantic messaging on "short waves." We would now refer these as "medium waves," as used for broadcasting.



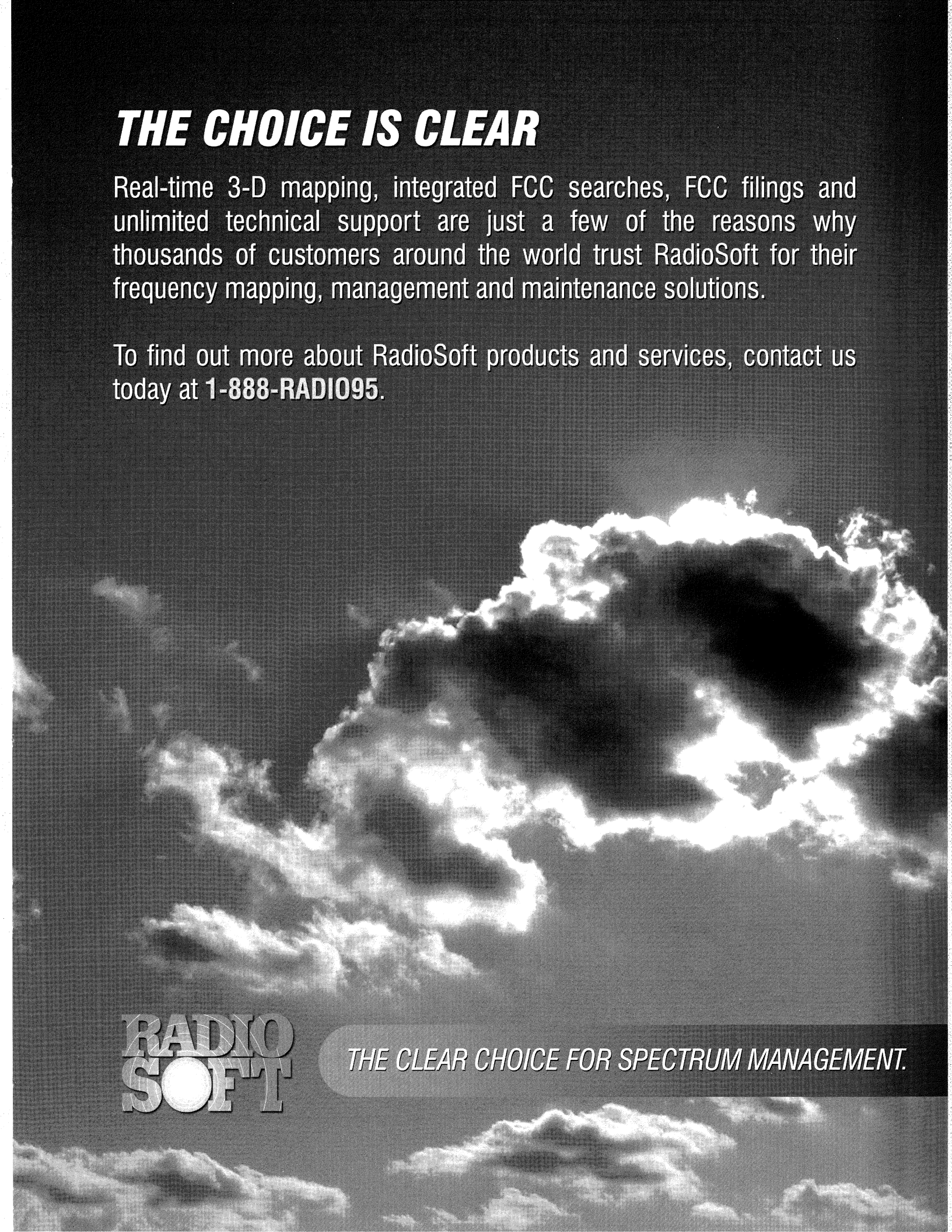
Record-breaking station 2PM, run by John F. Grinan and Adolph Faron at 808 West End Ave., New York, N.Y., in 1916. The station produced the first transcontinental signals in 1916. The set was the most famous amateur station of its time. A short-wave regenerative receiver with one stage of audio frequency amplification was used with great success. Note the synchronous rotary gap mounted between motor and generator, the large plated "Leyden jar" condensers, and the 1 kilowatt United Wireless coffin transformer. This was the very latest equipment at the time.

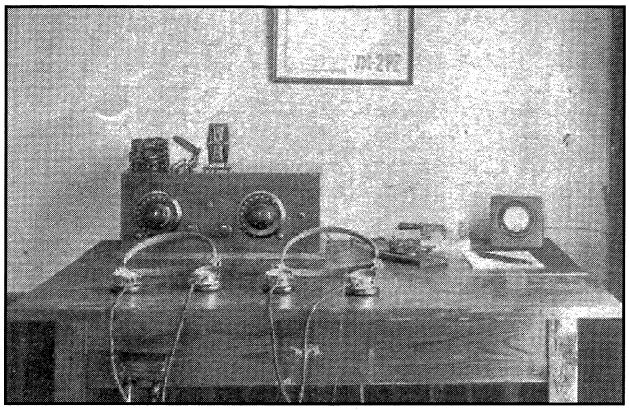


To fully appreciate the significance and impact of this fact, one must realize that all radio communication worldwide at that time was operated on very long waves, using very high power and huge radiating systems...all extremely costly and slow moving. In contrast, the "short" wave length and relatively low power employed at 1BCG was in an area of the radio spectrum considered by expert opinion as "unfit for commercial use" and, thus, given over to amateur experimenters. There can be little doubt that this breakthrough heralded the enormous worldwide development of "short-wave radio" as we came to know it. International broadcasting, and commercial and governmental high-speed traffic all followed in short order.

Influencing Marconi

It is an interesting thought that Marconi himself might well have been influenced by this event. Prior to World War I, the Marconi Company was commissioned by the British government to provide a long-wave, empire-wide link system, but with the advent of war in 1914, this was not completed. Around 1923, the British government was considering completion of the system; however, Marconi - who had, meanwhile, been researching higher frequencies using his yacht - discouraged this, proposing instead to provide a new system utilizing short waves. With some hesitancy, the government agreed, and the Marconi Company commenced work on this project, against an extremely tough specification from the British Post Office. The end result was the sophisticated


THE CHOICE IS CLEAR
Real-time 3-D mapping, integrated FCC searches, FCC filings and unlimited technical support are just a few of the reasons why thousands of customers around the world trust RadioSoft for their frequency mapping, management and maintenance solutions.
To find out more about RadioSoft products and services, contact us today at 1-888-RADIO95.
RADIO SOFT
THE CLEAR CHOICE FOR SPECTRUM MANAGEMENT.



Receiver station "NJ2PZ", John Grinan, Kingston, Jamaica, B. W. I., 1926

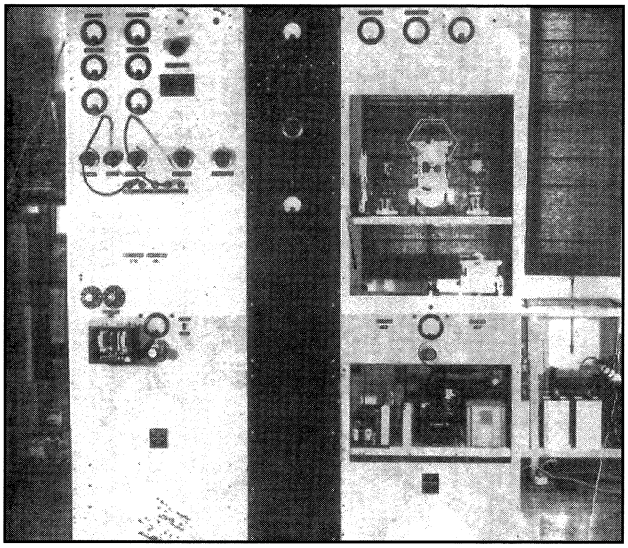
"Short Wave Beam" system commissioned in 1927, initially with links to Australia and India. This system was an outright success, it exceeded the specification by a wide margin, and it represented a huge leap forward in international telecommunication.*

Station 1BCG was a great success, being received in every state in the United States and in several parts of Europe, with the longest path being to Amsterdam, Holland (3,800 miles). It won the prize for the best station in the test, donated by Lord Burnham in England; a monument now stands on the spot where the 1BCG station was located. In 1950, in recognition of the leading part he played in this event, Grinan was awarded the Armstrong Medal by the Radio Club of America.

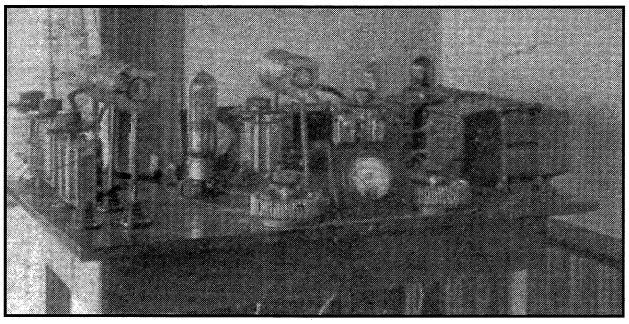
By 1926, Grinan had returned to Jamaica, establishing his amateur station at his home in the upper suburbs of Kingston. He operated under the call sign of NJ2PZ, later to become VP5PZ when the new 'VP' series of British West Indies call assignments were implemented under a plan suggested to the British Foreign Office by Arthur Watts, G6UN, later president of the Radio Society of Great Britain.

Around 1930, Watts went on to father the British Empire Radio Union, a section of the RSGB. This worldwide network of amateur radio stations was supported in most British overseas territories, and VP5PZ became an active member station. Under certain circumstances, member stations were permitted higher power - a kilowatt in Grinan's case - in return for their availability as a backup to the commercial cable and wireless networks. Close communication was kept with the U.K. and such messages as birthday greetings to the Prince of Wales, the Patron of the RSGB, were a regular feature.

In this period of his life, Grinan served his country well, being a member of several government boards and committees, working in close cooperation with Thomas Guilfoyle, the government's Superintendent of Wireless and Telegraphs, who also was a Fellow of the Radio Club of America.



The Transmitter at Jamacia's first Broadcasting-Station "ZQI" which started operating in 1940. On right is the VP5PZ 1Kw transmitter using a pair of 250TH valves, with power supply chassis to the rear. Lefthand rack and black panel are the audio section added in 1940 to convert to broardcast use.



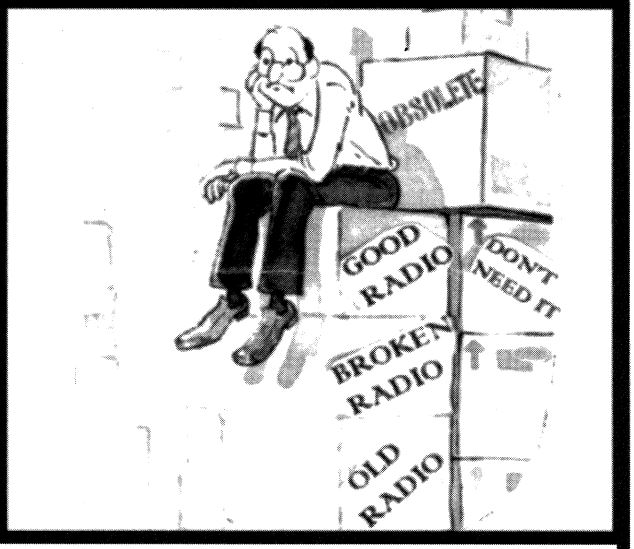
Transmitter station "NJ2PZ"

In the later 1930s, VP5PZ employed a beautifully engineered transmitter using a pair of 250TH tubes in the final amplifier and (I believe) a National HRO receiver. Tall wooden masts at his residence supported delta matched dipoles with open-wire feed, a popular choice at that time.

During that decade, VP5PZ grew to be one of the foremost amateur stations in the world. In 1985, in conversation with Dud Charman (G6CJ), president of the RSGB (1952) and the then-president of the Radio Amateur Old Timers' Association, he remarked with

DONATE YOUR RADIO

SITTING ON A TAX WRITE-OFF?



Turn your excess Ham Radios and related items into a tax break for you and learning tool for kids.

Donate your radio or related gear to an IRS approved 501 (c)(3) charity. Get the tax credit and help a worthy cause.

Call 24 Hours A Day

Equipment picked up anywhere or shipping arranged.

Radios you can write off - kids you can't.

Call (516) 674-4072 FAX (516) 674-9600

WB2JKJ

THE RADIO CLUB OF JUNIOR HIGH SCHOOL 22

P.O. Box 1052
New York, NY 10002

Bringing Communication to Education Since 1980

Up Against The Wall

Alternative antenna and monopole designs may be desired by local zoning, but they have an effect on system performance.

By Adam Trombley

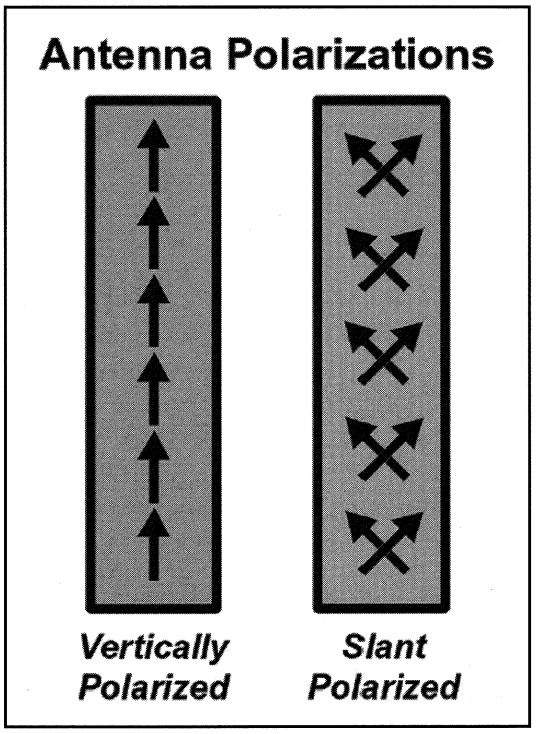
In recent years, zoning municipalities — through the implementation of wireless policies, ordinances and guidelines — have more frequently required wireless providers to build communication sites that employ "slim-pole" and "flush-mounted" antenna array designs. The goal of the municipalities has been to decrease the visual "clutter" of traditional cellsites that employ antennas that are typically mounted on triangular cross-arm brackets positioned several feet away from the support pole.

The demand to use these alternative designs is becoming more prevalent by municipal planners and public officials. There appears to be a general perception that traditional cellular and PCS antenna arrays are antiquated and outdated, and that the new technology of modern antennas somehow allows the use of either a slim-pole or a flush-mounted configuration with no degradation to service levels. This perception is erroneous.

The purpose of this brief is to explore the radio frequency (RF), or "technical" considerations, of utilizing either slim-pole or flush-mount configurations for new or existing sites. Only by understanding the costs and benefits of these applications can sound, practical land-use decisions be made by municipal officials.

Slim-Pole Antenna Configurations

What is a "slim pole"? Simply stated, a slim pole is a loosely used term to describe a communications monopole or support structure with a significantly smaller diameter than a typical structure. What typically characterizes a slim pole, however, is the fact that all cellular antennas are either placed inside of the pole or in a separate canister (see Photo 1) located at the top of the pole.



Polarization techniques are case-specific to the reception and transmission requirements of the site.

Because of the narrow diameter of the slim pole, it typically only accommodates three antennas. Conversely, traditional cellular and PCS sites typically accommodate between six and 12 antennas per carrier. In a slim-pole configuration, each antenna is placed 120 degrees apart from each other, giving each antenna the same degree of separation. The type of antenna that must be used in a slim pole is a "slant" polarized antenna. Typical cellular antennas are vertically polarized, meaning they only read signals from waves that are parallel to the antenna (ver-

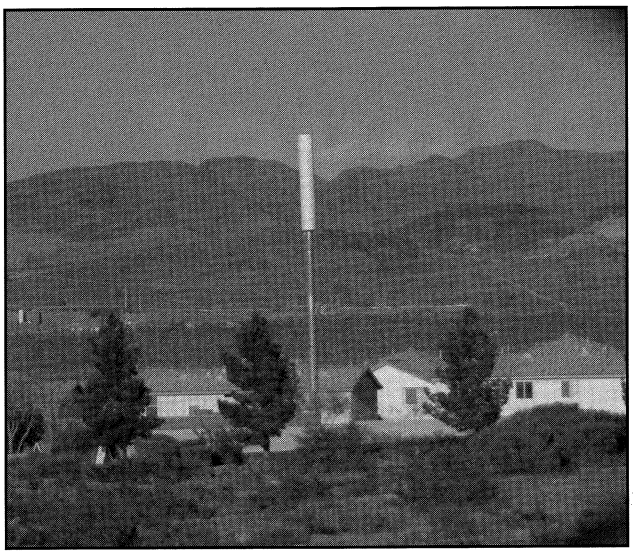
Make the Right Move!

Contact Schwaninger & Associates to represent you before the FCC, the U.S. Court of Appeals and Congress. We offer you:

- 20 years of experience in telecommunications law
- Expertise in risk management and liability protection
- Highly skilled at lease negotiation
- Valuation of towers or spectrum for financing or sale
- Expertise at handling your business and technical issues

S&A

Schwaninger & Associates, P.C., Attorneys-at-Law
1331 H Street, NW, Ste. 500, Washington, DC 20005
Ph: 202-347-8580 • Fx: 202-347-8607
info@sa-lawyers.net • www.sa-lawyers.net



One method of using slim poles is to mount antennas in a canister at the top, as was done with this installation in a residential neighborhood.

tical in nature). The following is a discussion of the shortcomings and differences between a slant-polarized and a vertically polarized antenna system.

In addition to the technical differences between these antennas, there are physical limitations as well when using a slim-pole design. Because each antenna is fixed in the pole or the canister, engineers have a difficult time adjusting the antennas. Modifications to down-tilts, azimuth changes or simply adding radio channels to accommodate additional wireless traffic all become problematic. Most obvious is the fact that the small diameter of the pole's design only allows a limited number of antennas to be installed.

Although slim-pole designs may be attractive to planning agencies because of their small size and potential reduced visibility, they do not provide a reasonable, long-term solution for the wireless provider. Often, the wireless provider must modify the site in the future, sometimes asking for permission to install a more traditional antenna array. If this approval is not available to the wireless provider, the result is often a new site in close proximity.

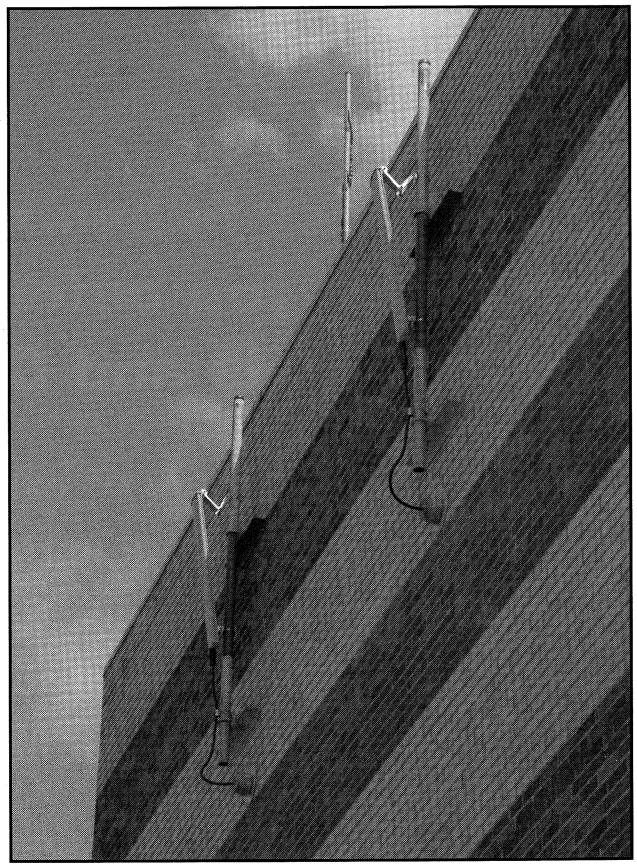
Flush-Mounted Antenna Configurations

Flush-mounted antennas are installed or mounted directly against a building or monopole, with little or no space between the backside of the antenna and the structure.

Either a vertical or a slant polarization can be used when flush-mounting, but when installing antennas on a monopole, in most cases only slant-polarized antennas can be used; this is because, in two-way communications, a cellsite needs to both transmit and receive signals. A vertically polarized antenna can effectively either receive signals or transmit signals. A slant-polarized antenna can perform both these functions. A minimum of one antenna per sector (three antennas total) is used and is placed at varying azimuths, as determined by the wireless provider's needs.

Flush mounting gives the wireless providers more flexibility than do slim poles but, as wireless systems mature and more calls are processed, either additional antennas are needed per sector or a new communication site will have to be built in close proximity. This is difficult to accommodate in a flush-mount scenario.

The reason is due to interference. Each cellsite is equipped with a number of radio channels to handle calls. Each channel can handle one call at a time. When all channels are occupied, the customer will experience blocking and will receive a fast busy signal on the phone. The only way to correct this capacity problem is

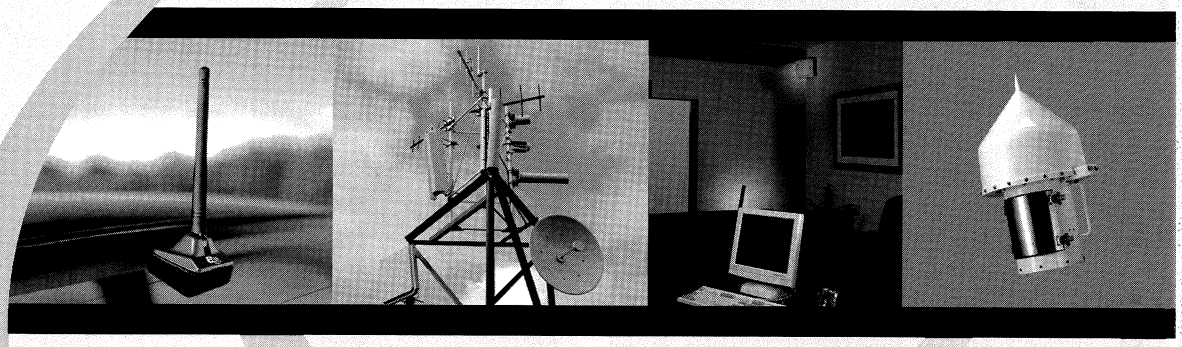


Flush-mount antennas may be used on building faces near the roofline, but future propagation characteristics may not allow placement of additional antennas.

Broaden Your

CONNECTIVITY

with PCTEL Antenna Products



Welcome to the world of PCTEL – through innovation and technology we simplify mobile communications by eliminating barriers to the adoption of advanced wireless technologies.

The PCTEL Antenna Products Group produces industry leading antenna brands – MAXRAD®, Antenna Specialists®, and MicroPulse™ – which together represent over 90 years of antenna design and development expertise. With over 8000 antenna models in our catalog, you'll be sure to find the ideal antenna design for your wireless application.

The world's leading manufacturers and distributors of radio frequency communication products rely on PCTEL Antenna Products Group for their antenna needs. Contact us today with ***your*** antenna requirements.

®"Stripes of Quality"
antenna specialists

MAXRAD

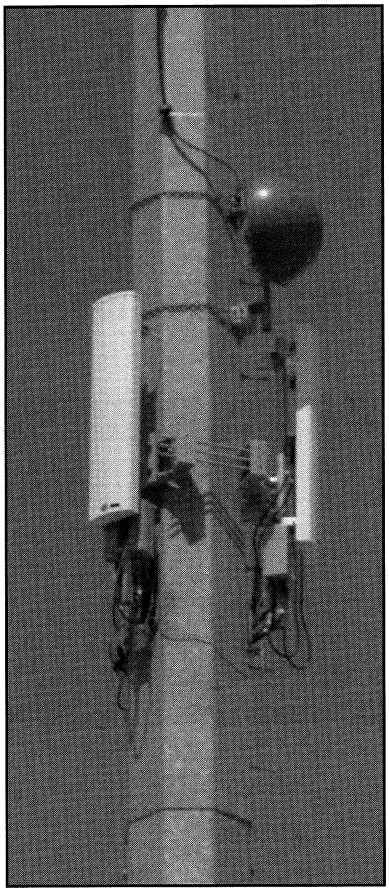
MICRO PULSE

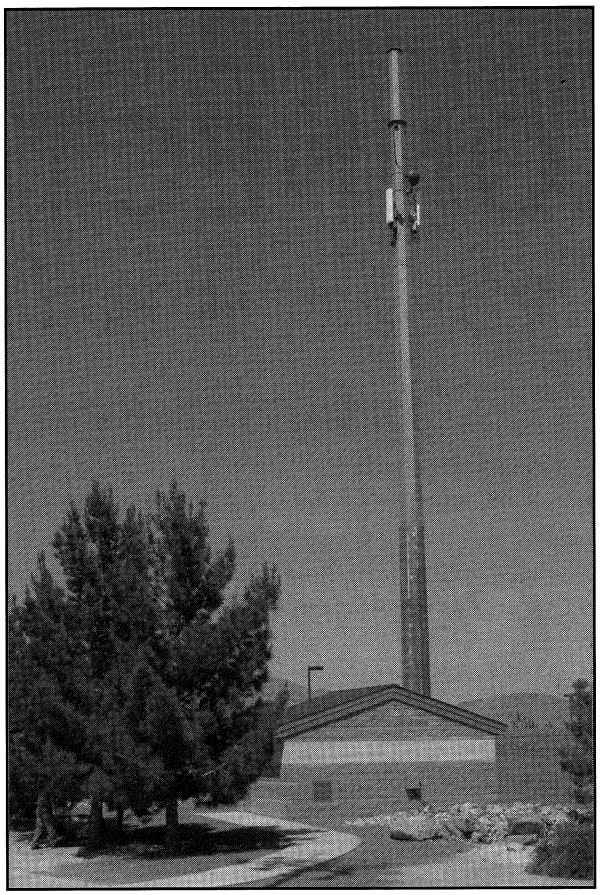
PCTEL ANTENNA PRODUCTS GROUP, INC.
471 Brighton Drive
Bloomingdale, Illinois 60108-3102
Toll-free within the U.S.: 1-800-323-9122
Phone: 1-630-372-6800
E-mail: antenna.sales@pctel.com
Web: antenna.pctel.com

ISO 9001:2000 Registered

Antenna Products Group

PCTEL™
simplifying mobility





Flush-mounted antennas used on traditional monopoles may provide less visual clutter, but the number of antennas that can be positioned is limited. This Mountain Union Telecom facility at an athletic field in North Las Vegas is a Nextel base station.

to add additional radio channels to a cellsite.

Adding channels to an antenna requires a frequency separation between channels to avoid interference, because each sector of antennas already has a certain number of channels at a certain frequencies and adding channels to antenna has the potential to cause distortion and interference by decreasing the frequency isolation between channels. For example, if a cellsite is capable of transmitting 10 channels numbered 1 through 10, and transmitting adjacent channels on a single antenna would cause interference, then one antenna could only transmit 5 channels (1, 3, 5, 7, 9) at a time. To add the additional 5 channels (2, 4, 6, 8, 10), a second antenna would need to be installed to avoid interference.

If there is a requirement to flush-mount antennas, sometimes adding a second antenna is physically impossible.

Vertical Vs. Slant Polarized Antennas

For years, the standard antenna used by wireless providers was vertically polarized. The cellular wireless providers (824-859 MHz, 869-894 MHz) use vertically polarized antennas for their main antenna configuration, and the PCS wireless providers (1850-1990 MHz) primarily use slant-polarized antennas.

What are the differences? The differences have to do with how the two antenna configurations handle "receive diversity." Most antenna configurations have two antennas that receive radio signals. This is used to combat the effects of signal weakening or "fading." When an incoming signal is detected at one of the receive antennas and begins to fade, the cellsite's radio equipment is able to reconstruct the original signal by using the second receive antenna to detect a non-fading signal or by combining the signals from the two receive antennas.

This is similar to two people listening to the same audible message. Information that one individual did not hear or understand can be recaptured by the second individual. Together, two individuals are able to recreate the entire audible message.

Vertically polarized antennas address this fading problem using "space diversity." Two receive antenna are placed about 10 feet apart1 (approximately five feet for PCS), and transmit antennas are placed in between. Slant- polarized antennas address this fading problem using polarized diversity. If the vertically polarized antennas only accept signals that are

vertical or parallel to the antenna, then +/-45 degree polarized antennas only accepts signals that have a 45-degree angle. This allows one antenna to have two receive capabilities and, therefore, able to address the diversity with one antenna rather than the two required to achieve spacial diversity.

Although in certain applications polarization diversity antennas can function in a similar manner as antennas with space diversity, their limitations are many and they are, therefore, typically only used when a cellsite is required to limit the physical antenna separation.

Cellular Vs. PCS

Many people think there are significant differences between cellular and PCS services but, in reality, they are similar. The only significant differences are the frequencies they use. Their names actually refer to the frequency band they are using. Cellular operates in the 824-849 MHz and 869-894 MHz bands, and PCS is the 1850-1990 MHz band. These frequency differences don't necessarily cause better or worse performance, but they do affect the size of the antennas the carriers must use to deliver these frequencies.

Antennas are built to be a proportional in height to the wavelength of the frequencies being used. What that means is that PCS antennas will almost always be smaller in size then a similar antenna designed for cellular frequencies because the PCS wavelength is shorter. Also, because the PCS wavelength is almost half the size of a cellular wavelength, the horizontal distances needed between antennas for diversity is much smaller. This means that PCS operators can physically locate their antennas in smaller spaces, making it easier for them to find suitable places to mount their antennas.

Consequently, PCS carriers can often flush-mount more then one antenna per sector, effectively giving them multiple transmits and receives, whereas a cellular carrier (using vertically polarized antennas) most often does not have this option.

The Digital Future

The transmission of data has become more and more prevalent in wireless systems. In order to transmit data along with voice, wireless carriers will need to add existing bandwidth to their sites. Adding bandwidth to existing sites requires adding additional frequencies. This is necessary to accommodate the wireless Web, interactive gaming and voice data for the ever-increasing population.

As such, adding frequencies typically requires antennas to be added to existing wireless facilities. This is problematic and sometimes impossible if the new antennas must be either flush-mounted to a pole or actually encased within a slim pole. If it is not possible to modify existing cellsites, wireless providers must build new sites.

Zoning has become more difficult over the years and continues to be more and more arduous, often even for collocation projects. Municipalities seeking to reduce visual impacts often seek to force all new installations to be flush-mounted or require that existing poles be slim poles with the antennas being encased inside of the pole itself. Although jurisdictions may believe flush-mounting is a more acceptable method of installing antennas on a monopole or similar structure, it is a more tolerable option for PCS carriers than it is for cellular providers.

Eventually, it is likely that wireless carriers will want more control over their sites' radio-signal propagation, and they will need to convert the site back to a traditional, full-antenna array. Because the wavelength of the cellular band is longer than it is in the PCS band, cellular providers require larger antennas and require almost twice as much horizontal separation between antennas. Because cellular companies use spacial diversity as their main antenna configuration, their horizontal spacing between antennas is approximately 10 feet. This is much too large to be able to be flush-mounted to a monopole. Moreover, because cellular systems are designed around vertically polarized antennas, requiring future antenna installation to be flush-mounted would lead to a competitive advantage for PCS carriers.

Flush-mounting and concealing antennas is an attractive idea for zoning agencies. Unfortunately, these designs are limiting, and they lead to an increase in single-tenant communication sites and a proliferation of new cellsites. With the possibility of as many as nine wireless providers in a given market area, these zoning requirements can lead to numerous additional, unnecessary, single-tenant communication facilities.

Adam Trombley is RF engineer/West Area for Crown Castle International in Phoenix. *This article originally appeared in the February-March 2005 issue of AGL magazine. For subscription information, go to www.agl-mag.com.*

THE 95TH
Radio Club of America Banquet & Awards In Pictures

Patrick E. Buller (F), winner of the 2004 President's Award with outgoing president Mercy Contreras.

Debra Wayne (F) accepts the 2004 Special Services Award from 2003 recipient Andrew A. Conte (F).

Patrick KIng (far right) (and family) following King's formal award of a Radio Club of America college scholarship.

Cellphone in hand, keynote speaker Steve Largent, president of CTIA-The Wireless Association, regaled banquet attendees with tales of the industry and his experiences as a professional football star.

William E. Baker (left) presents Hubert Schlafly Jr. with the 2004 Sarnoff Citation.

The Passing Of The Gavel: Incoming Radio Club of America President Tony Sabino gifts Outgoing President Mercy Contreras with a token of the club's appreciation.

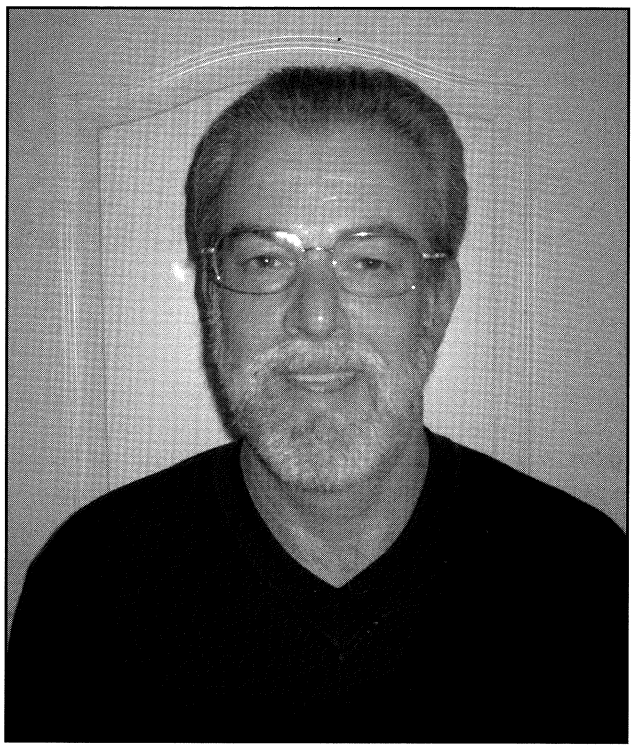

16

trum allocation or 800 MHz rebanding-they just need their radios to work well all the time. Utility companies need backup power for communications, should their initial communications system be disabled in a hurricane or earthquake. And, with the unreliability of certain wireless communications during emergencies when traffic is at its peak, radio communication is forever proving that it can stay the course.

That's where we step in as seasoned communications professionals, becoming consultants instead of salespeople and engineering specialists instead of customer-service representatives. The time has long passed when our customers want radios-they want systems and solutions that allow them to grow and expand with their future needs without reinventing the wheel each time. And they want enhanced voice and data features that were once only available with consumer wireless communications.

Police chiefs want to be able to communicate with fire departments and emergency-service personnel in other jurisdictions without interference problems. Interoperability is crucial if we are to equip users to handle any future situations that may occur. As we move forward, I hope we continue to keep the customers foremost in our minds. I challenge the Fellows Class of 2004 and all of you here tonight to listen to our customers in devising new strategies and solutions. Make our products and services fit their needs, not reshape their needs to fit our products and services. If we continue to do this, we'll have a thriving, growing-yes, changing-industry that holds its own against any hurricane, earthquake or volcanic eruption that nature throws our way.

Our involvement in the Radio Club of America and in other vital industry organizations is an investment in the future success of our industry. By our presence here tonight, we're not only enjoying good food and friends, but we're recommitting ourselves to making 2005 an even more prosperous year than 2004. I'm looking forward to our journey together. Thank you again for bestowing upon me the honor of "Fellow." Good evening.



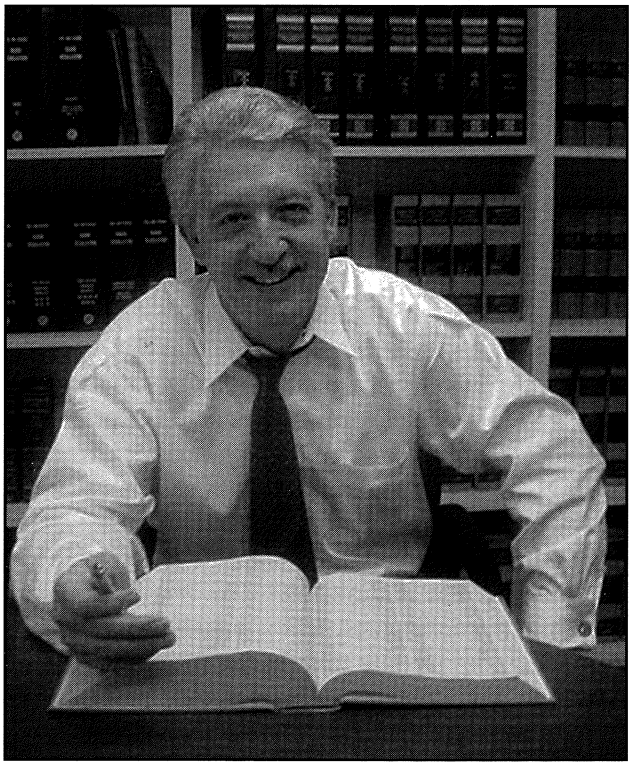
"I challenge the Fellows Class of 2004 and all of you here tonight to listen to our customers in devising new strategies and solutions," said new Radio Club of America Fellow Scott Henderson.

Fixing It Together

How to get back to being an industry that rewards innovation, cooperation and good manners.

By Robert H. Schwaninger, Jr. (F)

(Speaker's note: This speech was written by me in anticipation of what I planned to say at the IWCE Breakfast on April 7, 2005, with all off-color jokes removed. Although I have given dozens of speeches over the years, I have never written one, so, this is a best guess of what I will say. If I say something else that pops into my head, it won't be the first time. Don't blame The Proceedings for any variations in delivery or content. Blame Ray Trott. No reason. I just want to give Ray a hard time.)



I wish to thank all of the people who have invited me to speak today. To those people who already went to sleep in their eggs, you could at least have waited until we hit the lights for the PowerPoint presentation.

Actually there will be no PowerPoint presentation because I'm a lawyer, not an engineer, so I don't know how to make it work.

I became a member of the Radio Club of America with the highest goal in mind. I wanted to join a group that saw the radio industry as more of a fraternity of shared interests than a boxing ring with multiple combatants. Within this Club, people celebrate and encourage the development of the radio art, and they give the bottom line a rest.

The Radio Club has continued to meet that goal for me and, in doing so, it has provided an oasis from our troubled industry. And the reason our industry is troubled is because too many members of our industry have forgotten the concept of fraternity and they focus, instead, on their highly individual agendas.

A Year Of Struggle

During the past year, we have seen the industry struggle with the solution for interference at 800 MHz. Unfortunately, the solution was not driven by technology or shared efforts to cooperate in the use of the radio spectrum. Instead, the solution was driven by divisive politics, economic machinations and a "me first" attitude that turned ordinarily cooperative elements against one another.

Remember the days when a local two-way shop had more in common with public- safety entities and industrial users? No one called himself a "critical infrastructure industry" to gain an advantage in rule-making. It was about radio and its benefits, not about

factions and "us versus them." In a few words, it was about making radio work better, and everyone learned from everyone.

What has resulted in the past year has been a kind of tragedy for law and good manners. The law used to say, in effect, "you broke it, you fix it." An operator was held to a standard of good engineering practices and if they failed that standard, both the industry and the Federal Communications Commission would take them to task. There was no sweetheart deal. And you sure didn't get to obtain additional spectrum for having fouled up another part of the band.

But because the industry divided itself against itself, it became vulnerable to brokered deals that left the guardians of good engineering out of the mix. Consider the outcome of the matter if every good RF engineer had stood and said, "You broke it, you fix it." Would hundreds of public-safety systems need to be rebanded and re-engineered? Would analog operators have their legitimate businesses disturbed by rebanding? Would industrial concerns be scrambling to figure out how to run systems that are going to be uprooted?

Different Choices, Different Outcome?

And what if the good RF engineers working for the cellular companies said the same thing? And what if the engineers at the FCC joined in the chorus? And (after having been paid handsomely for their opinions) what if all of the lawyers wrote comments that said to the FCC commissioners, "Your decision should be, 'you broke it, you fix it?'" Then where would we be?

I'll tell you. We would be a fraternity of persons dedicated to a future that does not provide opportunity based on lobbying expertise, but rather one that rewards innovation, cooperation and good manners.

To those of our industry who promoted a solution that relied on dividing your fellow land mobile operators, I will leave you to your conscience, salved by whatever temporary advantage you believe that you got as a result of your actions. To those people who supported an agenda of personal responsibility and cooperation, I salute you. Your position is mirrored within the foundation of the Radio Club and what it stands for.

This morning, we join together in comradery, cooperation and the common good of the radio art and our industry. The Radio Club reminds us of what we have in common, not what pulls us apart. Its membership is diverse as it calls to every corner of the radio industry to come together, sometimes for something as simple as a pleasant cup of coffee among old friends.

I have lived my life as an advocate for my clients and friends. I'm a fighter with a reputation that relies on fact and law and the plain truth. Over the years, I have gotten into plenty of scrapes and I've often said things that others found politically incorrect. Not surprisingly, there are some people who wish that I'd just shut up.

But years ago, my parents taught me that you don't lie to family. The Radio Club is like family. So, in all candor to my colleagues, fellow members and friends here today, let me say this: In the future, when you find that a system is not performing properly, do yourself and the industry a favor. Find the guy who owns the system and tell him, "you broke it, you fix it...and I'll help you." Thank you.

Robert H. Schwaninger, Jr. is president of the Washington, D.C., law firm Schwaninger & Associates.

Why BPL's RF Rules Are Still Causing Sparks

A quiet squabble over alleged radio frequency (RF) interference by proposed broadband-over-power line (BPL) communications systems continues to pit the American Radio Relay League (ARRL), the national association for amateur radio operators, against the United Power Line Council (UPLC), an alliance of electric utilities and technology companies advocating BPL development and deployment.

By Stuart Zipper

Ongoing arguments surrounding the new technology broadband over powerline (BPL) currently are playing out at the Federal Communications Commission, despite the regulator's mid-October 2004 Report and Order to adopt new rules for BPL in the belief that the communications technology could possibly provide a third access alternative for U.S. customers in competition with DSL and broadband cable.

ARRL (a familiar entity at the regulatory level known for trying to protect amateur radio spectrum) won't let go of past efforts in opposition of BPL. In early February 2005, it filed a petition for reconsideration at the FCC with continued claims and data about BPL interference and charges that the commission had long-ago prejudged the public proceeding in favor of BPL, anyway. Among other things, ARRL wants the BPL radio emission levels to be reduced or the frequency use shifted away from amateur bands. ARRL also has had the backing of the ARINC Corporation aviation communications organization and a broadcast -technology lobbying group, the Association for Maximum Service Television Inc. (MSTV).

Of course, the UPLC - which describes itself as an independent operating unit of the United Telecom Council (the telecom and information technology trade association for utilities, energy companies and other critical infrastructure organizations) has filed opposition replies to debunk ARRL's claims. It says such petitions amount to seeking further restrictions on BPL as well as lack legitimate technical reasons.

For some time, ARRL has maintained that BPL technology - especially when used under the FCC's looser Part 15 unlicensed-use rules - poses significant interference potential to HF and low-VHF spectrum users between the allowable 1.7 MHz and at 80 MHz. The power lines used as conductors for the signals in those bands are not designed to prevent RF radiation, so they "overly create" radiated emissions.

The group claims its data suggests BPL itself is seriously degraded by nearby radio transmitters and that interference from BPL systems is strong locally. ARRL says its amateur radio members are supported by more ubiquitous broadband access services and, in fact, they are often early adopters of such new technology. However, they don't want to see broadband delivered in a manner that can "pollute the radio spectrum," as BPL allegedly does.

"Overhead electrical power lines and residential wiring act as antennas that unintentionally radiate the broadband signals as radio signals throughout entire

BPL Rules In A Nutshell

The official text of the FCC's decision on broadband over power line (BPL) indicates its rules, adopted in October 2004, are relatively straightforward and narrowly tailored:

- Even though the commission has acknowledged the public interest benefits from the deployment of BPL technology, the agency nevertheless has adopted a cautious approach requiring that BPL equipment be capable of mitigating interference by "notching" or shifting frequencies of operation or remotely shutting down operation altogether in response to complaints of interference.
- The FCC has also recommended avoiding the use of certain frequencies on a nationwide or on a more limited geographic area basis. The federal regulator will also begin to authorize equipment through a certification process, but this will not affect equipment that has already been deployed while a transition period is in place, according to agency officials.
- Finally, the FCC has developed measurement guidelines that provide additional certainty to demonstrate compliance with the Commission's rules on BPL. In the event that interference does occur, the FCC requires that BPL operators notify licensees about BPL deployments in their area through a central BPL database.

The FCC is requiring the industry to create a database of BPL deployments. The United Power Line Council (UPLC), a BPL industry advocacy group, developed a Web-based prototype that anticipates supporting rapid, local resolution of any possible interference problems. UPLC created the database following initial discussions with the American Radio Relay League (ARRL), and it anticipates continuing to work jointly with ARRL and other interested groups on this issue.

UPLC's parent organization, the United Telecom Council, already maintains a confidential database of power line carrier users in conjunction with the U.S. Department of Commerce.

neighborhoods and along roadsides," the group says. "Interference has been observed nearly one mile from the nearest BPL source. So far, BPL has been deployed in numerous temporary test sites but in few commercial installations. Despite the very limited deployment, considerable interference has been documented.

You Can't Always Get What You Want

The FCC's October 2004 rules for BPL systems, as the ARRL sees them, placed new restrictions on BPL systems "in recognition of the fact that they pose a greater threat of radio interference than most Part 15 devices...However, the new rules are not sufficient to reduce the probability of harmful interference to reasonable levels."

The ARRL says its own laboratory staff has made many observations of BPL radiation at a number of trial areas plus the group cites some past studies by the National Telecommunications and Information Administration (NTIA) that show high probabilities of interference from BPL systems with two-way radio stations, depending on the distances measured. "Although BPL proponents dispute these claims of interference to licensed services, they have provided little in the way of calculations or measurements of BPL radiation levels and what they have provided has been flawed by technical errors," the ARRL stated.

The UPLC, meanwhile, says it didn't get everything it wanted from the FCC order last year either, but it lauded the action because it encourages more broadband deployment and, in part, because the rules were the result of "close cooperation and compromise" with NTIA to address its concerns about potential interference from BPL operations.

The group - which first took shape in 1998 as the UTC's Power Line Telecom Forum (PLTF) created as an information and advocacy conduit for the nascent business - says proposals to ban BPL in certain frequency bands change the measurement procedures by which BPL complies with the Part 15 radiated emission limits. They also provide prior notification to certain licensees about BPL operations. The group claims "petitioners raised the same arguments that they made on the record and had not presented additional facts that would warrant reconsideration" of the FCC rulings.

"The UPLC believes that the FCC Report and Order largely struck the right balance between protecting against potential interference and promoting the public interest in BPL deployment, and it does not believe that further restrictions on BPL operations are

warranted," it says. "As such, the FCC should not expand its limited special protections in the high-frequency bands, and it should not change the notching requirements and extrapolation factor for measuring emissions, as requested in various petitions."

New Action In Congress

Arkansas Congressman Michael Ross (WD5DVR) has introduced a resolution in the U.S. House of Representatives calling on the FCC to "conduct a full and complete analysis" of radio interference from broadband over power line (BPL). The resolution, H. Res 230, says the commission should comprehensively evaluate BPL's interference potential incorporating "extensive public review and comment," and, in light of that analysis, to "reconsider and review" its BPL rules adopted in October 2004. If approved by the full House, the non-binding resolution would express the requests as "the sense of the House of Representatives."

"We are grateful to Congressman Ross and his staff for taking a leadership position in recognizing that the BPL interference issue deserves more careful consideration than the FCC was willing to give it under former [FCC] Chairman Powell," said ARRL CEO David Sumner (K1ZZ). The resolution has been referred to the House Committee on Energy and Commerce, on which Ross serves.

The resolution's prime focus is on BPL's potential to disrupt critical public-safety radio communications. It cites NTIA studies that "have determined that broadband over power line creates a 'high risk' of radio wave interference, and that harmful interference to public safety mobile radio receivers can be expected at distances of 75 meters from the power line where broadband over power line is in operation, and at distances of up to 460 meters from fixed stations, such as VHF police or fire dispatch communications facilities."

The resolution notes that the same NTIA study determined that BPL interference to aeronautical and airline travel communications "could be expected at distances up to 40 kilometers from the center of the broadband over power line system, and that interference to outer marker beacons for airline instrument landing systems could be expected at great distances as well."

Many public safety agencies and support services, including emergency medical services, fire, and law enforcement, use low-band VHF (30 MHz-50 MHz), the resolution points out. Thirteen states — California, Connecticut, Florida, Illinois, Indiana, Mississippi, Missouri, Nebraska, North Carolina, South Carolina, Tennessee, West Virginia and Wyoming — use the band for state police operations, while it's the primary public safety radio band in nine states.

The resolution further notes that the Association of Public Safety Communications Officials Inc. (APCO) and the National Public Safety Telecommunications Council (NPSTC), urged the FCC to withhold final action in the BPL proceeding for at least a year, pending a "conclusive determination" of BPL's potential to interfere with public safety and other licensed radio systems operating below 80 MHz.

APCO and the National Public Safety Telecommunications Council have urged the FCC to withhold final action in its BPL proceeding for at least a year, pending a "conclusive determination" of BPL's potential to interfere with public safety and other licensed radio systems operating below 80 MHz.

The resolution also sites comments that the FCC has struggled for years to resolve widespread harmful interference to the radio communications of first responders on 800 MHz and that it "should not have proceeded with introduction of a technology which appears to have substantial potential to cause destructive interference to police, fire, emergency medical services, and other public safety radio systems" without first conducting a comprehensive evaluation.

The ARRL's Bandwidth Initiative

Acting on the premise that the amateur bands must flexibly and comfortably accommodate present and future operating modes and technologies over the long haul, the ARRL Executive Committee has reached consensus on recommendations to the ARRL Board of Directors for a regulation-by-bandwidth pro-

TREASURER'S REPORT FOR FISCAL YEAR 2004

(October 1, 2003 – September 30, 2004) (continued)

SCHOLARSHIPS AND GRANTS FUNDS

	Capital	Available for Distribution	Totals
Opening Balance October 1, 2003	$361,236	$17,977	$379,213
Contributions & Additions	11,465		11,465
Interest Earned		15,828	15,828
Scholarships & Grants Awarded		(17,000)	(17,000)
Ending Balance September 30, 2004	$372,701	$16,805	$389,506

SATCOM, LLC.

John C. Aegerter
P O Box 665
Elm Grove, WI 53122
14150 W Greenfield Ave
Brookfield, WI 53005
Phone: 262-780-9999 • **Fax:** 262-789-0296
Page: 414-990-2337

TOWER AND ANTENNA SITE LEASING

HIGH COUNTRY COMMUNICATIONS, INC.

Chris Bertolini, *President*
PO Box 100
Linville, NC 28646
Phone: 828-733-1822, Ext 102
Fax: 828-733-3651
Email: *kenwood@hccinc.net*
Website: *www.hccinc.net*

KENWOOD COMMUNICATIONS

SALES & SERVICE

INFORMATICA

Donald Christiansen, *P.E., F.I.E.E.E., President and Principal*

434 West Main Street
Huntington, N.Y. 11743
Tel: (631) 423-3143
Fax: (631) 385-4940
Email: *donchristiansen@ieee.org*

INFORMATICA

CONSULTING IN THE COMMUNICATION ARTS

AIRPAGE

John C. Aegerter, President
14150 W Greenfield Ave
Brookfield, WI 53005
Phone: 262-784-2337

AIR PAGE

BIBY PUBLISHING

Richard P. Biby
P O Box 364
Waterford, VA 20197
Phone: 540-882-4290
Email: *rbiby@biby-pub.com*

TOWER AND COMMUNICATIONS INDUSTRY MAGAZINE PUBLISHING

VERIZON ENTERPRISE SOLUTIONS

Craig E. Cobb P.E., Sales Engineer
201 South State Street
Syracuse, NY 13202
Phone: 315-448-2025
Fax: 315-448-2030
Mobile: 315-415-1947
Email: craig.e.cobb@verizon.com

verizon

SALES & SERVICE

AMTOL RADIO COMMUNICATIONS

Gaetano Tom Amoscato
150-47A 12th Rd
Whitestone, NY 11357
Phone: 718-767-7500
Fax: 718-767-9858

GEATANO

LAND MOBILE CONSULTANT

EDITORIAL OFFICE

Don Bishop
PO Box 4075
Overland Park, KS 66204
Phone: 913-322-4569
Cell: 913-221-3007
Email: *donbishop@usa.com*
Website: *www.editorial-office.net*

INTERVIEWING, WRITING, EDITING AND PHOTOGRAPHY

MARKETING CONNECTION LLC

Mercy Contreras,
2835 S. Ingalls Way
Denver, CO 80227
Phone: 303-988-3515
Fax: 303-988-3517
Email: *mercycontreras@comcast.net*
Website: *www.mktgconnection.com*

Marketing CONNECTION

TESSCO TECHNOLOGIES

Robert B. Barnhill, Jr., Chairman/CEO
11126 McCormick Road
Hunt Valley, MD 21031-1494
Phone: 410-229-1353
Fax: 410-229-1669
Email: *barnhill@tessco.com*
Website: *www.tessco.com*

TESSCO TECHNOLOGIES

ELECTRO-COMM DISTRIBUTING

Mike Brownson
5015 Paris St
Denver, CO 80239
Phone: 303-371-8182
Fax: 303-371-8158
Email:*mike@electro-comm.com*
Website: *www.electro-comm.com*

ELECTRO-COMM DISTRIBUTING, INC.

WHOLESALE DISTRIBUTOR OF WIRELESS PRODUCTS

DALEY & ASSOCIATES, INC.

William J. Daley
PO Box 370
Somis, CA 93066
Phone: 805-386-0777
Fax: 805-386-1650
Email: *wdaley@ix-netcom.com*
Website: *www.ecomsystem.com*

The Sales Group, inc.
MANUFACTURERS REPRESENTATIVES

TWO WAY RADIO COMMUNICATION CONSULTING

LBA GROUP, INC.

Lawrence Behr, Chairman/CEO
P O Box 8026
3400 Tupper Drive
Greenville, NC 27835
Phone: 252-757-0279
Fax: 252-752-9155
Email: *lbwireless@lbagroup.com*
Website: *www.lbagroup.com*

PMC ASSOCIATES

Phil Casciano
8 Crown Plaza, unit 106
Harlet, NJ 07730
Phone: 732-888-9300
Fax: 732-888-9388
Cell: 908-256-4373
Website: *www.pmcreps.com*

PMC Associates, Inc
Wireless Communications

MANUFACTURERS' REPRESENTATIVES SERVICING THE COMMUNICATIONS INDUSTRY

PCTEL ANTENNA PRODUCTS GROUP

Steven L. Deppe, *President*
4350 Chandler Dr.
Hanover Park IL 60103-6763
Phone: (630) 372-6800
Fax: (630) 213-7508
Cell: (630) 842-7528
Email: *steve.deppe@pctel.cc*
Website: *www.pctel.com*

MAXRAD
STATE OF THE ART ANTENNAS

DESIGN & MANUFACTURE ANTENNAS AND ACCESSORIES FOR WIRELESS SYSTEMS

DETTRA COMMUNICATIONS, INC.

John E. Dettra, Jr., President

7906 Foxhound Road
McLean, VA 22102-2403
Phone: (703) 790-1427
Email: *jdet@erols.com*

TELECOMMUNICATION ENGINEERS

ACTICOM WIRELESS COMMUNICATIONS, INC.

Joseph E. Fiorini, President/CEO
12459 Tamiami Trail
Punta Gorda, FL 33955-2402
Phone: 941-575-8609
Fax: 941-575-9883
Email: *jfiorini@awci.net*
Website: *www.acticomwireless.com*

LAND AIR COMMUNICATIONS LTD

Hal Guretsky
95-15 108 St.
Richmond Hill, NY 11419
Phone: 718-847-3090
Fax: 718-849-8279
Email: *landaircom@aol.com*
Website: *www.landaircom.com*

CONSULTING - ENGINEERING-SALES-SERVICE
FCC LICENSED

TELCO COMMUNICATIONS

David A. Ehehalt, President
P. O. Box 468
Mt. Freedom, NJ 07970-0468
Phone: 973-895-55000, 800-345-5538
Fax: 973-361-on request

450 MHZ TRUNKED OPERATOR, MOTOROLA, KENWOOD, ICOM
SALES, SERVICE, DESIGN & IMPLEMATION

A.W.A. ELECTRONIC COMM. MUSEUM

Edward M. Gable
187 Lighthouse Rd
Hilton, NY 14468
Phone: 585-392-3088
Email: *egable@rochester.rr.com*
Website: *www.antiquewireless.org*

MUSEUM, RESEARCH

FOX RIDGE COMMUNICATIONS, INC.

Ralph A. Haller, President
122 Baltimore St
Gerrysburg, PA 17325
Phone: 717-334-7991
Fax: 717-334-5656
Email: *rhaller@frci.com*
Website: *www.frci.com*

FCC LICENSING, RF HAZARD STUDIES, ENGINEERING

TELE-MEASUREMENTS INC.

William E. Endres, President
145 Main Avenue
P.O. Box 1078
Clifton, N.J. 07014
Voice: (973) 473-8822
Fax: (973) 473-0521
Email: bill@tele-measurements.com
Web Site: *www.tele-measurements.com*
Teleconferencing: (973) 773-1102

VIDEOCONFERENCING & DISTANCE LEARNING ROOMS/PRESENTATION AND LCD PROJECTION SYSTEMS/CCTV SURVEILLANCE & REMOTE MONITORING

SIGMA MARKETING CO, INC.

John C. Gfeller, President & CEO
148 Mailands Road
Fairfield, CT 06430-3529
Phone: 203-254-7084
Fax: 203-254-7085
Mobile: 203-209-4999
Email: *jgfeller@compuserve.com*

MANUFACTURERS REP

HARTECH, INC.

James W. Hart, P.E., President
PO Box 88
Littleton, CO 80160
Phone: 303-795-2813
Fax: 303-347-2652
Email: *jhart@du.edu*
Website: www.hartechinc.com

TELECOMMUNICATIONS CONSULTING ENGINEERING

M/A-COM, INC.

John Facella, PE, C. Eng, Director, Public Safety Market
1011 Pawtucket Blvd
Lowell, MA 01853
Phone: 978-442-4352
Fax: 978-442-5354
Email: *facella@tycoelectronics.com*
Website: *www.macom-wireless.com*

GIFFORD ENGINEERING, INC.

Frank Gifford, President
3930 Idaho Street
San Diego, CA 92104
Phone: 619-291-8000
Fax: 619-291-5300
Email: *frank@giffordengineering.com*

DH MARKETING

Carroll Hollingsworth
P. O. Box 5680
7301A Bar-K Ranch Road
Lago Vista, TX 78645
Phone: 800-966-3357
Fax: 512-267-7760
Cell: 512-751-5472
Email: *carroll@dhmarketing.biz*
Website: *www.dhmarketing.biz*

MANUFACTURERS REPRESENTATIVES
WIRELESS CONNUMICATION INDUSTRY

RADIO CLUB OF JUNIOR HIGH SCHOOL 22 NYC, INC.

Joseph Fairclough, President
P.O.Box 1052
New York, NY 10002-0912
Phone: 516-674-4072
Fax: 516-574-9600
Cell: 516-658-6947
Email: *crew@wb2jkj.org*

MAL GURIAN ASSOCIATES LLC

Mal Gurian
5245 88th Street East
Bradenton, FL 34211
Phone: 941-752-1133
Fax: 941-752-1144
Cell: 941-685-1111
Email: *mgurian@malgurianassoc.com*
Website: *www.malgurianassoc.com*

WIRELESS INDUSTRY ADVISORS

WIRELESS ACCESS TECHNOLOGIES, INC.

James Innes, Vice President
4217 Ridge Avenue, Unit #2
Philadelphia, PA 19129
Phone: (267) 481-1461
Fax: (215) 438-1220
Email: *innesj@i-2000.com*

WIRELESS SITE ACQUISITION & TRANSMISSION SYSTEMS DEPLOYMENT

Business & Professional Directory

SSI SERVICES, INC.

Stephen J. Shaver, Marketing/Managing Consultant
2578 Interstate Drive, Suite 100
Harrisburg, PA 17110
Phone: 717-541-8630 Ext. 25;
800-590-8837
Fax: 717-541-8649
Email: *sshaver@vanadium.com*
Website: www.vanadium.com
TELECOMMUNICATIONS CONSULTANTS

ITT INDUSTRIES
ITT Aerospace/Communications

Eric D. Stoll, Ph.D., P.E., Sr. Staff Engineer

100 Kingsland Road
Clifton, NJ 07014-1993
Phone: (973) 284-4887
Fax: (973) 284-3394
Email: *eric.stoll@itt.com*

L. ROBERT KIMBALL & ASSOCIATES

William Waugaman
200 S. Harbor City Blvd.
Melbourne, FL 32901
Phone: 321-733-4448
Fax: 321-733-4464
Cell: 321-266-2237
Email: *billwaugaman@lrkimball.com*
Website: *www.lrkimball.com*
COMMUNICATIONS SYSTEM CONSULTANTS

THE SPECTRUM FIRM, INC.

Nancy C. Smith, Vice President
1409 Kleber Drive
Carrollton, TX 75010
Phone: 972-492-0330; 800-418-9128
Fax: 972-492-0335
Email: *nancyc.smith@thespectrumfirm.com*
Website: ***www.thespectrumfirm.com***
WE PROVIDE QUALITY SPECTRUM THAT INCLUDE PRE-SALE AND/OR POST-SALE SPECTRUM STRATEGY, RESEARCH AND ANALYSIS, REBANDING, SPECTRUM AND LICENSING PROJECT MANAGEMENT, FCC LICENSING, WAIVERS, ACQUISITIONS, CUSTOM ANNUAL PACKAGES, LICENSE MONITORING AND RENEWAL SERVICES. M/WBE CERTIFIED.

JCS & ASSOCIATES

J.C. "Jim Stratt, E.C. Tseretopoulos
139 Devins Drive
Aurora, Ontario L4G 2Z5, Canada
Phone: 905-841-1627
Fax: 905-841-3562
Email: *jcstratt@aci.on.ca*

INTERNATIONAL COMMUNICATIONS CONSULTANT

THE SALES GROUP, INC.

Larry G. Weber, President
23942 Craftsman Road
Calabasas, CA 91302

The Sales Group, inc.
MANUFACTURERS REPRESENTATIVES

MIDIAN ELECTRONICS INC.

Chuck Soulliard, President, K7JTJ

2302 E. 22nd St
Tucson, AZ 85713-2024
Orders: 800-MIDIANS
Service: 520-884-7981
Fax: 520-884-0422
Email: *chuck@midians.com*
Website: *www.midians.com*

NEW HORIZON TOWERS, INC.

W. Thomas Thornton, President
11471 Twin Lakes Lane
San Angelo, TX 76904
Phone:325-947-3436
Fax: 325-947-7160
Cell: 325-656-6650
Email: *newhorizontowers@aol.com*
Website: *www.newhorizontowers.com*

ANTENNA SITE LEASING OR TOWER SPACE LEASING

WALLACE & WALLACE

Donald G. Werner, Vice-President
2600 S. California Ave., Suite F
Monrovia, CA 91016
Phone: 626-305-8800
Fax: 626-305-8801
Email: *don.werner@prodigy.net*
Res: 626-914-7216

ELECTRONIC MANUFACTURERS' REPRESENTATIVE

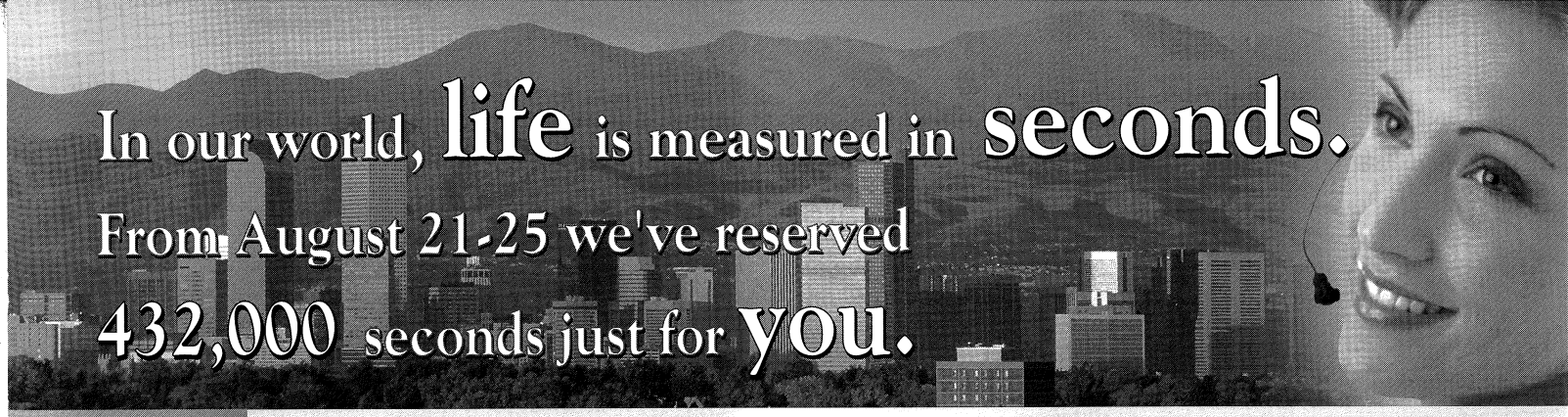
TROTT COMMUNICATIONS GROUP

Raymond C. Trott, P.E., Chairman

4320 N Beltline, #A100
Phone: 972-252-9280
Fax: 972-258-8172
Email: *ray.trott@trottgroup.com*
Web Site: *www.trottgroup.com*

RF ENGINEERING CONSULTING

Ad Index



www.apco2005.org

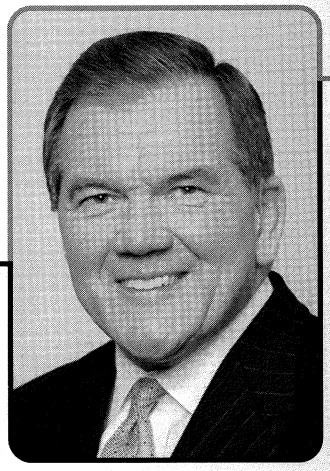
APCO INTERNATIONAL
Mile High in 2005
Denver, Colorado

Join us at
APCO INTERNATIONAL'S
71st Annual Conference & Exposition

MILE HIGH IN 2005

August 21-25, 2005
Colorado Convention Center
Denver, Colorado

Join more than 5000 professionals and 300 exhibiting companies for the premiere event in public safety communications!



Tom Ridge

APCO International is pleased to announce that Former Secretary of Homeland Security Tom Ridge will be the Keynote Speaker at our 71st Annual Conference and Exposition in Denver.

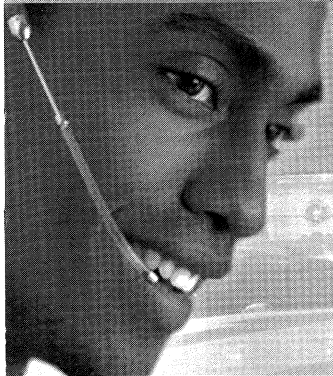
From August 21-25, APCO International's 71st Annual Conference and Exposition, will be the leading public safety communications event of the year!

Mark your calendar and visit us at **www.apco2005.org** for more information and to register!

THANK YOU TO OUR SPONSORS:

Simulcast Solutions
Plant Equipment, Inc.
Positron
MSV Mobile Satellite Ventures
Lockheed Martin — We never forget who we're working for™
SBC
National Public Safety Information Bureau
Motorola
M/A-COM
ATX
Raytheon JPS Communications
Northrop Grumman
NICE
Nextel
Intrado

AS OF 04/12/05

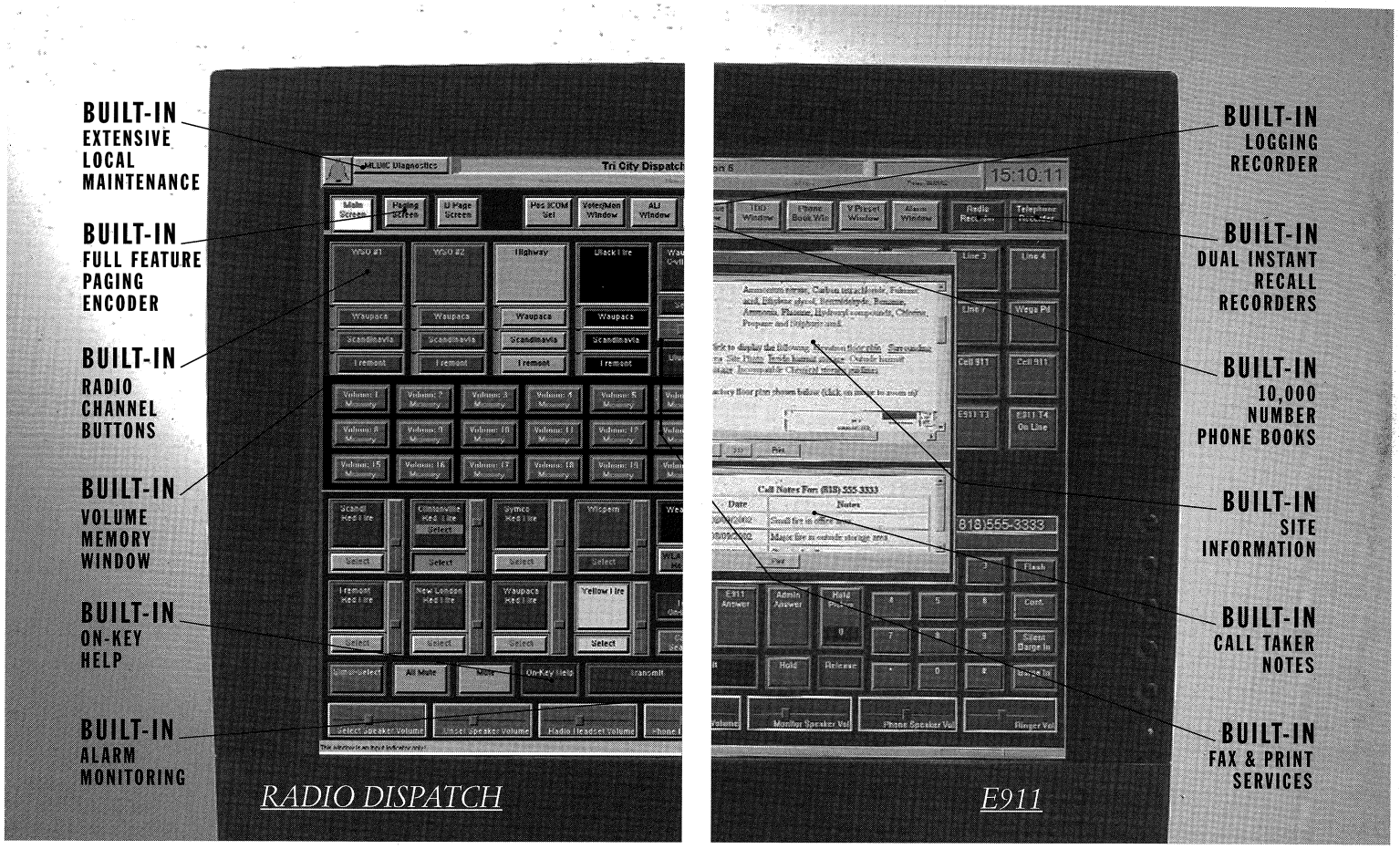


Safety has a guardian...

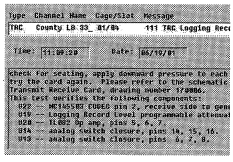
We answer that call!

www.apcointl.org

PUBLIC APCO SAFETY™



THE OPTIONS OTHER E911 AND RADIO DISPATCH SYSTEMS CHARGE YOU FOR WE BUILD-IN AT NO EXTRA CHARGE.



The built-in MEDIC spots trouble down to the component level. It can be used remotely even by technicians back at our factory. This could mean a 50% savings in support.

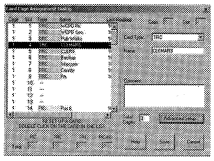
The UltraCom™ E911/Radio Dispatch Console System comes complete with all its features built-in. Unlike the competition, this is not a stripped-down system with loads of expensive options to make it complete. Our built-in features and free software upgrades save you big money.

If you choose to buy the E911 or Radio component separately you also get the software for the other component at no extra cost, just add minimal hardware to save as much as 50%.

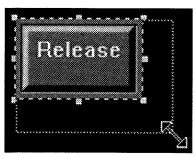
UltraCom is an all digital, 32-bit Windows, single application system. Telcordia and NENA compliant handling both E911 and ADMIN lines. Built from the ground up by us - not a collection of older systems.

Contact us today to find out just how much money you will save by eliminating all those pricey options.

Moducom holds many state & government contracts.



System programming changes can be made by the customer instead of expensive factory programmers. This makes it a snap to change levels, add cards and enable new features.



Our built-in Screenmaker easily customizes any screen to meet your needs. Buttons can be easily resized, moved and changed.

Free Demo

Demo our cost saving system software and request or download a brochure at www.moducom.com or call us at: 818-764-1333

MODUCOM

COST EFFECTIVE NOW.
MORE COST EFFECTIVE OVER TIME.

MODULAR COMMUNICATION SYSTEMS, INC. 13309 SATICOY ST. NORTH HOLLYWOOD, CA 91605. E-MAIL: moducom@1x.netcom.com