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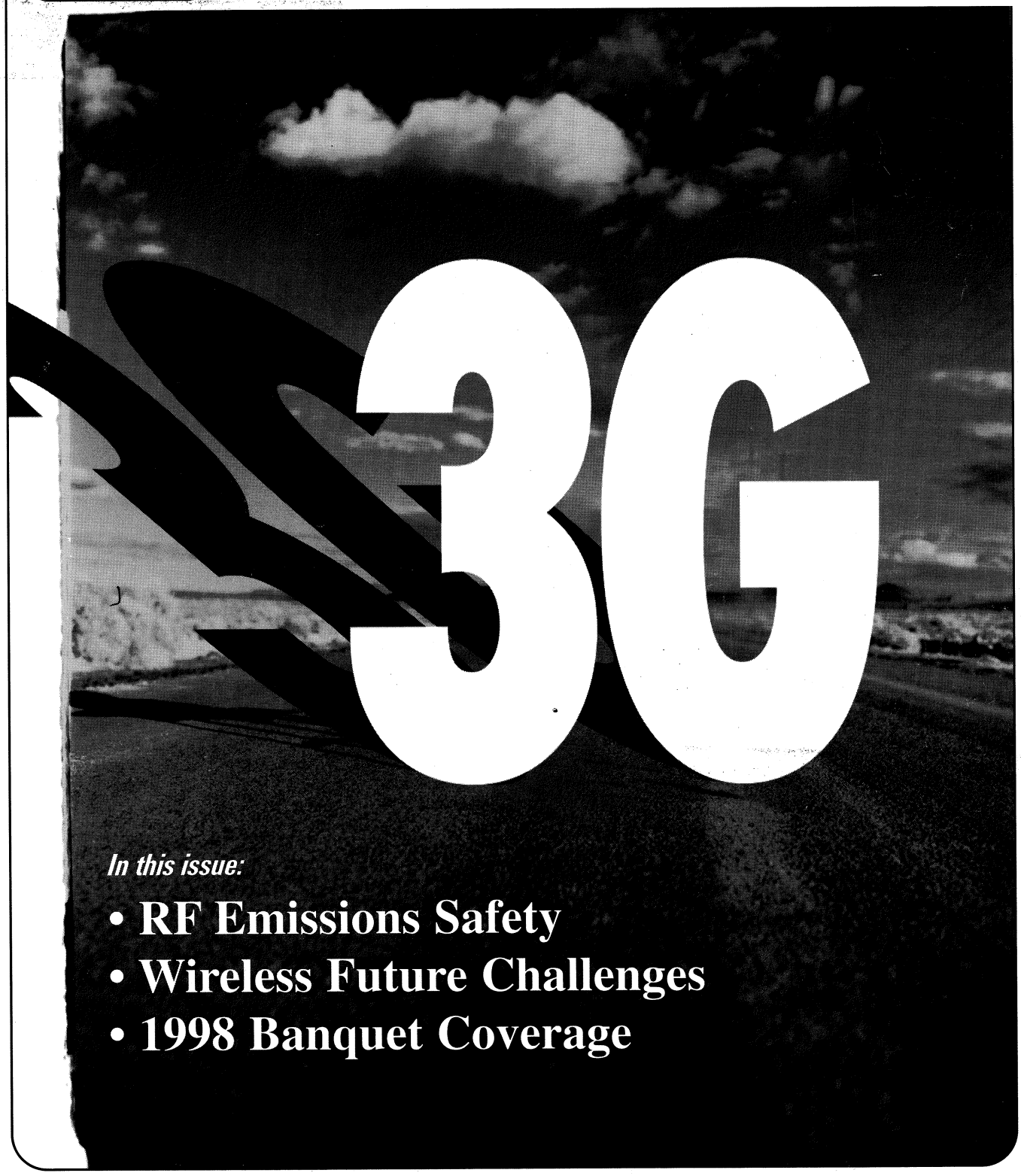

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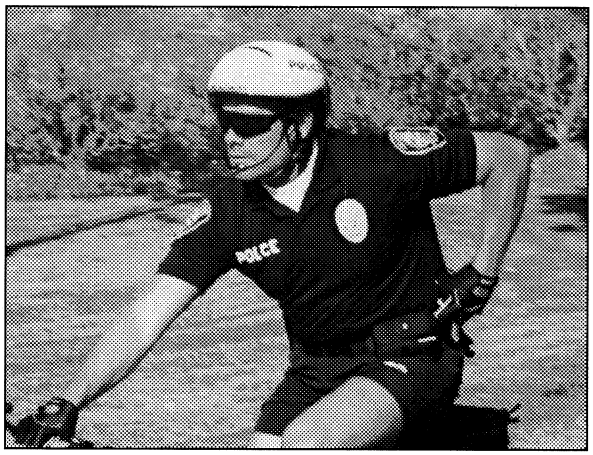

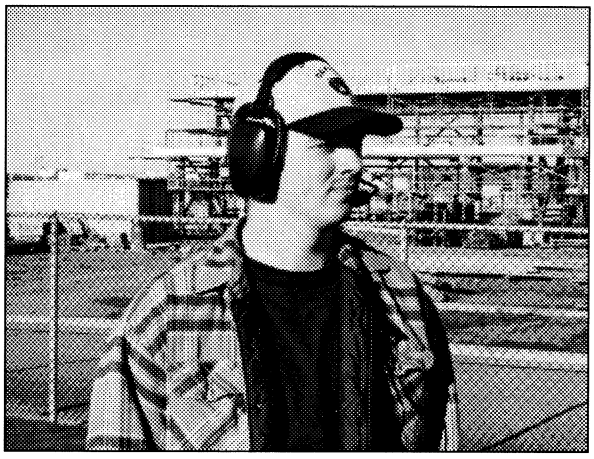

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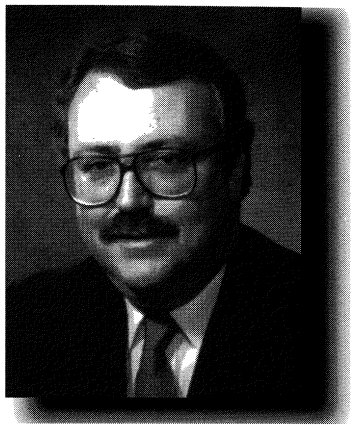


The New Millenium

I want to personally welcome everyone into the new millennium. This new century will bring unique and exciting opportunities for the Radio Club.

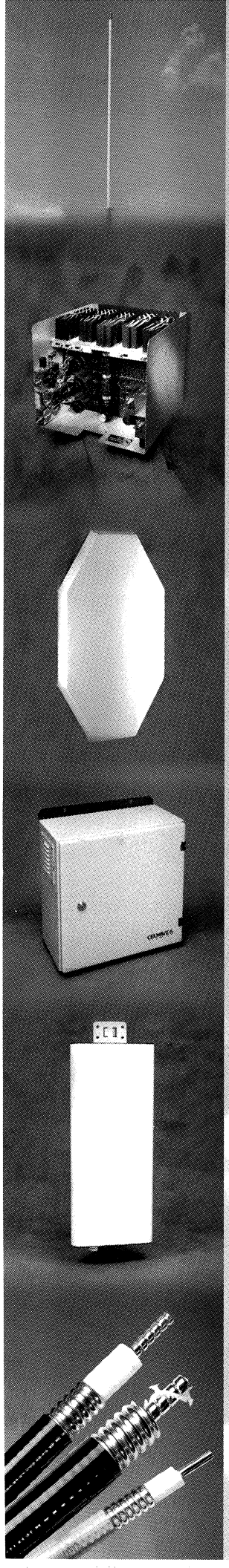
Already we have a new editor for the *Proceedings* and have streamlined the process in which we review and approve articles. Cindy Stevens, our new editor, brings a wealth of knowledge and experience to my staff and most importantly, new ideas to modernize and improve our biannual publication.

While we will not only print vital articles that highlight our past, we also will try to stay in the forefront of our industry by publishing articles that are relevant and pertinent to the future of this dynamic industry.

In order to continue the legacy of the Club, we also must concentrate on the membership. Not only should we search for the leaders of the wireless industry, but we should also concentrate on the hams, engineers, inventors and technicians that have dedicated their lives to the improvement of this industry.

My last goal for my tenure is to increase the financial status of the Radio Club by seeking donations from corporations and individual members as well as to broaden our scholarships to young deserving future hams, engineers and technicians of tomorrow.

I call on every member to help in expanding the horizons of the Radio Club and I welcome suggestions from our members to maintain and enhance the elite status that this Club has realized throughout its 90-year history.



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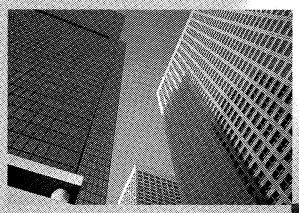

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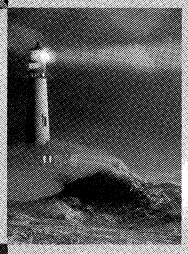

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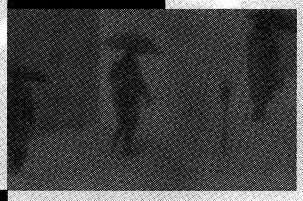

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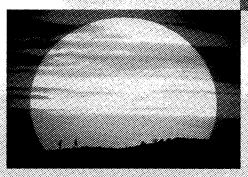

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Challenges for the Wireless Future

The wireless industry is on the verge of an explosive business and sociological opportunity. With the sale of wireless handsets increasing exponentially, it will not be long before the sale of wireless phones will exceed the sale of wireline units. Where do we see the greatest potential for growth? While the use of wireless networks is increasing for voice traffic, the explosive growth for the industry will come when high-speed data, multimedia services and Internet connections can readily be made using wireless handsets.

Solving Interoperability Issues

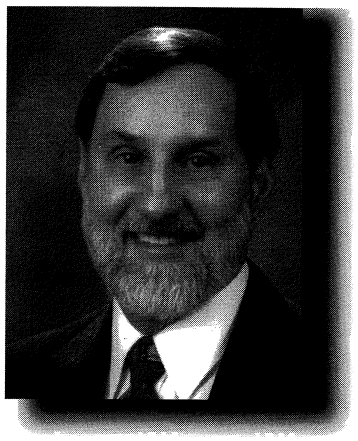
The greatest stumbling block in seizing this opportunity is interoperability. While overcoming the technological challenges of increased data rates is foreboding, in order to provide the level of services demanded by potential users, the service must be available everywhere, at all times. This is similar to the way the fixed landline phone system has been perceived in the past. That is, where phone service existed, you had the ability to connect with any other device worldwide. In the wireless industry of the future, we must continue to provide coverage anywhere, anytime. The networks of the future must offer a greatly expanded array of services and capabilities.

The interoperability challenge we face is multifaceted. Interoperability must be provided between global system for mobile communications (GSM), IS-136 time division multiple access (TDMA), and IS-95 code division multiple access (CDMA). The universal network of the future must operate over terrestrial as well as satellite infrastructures.

The path to this ubiquitous system of the future is called 3G, for third-generation wireless technology. The name given to the 3G wireless standard by the International Telecommunications Union (ITU) is IMT-2000 (International Mobile Telecommunications-2000). The original vision for IMT-2000 was to create a single system common to all global regions. While that lofty goal should not be dismissed, it now appears that a family of standards is a more likely near term reality.

On March 25, 1999, two major manufacturers in the wireless market, Ericsson and Qualcomm reached an agreement that resolved the legal disputes covering patent and intellectual property rights for CDMA wireless phone technology. Because of this agreement, the path forward to a common third-generation standard may now be more readily achieved.

The goal of IMT-2000 is to smoothly upgrade the entire world's second-generation (GSM, TDMA and CDMA) wireless systems to a common interoperable network. The launch is expected some time after the year 2001. At that time, data access speeds will be increased by twenty-fold, multimedia capabilities will be provided and



location enabled features of E911 will be in operation.

History

In order to have a better understanding of the 3G concept; it is helpful to take a brief look at where we are today and where we have been. The first-generation cellular wireless standard was available during the 1970s and early 1980s, and utilized analog waveforms. Following are the most successful first-generation standards.

A. Nordic mobile telephone (NMT) was the first commercially available analog system. It was launched in 1979 and provided service in Sweden, Norway, Denmark and Finland.

B. Advanced mobile phone system (AMPS) was launched in 1982. It is the most successful analog standard. AMPS service is offered on every continent except Europe. Total access communications system (TACS) was originally specified for the UK. This technology has been extended to enhanced-TACS (ETACS).

The current digital second-generation wireless standard was born out of the need to improve coverage and capacity. It has made the movement towards personal communications services (PCS) much easier. Following are the three most widely adopted digital wireless standards based on TDMA.

A. GSM is the world's most widely adopted digital standard. It is used by more than 150 million subscribers and as of March 1999 is connected by more than 200 networks in 118 countries. GSM, introduced in 1992, was the first commercially available second-generation standard.

B. D-AMPS IS-136, as of June 1998, was used by 13 million subscribers in 34 countries.

C. Personal digital communications (PDC) is the third largest digital second-generation standard. It only is used in Japan, and had 16 million subscribers as of June 1998.

Another major second-generation standard is IS-95. IS-95 is based on narrowband CDMA technology. By mid-1998 there were 13 million subscribers using this technology, nine million of who reside in South Korea.

The Wireless Network of the Future - 3G

What are the driving forces and hurdles to be overcome if we are to achieve the goals of a global third-generation wireless network? Over the long term the challenges are not RF related, nor are they hardware, modulation format or multi-

plexing issues. Rather, the challenges to be overcome are in the marketplace, and in the market demands of emerging industries and technologies, the diverse players, users, regulators and the industry in general.

The IMT-2000 selection already has begun. In June of 1998, fifteen submissions were received as candidate technologies for IMT-2000. Six were based on variations of wide-band CDMA. Submissions were received from Europe, Japan, China and the United States. Other submissions were based on wide-band TDMA, digital enhanced cordless telecommunications (DECT), and three were based on satellite solutions. These submissions are being evaluated by sixteen independent evaluation groups. The date for the final selection initially was set for March 1999; however, the decision has been delayed until later this year.

IMT-2000

The Japanese have been the most aggressive in the push toward developing 3G technology. Their demand for wireless service has exploded in recent years. Japanese telecommunications operators, such as NTT DoCoMo, the largest telecommunications company in the world, and Japan Telecom have been focusing on wideband-CDMA (W-CDMA). Additionally, the European Telecommunications Standards Institute (ETSI) is developing a European set of third-generation standards called the Universal Mobile Telecommunications System (UMTS). The current UMTS proposal now called UMTS terrestrial radio access (UTRA) focuses on ways that GSM technology can evolve into the third-generation by taking advantage of W-CDMA technology.

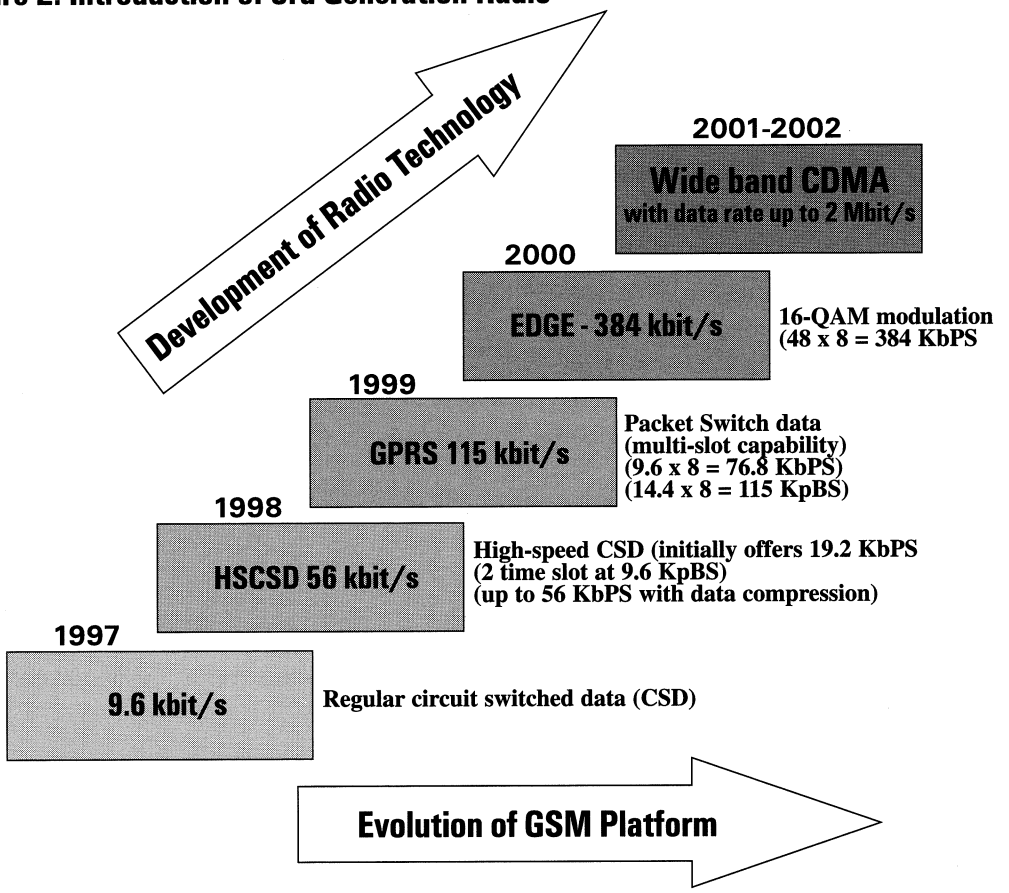
In North America, major efforts are underway by the Telecommunications Industry Association (TIA), a group responsible for public, mobile and personal communications systems standards. TIA is seeking to determine the evolutionary path of cdmaOne, GSM, and TDMA (IS-136) technology into the third-generation.

The cdmaOne (IS-95) technology is supported

Figure 1: Main parameters of third-generation air interface proposal

	WCDMA	Korea ITA II	Korea TTA I	cdma2000	UWC-136-136HS
Multiple Access	CDMA	CDMA	CDMA	CDMA	TDMA
Chip Rate/carrier bit rate	(1.024)/4.096/8.192/ 16.384 Mcps	1.024/4.096(8.192)/ 16.384 Mcps	0.9216/3.6864/14.74 56 Mcps	1.228/33.6864/7.37 128/11.0593/14.7456 Mcps for direct spread nx 1.2288 Mcps (0.1, 3, 6, 9, 12) for multicarrier	
Carrier spacing	5, 10, 20 MHz		1.25, (5) (10), 20 MHz	1.25, (5) (10), 20 MHz	200 KHz, 1.6 KHz
Frame length	10 ms	10 ms	20 ms	20 ms	4.615 ms, 8 slots/frame (200 KHz) 16/64 slots/frame (1.6 MHz)
Inter base station synchronization	Asynchronous	Asynchronous	Synchronous	Synchronous	Asynchronous
Coherent detection	User dedicated time multiplexed pilot (downlink and uplink), Common pilot in downlink	UL: Pilot symbols DL: Common pilot channel	DL: Common pilot channel UL: Continuous pilot	DL: Common continuous pilot channel and auxiliary pilot UL: Pilot time multiplexed with PC and EB	Training sequence

Figure 2: Introduction of 3rd Generation Radio



by the CDMA Development Group (CDG), an international consortium of CDMA operators. cdma2000 is the CDG's 3G technology of choice for the future of cdmaOne operators. It offers higher capacity and more advanced multimedia services than current second-generation IS-95 CDMA systems.

The GSM worldwide community, including North American GSM operators, has chosen W-CDMA for 3G. W-CDMA will offer up to 2 Mbit/sec data rates, and is optimized for "fast access and release." The evolution of GSM is in its final stages of standardization. The next successive stages include high-speed circuit switched data (HSCSD), general packet radio service (GPRS), and enhanced data rates for global evolution (EDGE). For IS-136 similar standardization activities are ongoing.

The Universal Wireless Communications Consortium (UWCC), a trade association of TDMA carriers, is evaluating how TDMA can evolve into third-generation. At this time, the air interface preferred by the UWCC is called UWC-136, a hybrid system that incorporates IS-136+ for voice and a new air interface called EDGE. The EDGE air interface is targeted to provide a high-speed data solution. (*See Figure 2).*

On January 29, 1998, ETSI selected universal mobile telecommunications system (UMTS) as its third-generation technology. The goal is to provide a seamless access to wide-band mobile communications service throughout Europe. The final UMTS standard is a wideband solution based on W-CDMA. W-CDMA has a 4.096 megachip per second chip rate. This will fit in to a 5 MHz channel, but offers little to no guard-band spacing. The guardbands are required in order to reduce the in-channel signal level from adjacent channels.

In the U.S., Qualcomm proposed a CDMA approach based on a chip rate of 3.6864 megachips per second. The reasons for this chip rate are:

Current 3G Events

U.S. Lucent is participating in cdma2000 tests with Sprint PCS and Bell Atlantic.

Canada Microcell is hosting the first W-CDMA trial of its kind in North America using Panasonic's prototype phones and Nortel's infrastructure.

UK British Telecom, Nortel Networks, and Panasonic joined forces for a 3G (UMTS) at BTs research facility. Testing involves a mobile terminal with a built-in camera.

Japan NTT DoCoMos 3G trial began as early as 1996 and continues today. Nokia, Lucent and Ericsson are among several vendors that are technical contributors to the W-CDMA effort. DoCoMo is expected to be the first commercial provider of 3G services around March 2001.

France In February, Nortel Networks successfully demonstrated packet-switched, mobile video conference calls and high-speed Web browsing at 384 kb/s using W-CDMA at the company's laboratory in France.

1. It is a times three multiple of the current IS-95 chip rate of 1.2288 megachips per second;
2. It provides 250 KHz guardbands on each side of a 5 MHz channel;
3. A 3.6864 megachip per second based waveform permits five CDMA carriers in a 20 MHz band allocation, and a minimum guardband of 250 KHz on each side of each 3.6864 MHz channel.

The choice of a 4.096 Mcps chip rate for W-CDMA yields only four wideband CDMA channels in a 20 MHz channel with no guardbands.

All of the debate over W-CDMA and cdma2000 may now be moot with the recent agreement between Ericsson and Qualcomm. Under their agreements, Ericsson and Qualcomm agree to jointly support a single world CDMA standard with three optional modes for the next-generation of wireless telecommunication.

The companies also have agreed to jointly support approval by the ITU and other standards bodies, including the TIA and ETSI, of a single CDMA third-generation standard. This standard will encompasses three optional modes of operation:

1. Direct sequence frequency division duplexing (FDD),
2. Multi-carrier FDD, and
3. Time division duplexing (TDD). Each mode supports operation with both GSM MAP and ANSI-41 networks.

The Future

While no one can predict the future of telecommunications with certainty, it is clear that the way the world communicates tomorrow will be vastly different from today. Not the least of which will be the speed and accessibility of mobile multimedia, the vast improvement in voice channel quality, and the ubiquitous coverage and availability of data and communications channels.

Special thanks to Dr. Davood Ashrafi for his assistance in reviewing this article, and for the additions he made for the final submission.

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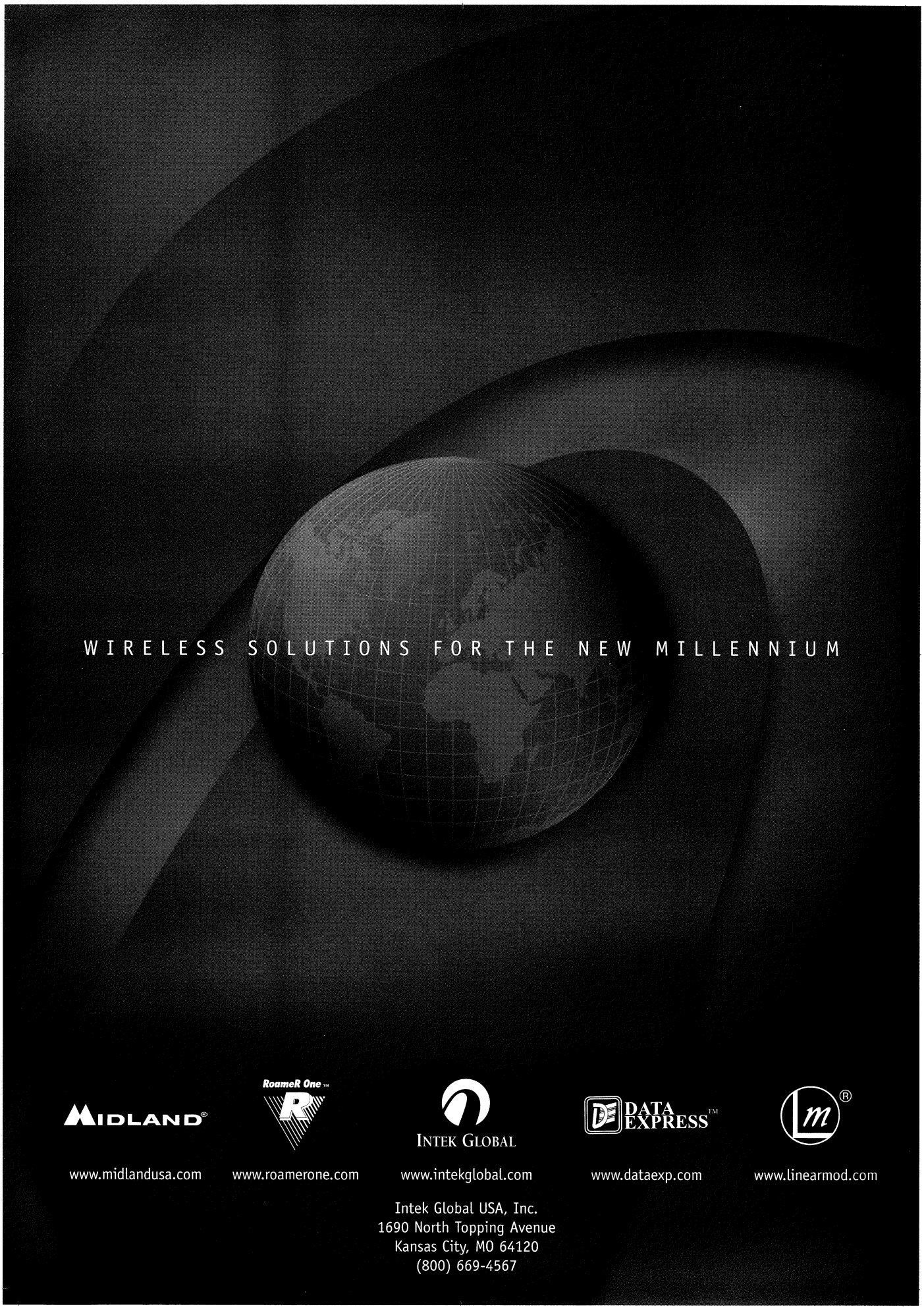
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RF Emissions Safety and Today's Regulations

Radio frequency (RF) radiation, RF emissions, electromagnetic energy, whatever you choose to call it — the new FCC regulations and increased awareness of non-ionizing radiation is a hot subject today. The most recent FCC regulations seemed to have caught many organizations by surprise, although it has taken years to get to where we are today.

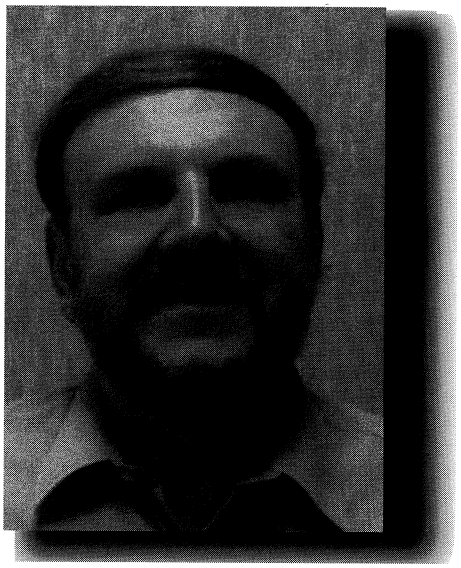
Where are we? We have some reasonable regulations that are soundly based on well-documented biological hazards. At least some of the confusion is due to the conflicting messages sent out by the Occupational Safety and Health Administration (OSHA) – messages that only now appear to agree with the FCC and other regulatory agencies. But before we go into details, perhaps it is better to review how we arrived at the place where RF safety is making headlines.

RF History

Although there were some indications of the heating effects from the energy emitted by radio transmitters in the late 1930s, the phenomena became well known with the development of radar during the Second World War. Quite simply, people noticed that they got warm when they stood in front of radar antennas. Dr. Percy Spencer of Raytheon took note and ultimately developed the radar range – today's microwave oven.

Narda got involved in 1969 when two representatives of the Food and Drug Administration asked for help. Public Law 90-602 that regulated the amount of RF energy leaking out of a microwave oven was about to be passed and there weren't any instruments to measure the leakage. The only things that existed were extremely crude instruments to measure field strength. Ed Aslan, invented the first instrument to measure microwave oven leakage and received a patent and an IR100, or Industrial Research award as one of the top 100 new inventions. Today, he has 47 patents in this field while the rest of the world has four.

The first human exposure guidelines were developed by the U.S. military in the 1950s. The military funded most of the research in those days because they were the ones with most of the high power emitters. The American National Standards Institute (ANSI) issued the first general RF exposure standard in 1966. It was only four pages long and suggested limiting human exposure to levels no higher than 10 mW/cm2 from 10 MHz to 100 GHz.



Other than the military, broadcasters were the only ones who faced concerns over RF radiation. But most broadcasters focused on the concerns of the public. In reality, RF radiation is almost exclusively an occupational problem. It is rare for someone to be exposed to significant RF field levels outside of work, although the proliferation of wireless antennas is making public exposure more of a concern than ever.

Because a concerned public outcry can impact broadcast operations, it must be dealt with even if the fears are usually unwarranted. It is ironic that those dealing with some of the most dangerous RF exposure situations – broadcasters – almost totally ignored occupational exposure issues. Until recently, that is.

Biological RF Research Determined

- How do various RF fields affect the body?
- At what levels does the body suffer adverse effects?
- At what levels are the effects permanent?

Early on we knew that the primary concern was thermal. Quite simply the body heats up in the presence of significant RF energy. The first ANSI standard was a best guess and suggested limiting exposure to the same 10-mW/cm2-field level at all frequencies. But, as research continued, it became apparent that many factors impact how much the body heats up.

The concept of specific absorption rate (SAR) evolved. SAR designates heat absorbed into the body in units of watts per kilogram. Ultimately, it was determined that much of this follows basic antenna theory. In an ungrounded situation, the body represents a fat, lossy dipole. When well grounded, the body represents a grounded quarter wave antenna. Researchers consider the "standard man" to be 1.75 meters tall, about 5'9". That makes him resonant at about 86 MHz. So the average adult male makes a perfect antenna for channel six television. The biology is certainly more complicated than that but height, grounding and polarization are the most important factors in determining SAR level.

The next question is, how much heat can the body tolerate? It was determined that the most heat the human body can deal with is approximately 4 W/kg. Much of this research was based on exercise levels rather than on actual exposure experiments. These levels are averaged over the

body since our circulatory systems function much like a radiator. For this reason, an arm exposed to a strong RF field from a satellite uplink dish can tolerate about twenty times as much energy as the whole body. The eyes and a male's testes are particularly vulnerable, however, since the limited blood flow of these organs limits the benefits of the circulatory system.

Time is also a factor. Most standards average exposure over time, which only makes sense since we are dealing with heat. Six minutes is the average period for most occupational exposure limits.

How can RF energy hurt people? Moderate level exposures cause heat stress and behavioral changes. The effects often are mistaken for the flu because the symptoms are similar and as the level of exposure increases, the potential for harm increases. Human cells die at 107 degrees Fahrenheit. This is the reason that doctors get concerned if a person's temperature rises above 105 degrees.

The body is constantly replacing cells so the amount of damage that is done depends on how many cells are killed and what kind of cells are exterminated. Kill off some cells and the effects may pass in minutes or hours. Cook off a lot of cells, such as liver cells, and you will have liver damage.

Back to the Present

Today, we understand the biology fairly well and we have reasonable standards in place. Both the public and workers are much more aware of the issue of RF safety. However, the industry still is trying to come to grips with how to deal with the new FCC regulations, OSHA and a host of state and local government agencies.

Most of the RF exposure standards worldwide are remarkably similar because they are based on the same biological data. The U.S. standards are most restrictive from 30 MHz to 300 MHz. The 300 MHz represents a newborn infant in a crib. At the other end, the standards are designed to protect a well-grounded NBA center. The exposure limits are set for one-tenth of the known limits for healthy young adults – a SAR level of 0.4 W/kg. The safety factor can be greater than 10:1, depending on the polarization.

Factors That Influence RF Safety

- Not everyone fits in the category of an athletically fit, healthy young adult.
- The standards were all developed at room temperature but high heat and humidity lead to severe erosion of what can be considered your "heat budget" before one even factors in the RF energy.
- Workers are often engaged in strenuous activity, such as climbing a tower, which also produces heat.

So, the standards and the FCC regulations make sense. It is important to ask what does my company need to do to satisfy all of these standards and regulations? However, the first question really should be, what do we need to do to keep anyone from getting overexposed? Most of this is common sense once you understand the biology and the standards.

What the FCC Regulations Require

The new FCC regulations have a single objective to prevent all people from being overexposed to potentially harmful RF energy. The regulations are concerned with human exposure, not emission levels.

Two Ways to Achieve Compliance

- Make a site compliant by design.
- Develop and follow a RF safety program to insure that personnel do not risk exposure.

One common misconception is that low power wireless systems that are categorically excluded somehow relieve the operator from all responsibility for RF safety issues. Categorical exclusion does eliminate the legal need for an engineering evaluation. So, you do not need to complete an

engineering evaluation. But you still need to protect your personnel.

First, what is an engineering evaluation (EE)? Basically, it is a written document that defines how you came to the conclusion that your facility was compliant with the FCC regulations. It might include a copy of a measurement report or a computer model that was completed or it may include some manual calculations. The EE must be completed by an expert who has the necessary skills and knowledge to do this work.

While we are on the subject, what is an environmental assessment (EA) and an environmental impact statement (EIS)? These are very formal, structured documents. And while some consulting firms offer to complete EAs for you, there is absolutely no reason to ever file an EA or an EIS with the FCC. The FCC says that they have received a few EAs but never an EIS. Both of these documents always put your violation in writing. But since you are not going to get any relief, why declare it? It would probably cost more to file these reports than to fix the problem.

Attaining Compliance

It is possible to achieve compliance by design for many wireless sites. To be compliant by design, the antennas must be located so that the field levels are below the FCC general population/uncontrolled environments limits anywhere that a person could reasonably be expected to go.

Since even a low power personal communications services (PCS) antenna creates fields above the maximum exposure limits (MEL) close to the antenna, typically within two feet, it is not possible to be compliant by design on a rooftop unless omni-directional antennas are elevated above your head and sector antennas are located either on the edge of the roof or overhead. It is possible to relocate antennas at many sites to achieve compliance. At other sites, economics or local ordinances, such as antenna height may preclude this type of solution.

For many sites the only way to be compliant is to operate under an RF safety program. Safety programs often are misunderstood by those in the communications industry. Yet, to health and safety professionals, all good safety programs follow a common template, regardless of the physical or chemical hazard that they are designed to protect against. In many ways they are similar to the quality control programs with which most of you are familiar.

A Safety Program Template Includes:

- Someone in charge with the resources and authority to carry out the program;
- The program must be communicated to and understood by the personnel that are affected, which usually involves training;
- Hazard areas must be identified and marked;
- Standard work practices and controls must be established; and
- The program should be reviewed, or audited, periodically to make sure that it is achieving the desired results.

A complete safety program should have three similar, related components:

- A corporate safety program document;
- A contractor or customer safety program document; and
- A site-specific safety program document.

In addition to the basic corporate document, a safety program also includes:

- A mission statement; and
- Various appendices with needed reference and background material.

If your organization hires subcontractors or leases space, these organizations are required to follow your safety program. Typically, the subcontractor or tenant is given a copy of the safety program contractor/customer document. They must sign a form acknowledging that they understand the requirements of your safety program and promise to operate under its rules.

A site-specific document is useful at a complicated or particularly hazardous site. This document will call out any site-specific work rules and

typically will include a site plan with hazard areas indicated.

Shared Sites

Operating companies should try to characterize all of their sites and use this information to achieve a safe work environment. At shared sites, where conditions change constantly, this is a difficult, if not impossible, task. The problem with many sites especially on rooftops, is the surprising number of organizations and people that need to access the site.

First and foremost, the goal should be to protect both a company's own personnel and all others who may visit a site. That also greatly reduces a company's liabilities.

Not only do you have all the communications people involved in installing and maintaining the electronic equipment, there are service personnel for elevators and HVAC equipment, window washers, building maintenance people, exterminators, painting and roofing contractors, and often a surprising number of other visitors. At many rooftop sites, RF energy is often not just an occupational problem. And although many of the typical visitors I have just described are there to perform work, those from occupations outside the communications industry rarely have any knowledge of RF radiation.

Service organizations have little control over their environment. Personal monitors are the only practical way for service organizations to protect their personnel. And many operating companies use monitors also since it is difficult to characterize all of their sites and keep up with the inevitable changes.

What is Next?

Now that many companies are in a mad rush to achieve compliance, what is next? There often is a big difference between what companies may do and what they should do. First and foremost, the goal should be to protect both a company's own personnel and all others who may visit a site. That also greatly reduces a company's liabilities. As business people, the goal should be to accomplish safety at minimum cost with the least amount of impact on operations.

Some things are a given. Most companies today would not even consider letting workers climb a tower without adequate fall protection equipment. Years ago, this was not the case. The very communications industry that we are working to build is enlightening more people so their tolerance of anything less than a RF safe environment is continually decreasing.

In the coming years the safety programs will become more rational and less reactive. There will be less of "let's do it so we can satisfy the FCC and OSHA" and more of "What works best for us?" Training issues will be resolved and annual refresher courses will become the norm. Employees will become more involved in developing and maintaining RF safety programs, much like they have become more involved in quality assurance issues.

In a few years, RF safety policies and procedures will be the norm, not a disruptive annoyance.

Richard R. Strickland is director of business development, Instrument Products Narda Microwave-East, an L-3 Communications Company.

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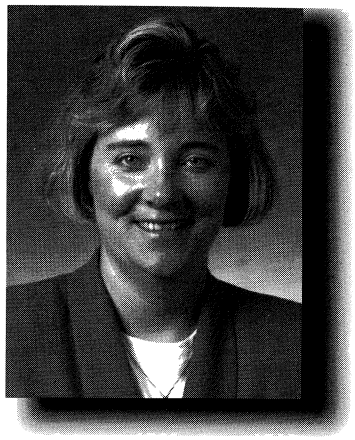


1998 Radio Club Banquet Honors Fred Link

Members of the Radio Club of America met in New York City on Nov. 20, 1998 at the New York Athletic Club, for the Club's 89th Anniversary Dinner and Awards Presentation, as well as for the Club's Technical Symposium.

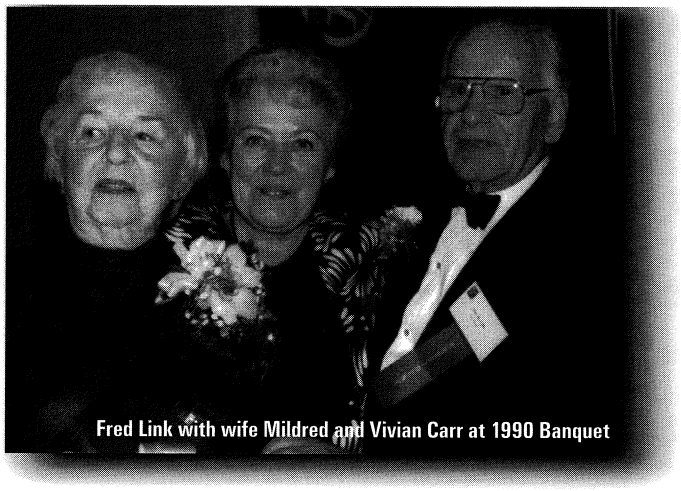
Club members and 1998 President Ray Trott used this occasion to honor Fred M. Link, longtime Radio Club member and past president of the club, a leadership position he fulfilled for 23 years. The special tribute to Link included a dedication page in the banquet program, where Radio Club members shared their memories of their esteemed colleague.

In this tribute, John E. Baliant said of Link, "One of the things that people have lost sight of is that Fred was an excellent engineer... he did not cut any corners. Everything had to be as perfect as could be."

J.C. Smith added, "Fred and I built the radio tower for 'Silver Dollar' Jim West at the ranch. I had known Fred since day one, when I first built my tower for my cab company. He was one of the smartest radiomen I ever knew, and I met and worked for a lot of them. He wanted to work before daylight and after dark.

"He didn't know when to quit. He never had a bad thing to say about anybody. He was always bragging about everyone he knew. He was a fine gentleman."

Club President Trott said, "Fred was the best storyteller I ever met. Stories about his experiences in the early days of radio piqued the interest of everyone who listened. They made the Radio Club breakfasts a success—stories about Will Rogers, 'Silver Dollar' Jim West, Warden Laws of Sing-Sing, the Morro Castle and many more."



Fred Link with wife Mildred and Vivian Carr at 1990 Banquet

Technical Sessions

The afternoon technical session included presentations by Oscar McKee, Richard Strickland and Ken Hoagland. Two of the presentations can be found in this issue of the Spring *Proceedings.* Club members Andy Singer and Tony Sabino moderated the technical symposium.

At the banquet, George Schmitt, president of Omnipoint Communications Services Inc. and executive vice president of Omnipoint Corp., one of the largest publicly traded personal communications services (PCS) companies in the United States, addressed the group with a keynote speech.

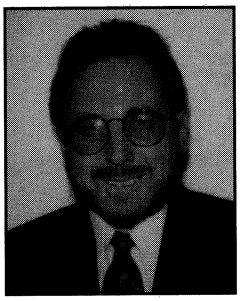
Another highlight of the banquet was the awards presentation. Award recipients include Maxine Carter-Lome, The Special Service Award; Richard Somers, The President's Award; Henry Kreer, The Fred M. Link Award; John Balint, The Edgar F. Johnson Pioneer Citation; Seymour Krevsky, The Frank A. Gunther Award; Reed Fisher, The Henri Busignies Award; Joseph Fairclough, The Barry Goldwater Amateur Radio Award; and James Dwyer, The Sarnoff Citation.

At the banquet, the Club recognized members who have demonstrated dedication and contributions to the Radio Club with bestowing upon them the membership grade of Fellow. In 1998, 19 members were elevated to the grade of Fellow. The new Fellows include Dale Carter, Philip Casciano, Robert Di Bella, James Dwyer, John Ehret, Harry Ekelund, James Hargenrader, James Healy, David Leonard, Jack Manon, Bruce McIntyre, Joseph McNeil, George Munsch, Robert Perelman, Harold Sobol, Thomas Traynor, Charles West, Ernest Worthman and David Zumwalt.

Philip Casciano responded for the Fellows. The Radio Club of America has bestowed awards to individuals for their achievements, contributions to the advancement of radio and service to the Club since 1935.

Jane Bryant is a Fellow in the Radio Club of America and serves on the board of directors. She is general manager and editorial director of McQUERTER-GROUP, which specializes in high-tech public relations.

1998 Honors & Awards

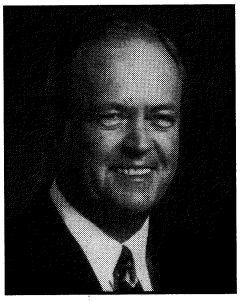


THE PRESIDENT'S AWARD

Richard G. Somers
For outstanding support of our club.

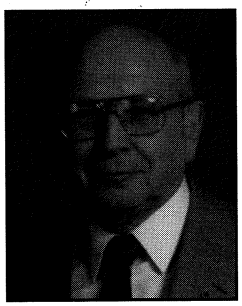
THE SPECIAL SERVICES AWARD

Maxine Carter-Lome
For her outstanding support of numerous club activities.



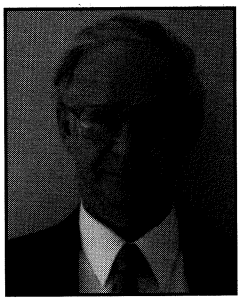
THE SARNOFF CITATION

James A. Dwyer
For his significant innovative contributions for advancement in paging and cellular industries.



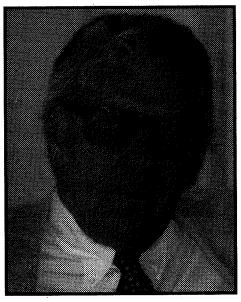
THE FRANK A. GUNTHER AWARD

Seymour Krevsky, Esq.
For advances in HF ionospheric radio propagation theory and techniques.



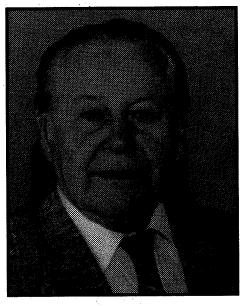
THE HENRI BUSIGNIES AWARD

Reed E. Fisher
For development and advances in cellular technology.



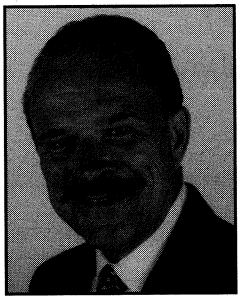
THE FRED M. LINK AWARD

Henry B. Kreer
For his founding of REACT, an organization of radio operators who support emergency communications.



THE EDGAR F. JOHNSON PIONEER CITATION

John E. Balint
For his invention of noise squelch for FM receivers.



BARRY GOLDWATER AMATEUR RADIO AWARD

Joseph J. Fairclough
For his innovative use of amateur radio to promote greater interest in learning for young people

Banquet Awards Photos

Henry Kreer
receiving
The Fred M. Link Award
from
Jack Brennan

James Dwyer
receiving
The Sarniff Citation
from
Jack Brennan

Richard Somers
receiving
The President's Award
from
Ray Trott

Tom [illegible]

Joan [illegible] nk
So[illegible]

The Radio Club of America

89th Anniversary Awards Banquet

November 20, 1998

Maxine Carter-Lome
receiving
The Special Services Award
from
Ray Trott

Reed Fisher
receiving
The Henri Busignies Award
from
Mal Gurian

Joseph Fairclough
receiving
The Barry Goldwater Amateur Radio Award
from
Eric Stoll

The Promise of Wireless

I would like to make some predictions about the future but I understand that part of the tradition of the Radio Club is to reflect on how far we have come. This excerpt is from a Western Union internal memo written in 1876. "The 'telephone' has too many shortcomings to be seriously considered as a means of communication. The device is inherently of no value to us." Obviously, Western Union was right — at least about the telephone's value for them!

Of course today nearly one hundred percent of the people in the United States have telephones. But if I had asked that question in a room like this a century ago, the answer would have been close to zero. Although Alexander Graham Bell got his patent in 1876, it took decades before telephone service in America became even remotely available. It only has been relatively "universal" even in our country for the last fifteen years.

The first exchange in the world — at New Haven, CT — was opened in 1878, just two years after Bell's patent. By 1920, one-third of U.S. households had a telephone. At the midpoint of the century in 1950, only about two-thirds of households had a telephone.

Now fast forward to the present. Service in the United States is now virtually universal with more than 95 percent of people with wired service. Nevertheless, in many other countries around the planet today, only a fraction of the population centers are fully wired together. Believe it or not, most people in the world have still never even made a single telephone call of any kind.

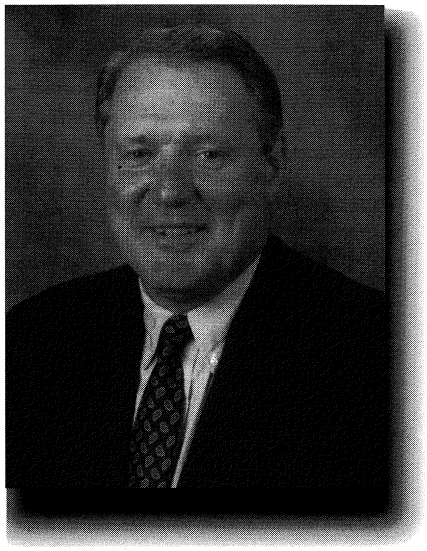
How many people own a radio today? Again, practically everybody. But at the turn of the century, except for a few engineers with experimental crystal sets, the answer would have been nearly zero. I can't pass up this opportunity to quote Guglieimo Marconi, widely thought of as the father of modern radio. In April 1899, Marconi, at the tender age of 25, supposedly said, "the possibilities for wireless radiations are enormous." Marconi made the comment after he had done some ship-to-shore communications for the press during the International yacht races off the coast of Sandy Hook, NJ.

The Mobile Revolution

Commercial radio service today is available almost everywhere on the planet. We even communicate with men and women in orbit using radio waves. The marriage of these two technologies — radio and telephones — eventually created the mobile telephone and a whole new industry during the last fifteen years.

We know that the rate of growth in the wireless industry is skyrocketing. In 1988, there were about two million wireless subscribers in the country. This year, that number has exceeded sixty million. That's a thirty-to-one rate of increase in just ten years. And experts predict one billion customers by the millennium.

The so-called second-generation of wireless technology is generally referred to as personal communications services (PCS). These are all digital systems. They take the basics of analog cellular telephones and add the advanced features of call waiting, call forwarding, caller ID, voice mail — every-



thing you'd expect from a modern fixed network phone, plus a lot more.

At the high-end of digital service is a technology called global system for mobile communications (GSM). This technology is used by more than two million customers in the United States and Canada — including more than three hundred thousand Omnipoint customers — as well as by one hundred twenty million people in one hundred twenty countries around the world. That's more than half of the world's two hundred million wireless subscribers.

In addition to offering seamless international roaming, GSM provides unsurpassed call clarity and privacy. It also makes it possible for customers to send and receive Internet e-mail messages and other data transmissions directly from their mobile handsets, which are getting smaller and lighter and feature amazingly long battery life.

The Cost of Calling

We sometimes forget how quickly the economics of telecommunications has changed. For example, take 1950 — the average blue-collar worker in the United States earned $53.15 a week, or a little more than $1.25 an hour. During that same year, a three-minute long-distance call from New York to San Francisco cost $3.70 through AT&T. There was no choice of carriers back then, of course.

So, the average American production worker had to labor for three hours to make that three-minute long-distance call — an hour-per-minute. It cost even more when you consider income taxes — even though the income tax rate was a mere fraction of today's. Although I was only seven years old at the time, I can remember that a long-distance call was only made for births and deaths in the Schmitt household.

Today, the most expensive three-minute call from New York to San Francisco costs $1.55 – that is the worst rate the FCC could find. The average American worker today earns about $450 a week. Now remember, in 1950, average Americans worked three hours to make that long-distance call. Today, it requires only eight minutes of labor. And if we shop around a bit, a one-minute coast-to-coast call requires less than one minute of labor.

And how about the economics of wireless? In 1950, the comparison is easy. There was no interconnected mobile radio service to speak of. Some Bell Labs folks were just starting to think about the 35 MHz "highway" mobile telephone channels. No amount of money would let you make an interconnected mobile call.

In the early 1980's, AT&T produced the Mckenzie study. It concluded that there would only be one million cellular customers by the year 2,000. (Remember that we already have more than sixty million.) So, during divestiture, the Bell system gave away its wireless holdings to the local operating companies.

I'm sure that Charlie Brown who was chairman of AT&T at the time is still kicking himself over that decision. And by the way, fifteen years later, AT&T paid McCaw twelve billion dollars to get back into the wireless business.

Omnipoint paid a lot less to get into wireless. That's why it is so affordable for our customers. Our

average customer spends about fifty dollars a month with us. The average working person can be an average Omnipoint subscriber for just a little more than four hours of labor a month. It has become so affordable that making a wireless call is scarcely memorable today.

Wireless replacing Wireline

And that is exactly the way it should be — an integral part of everyday life. Just as you don't marvel that the lights come on when you flip a wall switch or that water comes out when you open the tap, our job as a wireless network operator is to provide the same level of sweeping availability.

Some of us have done better than others at that task, but soon there will be more wireless telephone lines than fixed ones. This may happen in Finland first, but it will also occur here sometime in the next ten years.

We are witnessing a phenomenon today known as technology convergence. Telephones, televisions, computers, stereos — whether for entertainment or information — are all coming together on a single device using a single delivery system. It is getting harder to know how to label this thing. The communications evolution — or revolution, depending on your point of view, has caught us all by surprise.

I predict that the next generation of Americans will make or receive the majority of their telephone calls on a wireless device — and do a lot of their fax and data, too. In some countries, such as Sweden, it is already true. In the new generation, many young people graduating from college don't even get ordinary, fixed-line telephone service anymore. Their first and only telephone is a wireless telephone.

This is partly an economic issue. Phone service on the fixed-line network in Europe is expensive. Resources are limited. Ordering new service takes time; second lines are at best difficult to obtain. By contrast, wireless is nearly as cheap. You don't need to wait and your number works all over the country. And if it's GSM, it works all over the world.

Calling Party Pays

Another factor is the cost of incoming calls. Except for the United States, Canada, and Chile, wireless subscribers around the world do not pay for calls they receive on their mobile phones. Calling a mobile phone number is like making any other toll call because the calling party pays. Since incoming calls are free, people are more likely to give out their mobile phone numbers and leave their phones on. This means subscribers are inclined to conduct a much bigger proportion of business and personal conversations on their mobile phones.

It is only a matter of time before Americans will not pay for incoming mobile calls. Some analysts' estimate that "calling party pays" could bring domestic wireless operators more than two billion dollars in additional revenue per year.

And certainly, we expect to see around twenty percent of total mobile traffic as inbound in the United States. On many European systems, that figure is already more than forty-five percent. A few countries are already over fifty percent inbound in some switches.

The conversion to calling party pays will require some consumer education. Callers will wonder why they have to pay for something that was "free before." It will be very helpful when mobile phones in America have their own area code, similar to many other countries.

But the major obstacle for us is the fixed network operators. These local carriers know that by agreeing to bill their customers for calls to mobile phones, many people will stop using their plain, old wired service. As an old Bell system person myself, I can tell you that this is a very shortsighted view.

Let me tell you a story about my own shortsightedness. About fifteen years ago, I was managing the

staff at Pacific Telephone — a little company out on the West Coast. One day, a couple of our senior engineers came to me and asked for an increased budget to install all fiber optic feeder cables and packet switches in our network. I asked why? They said, "we need it to handle the anticipated increase in fax and data traffic." Well, at that time, fax and data accounted for a fraction of our calls, so I kicked them out of my office.

The Promise of 3G

Today, more than half of all fixed network connections are fax and data. They were right. I was wrong. I won't make that mistake again. That's why we're already planning for the development of high-speed packet data leading to the third generation of wireless technology or 3G.

This next step opens the door to some services that have been the subject of science fiction for decades: from full-motion video phones to live e-mail messages to interactive global positioning units — all integrated with voice recognition and artificial intelligence. It fundamentally changes communications with nearly instant information availability.

One promise of 3G technology is higher data speeds. Today's wireless systems are limited to a relatively slow 14.4 kilobits per second. Third generation networks will initially boost data speeds up to 384 kilobits per second and eventually to more than 2 megabits per second.

Although 3G will probably operate on different radio frequencies than the ones we presently use, it will co-exist with and work off of the existing GSM infrastructure.

Another element of 3G is full network interoperability. Today, GSM provides wonderful international roaming — as long as you are on a GSM network. Tomorrow's wireless user might be able to roam on any digital network with full features and services available.

But even before that day comes, there is much more we can do with our present technology. For example, GSM handsets come with a card-mounted computer chip called a subscriber identity module (SIM). This card holds the potential for numerous applications such as point-of-purchase transactions. Imagine charging your parking meter payment or buying something from a vending machine by dialing a number on your handset and having the cost show up on your phone bill. Imagine using your wireless handset to access certain secure locations within a building. This is not science fiction. In some places, it is already being done.

The dean of modern science fiction, Robert A. Heinlein wrote an essay in 1950, which consisted of a series of predictions. Two of them jump out at us today. One was that communism would not survive. The second was that you would carry your telephone with you in your pocket. Heinlein died in 1988. It is too bad that he did not see the Berlin wall come down. But he was around to see the first wireless pocket phone.

Business Challenges

Today we know that miniaturization is hardly challenging at all. The real challenges are not technical. They are business challenges. It's no longer a question of whether we can provide wireless communications everywhere, but how we can make it affordable for everyone.

One of the biggest breakthroughs in our industry has been prepaid service. I am proud to say I pioneered in this area. At first, prepaid service was offered as an alternative for those customers who couldn't qualify for credit. But we quickly learned at Omnipoint, that many prepaid subscribers in the New York area were not poor credit risks. Some were new immigrants with good jobs who simply hadn't been here long enough to establish credit records. Others were credit-worthy parents who wanted to provide wireless phones for their children but not give them an unlimited monthly spending allowance. Still others were wealthy residents who — for one reason or another — didn't want their personal finances examined.

Another challenge our company has faced is growth. When I came to work for Omnipoint three years ago, we had eight employees. Eight. Today, that number is around fourteen hundred. In two years, we went from zero customers to more than a quarter million, and we built more than two thousand base stations to provide coverage for more than thirty-five million potential customers.

Growth is a key factor throughout the wireless industry. Mobile handsets are seen everywhere — in Europe, in Asia and even in the former Soviet

Union. This ubiquitous technology has become a focus of social and political debate. That is why we decided to publish a book, "wireless etiquette," to help our customers deal with such issues.

Issues with Numbers

This new technology raises questions we never had to ask before. For example, until recently, a person's telephone number was associated with a particular location. Area codes identified cities and prefixes specified neighborhoods. So, for example, when you dialed a number that began with 212, you knew it was in Manhattan. And when 684 followed it, you knew it was in midtown.

But today, if the area code is 917 and the prefix is 770, the number might belong to someone from the Upper East Side. But the subscriber could just as easily live in Brooklyn. And with global roaming, that local number you dial might easily ring in Paris or Prague; in St. Petersburg, FL or St. Petersburg, Russia. So the question you have to ask when someone answers the phone in a sleepy voice is "where are you?" Followed by "what time is it there?"

The difference is that the person answering the phone will be the individual you want to reach, not merely the business or residence associated with the number. The good news is that it is becoming easier to reach people directly. The bad news is that we're running out of numbers. The conventional wisdom is that within the next few years, telephone numbers are going to get longer. We have already seen this happen overseas.

France, for example, recently switched to ten-digit dialing. That's ten digits for all calls within the country — local as well as long-distance. It is estimated that with the increased demand for fax machines, modems, and of course, wireless phones, we'll inevitably be dialing twelve or even fifteen digits in the United States.

Does that mean that you'll have to remember such a long string of numerals? Not necessarily. Just as is the case with computer e-mail addresses, telephone numbers could also be converted to a person's name. We are already doing this with voice dialing.

But there is an alternative to making phone numbers longer. We could conceivably make all phone numbers personal. Number portability will help. A person should have the right to keep his or her number forever.

Cutting Wired Ties

Some consumers have already taken the plunge and are cutting ties to landline phones. Manufacturers are starting to see the writing on the wall, too. For example, a number of luxury cars including Cadillac and BMW now come equipped with a wireless phone and global-positioning satellite unit tied in to their 24-hour roadside assistance services. They offer normal voice functions at the touch of a button and activate automatically when the car's airbags are triggered.

The telecommunications industry is changing so quickly that it can make your head spin. Fortunately none of this means the death of radio – a medium that has survived decades of technological breakthroughs – even television.

Those of us in the wireless business today are working hard to get as many new customers as we can and to serve them as well as we can. But, of course, the real joy of this industry is what we're creating for our children.

I'm looking forward to the day when kids ask, "why did phones have wires?" And "why couldn't you see people when you talked to them on the phone?" And best of all, "you mean that all you could do was talk on the phone?"

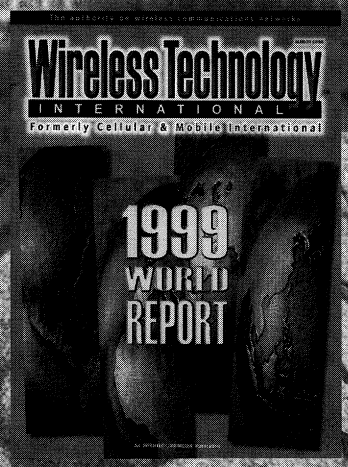
Just how far can we go? When I was a little boy, my father used to read the Dick Tracy comic strip to me as we walked along the banks of the East River here in New York City. As you might recall, Tracy had that nifty two-way wrist radio, so I thought that someday, telephones would be small enough to fit inside a wristwatch. My father told me that it was impossible. I have jokingly said that I would get out of the business when that day came, because I didn't want to prove my father to be wrong. But I might have to delay that decision because prototype watch phones are already here.

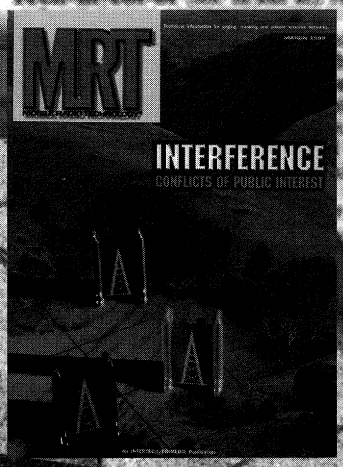
George Schmitt is president of Omnipoint Communications Services, Inc. and executive vice president of Omnipoint Corp. Omnipoint is the largest publicly-traded personal communications services (PCS) company in the United States.

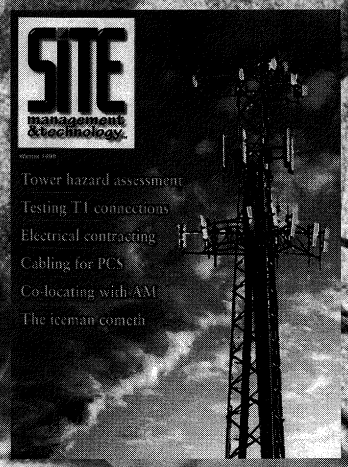
tech•nol•o•gy (tĕk-nŏl' əjē) n. The body of knowledge available to a civilization that is of use in fashioning implements, practicing manual arts and skills, and extracting or collecting materials.

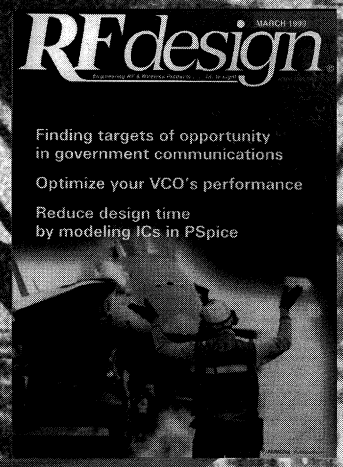
wire•less tech•nol•o•gy (wīr lĭs tĕk-nŏl' əjē) n.

See









In the wireless industry there are many sources for business news and information. But there is only one place to go for the in-depth technology that drives the industry—the Wireless Technology Publications at Intertec Publishing. Dedicated to the technologies and applications shaping the market, *Mobile Radio Technology (MRT), Wireless Technology International, RF Design and Site Management & Technology* are published so that wireless professionals just like you can do their jobs better, faster, smarter every day.

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Response for Fellows

President Trott, directors, members and guests:

It is an honor to be elevated to the status of Fellow of the Radio Club of America and I thank you for the opportunity to speak on behalf of the 1998 recipients.

For the past ten years my wife, Maryann and I have attended this banquet. As kids will do, ours have asked about this long time annual event. I have taken the opportunity over the years to explain to them about the history of wireless communications, and the significant role that the Radio Club has played in its development.

In essence, this is what I have told them. For most of us, next to family, work, is the most important facet of our lives. We spend more time at our jobs then with anything else, unless, of course, you're a golfer. For those of us who have been fortunate enough to have found the right job, in the right industry – it quickly becomes a labor of love.

Industry Opportunities

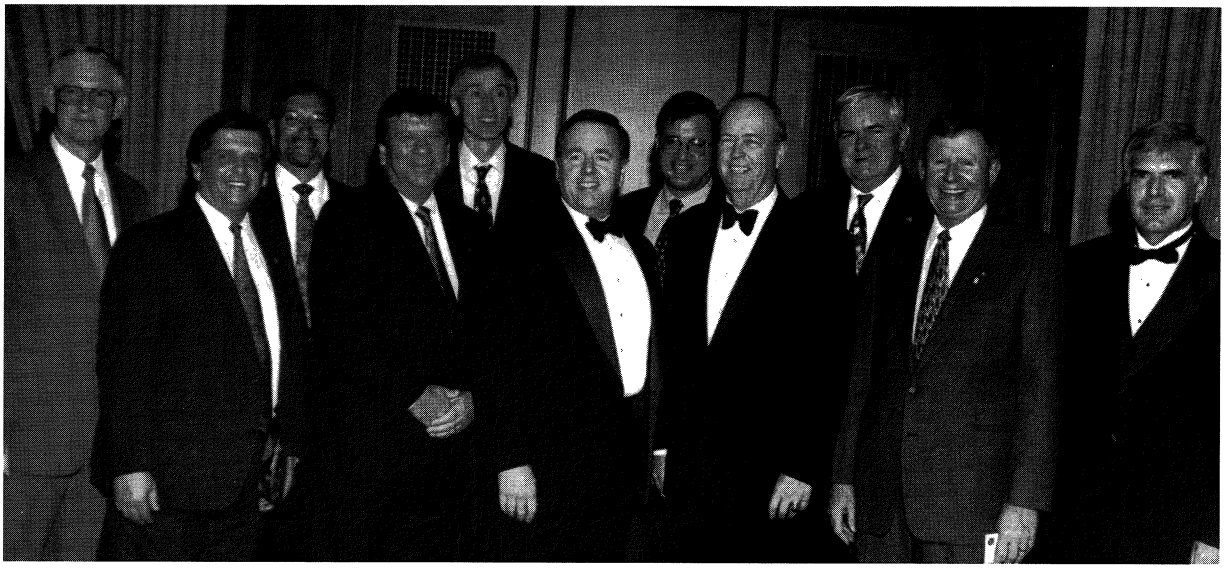
I think most of us will agree – wireless is the right industry and it is a great place to be. In a world that is becoming more trivialized everyday, as illustrated by the vacuous things given media attention and the types of people and professions we financially reward, I am proud to be affiliated with an industry that creates real value for our society. We deal in substance, not pizzazz.

Every time I see an emergency service person being dispatched or a doctor receiving a page or a business person using a palm size wireless device to talk anywhere around the world, I take pride of ownership in our collective accomplishments which have made it all possible. It is a good feeling. I tell our kids that I hope they are as fortunate to find a worthwhile profession in such a productive industry.

Continuing the Tradition

In this rapidly changing industry, the Radio Club is as reassuring as a beacon of light on a dark night. Every year we take this momentary pause for one evening in order to allow ourselves an industry perspective. We take the time to honor those who have gone before us; we pay homage to those members who continue to lead the industry; and we actively seek those young people who will insure our future.

Thank you again on behalf of the 1998 Fellow recipients and be assured that we are committed to carry on the ideals, values and traditions of the Radio Club.



Left to right: Harry S. Ekelund, P.E., Robert F. DiBella, Philip M. Casciano, Bruce R. McIntyre, Thomas M. Traynor, P.E., James J. Healy, Robert D. Perelman, James A. Dwyer, Esq., Joseph McNeil, John R. Ehret, Dale W. Carter

Not pictured: James R. Hargenrader, David A. Leonard, Jack Manon, George F. Munsch, Harold Sobol, Ph.D., Charles P. West, P.E., Ernest J. Worthman, David M. Zumwalt, P.E.

Treasurer's Report for Fiscal Year 1998

(October 1, 1997 - September 30, 1998)

REVENUES

Dues Collected & Applied	$27,991
Other Member Fees	2,718
Banquet (net)	5,673
Advertising Sales	11,730
Pins & Plaques Sales	1,301
Interest on General Funds	6,070
Net Gain on Redemption of Bonds	1,050
Publications Sales & Miscellaneous	535
TOTAL Revenues	**$57,068**

EXPENSES

Publications	
Printing & Supplies	$9,059
Mailing of Publications	2,323
Meeting Expenses	3,730
Office	
Printing & Stationery	1,616
Postage	1,982
Other Office & Computer Expenses	946
Trade Show & Web Site Costs	1,234
Executive Secretary & Other Admin. Costs	17,350
Legal & Accounting	1,100
Insurance	1,627
Pins & Plaques Costs	947
Miscellaneous	875
TOTAL Expenses	**$42,789**
NET Revenues Less Expenses	**$14,279**
Other Adjustments (net) (see note *)	42,019
NET Increase in Fund Balance	**$56,298**

ASSETS

Inventory & Receivables	$9,176
Banquet & Section Funds	29,303
Cash In Bank - Operating	19,968
Investments	
Short Term Money Fund	3,074
Common Stock	38,386
GNMA Certificates	35,079
FNMA Certificate	17,909
FHLM Certificates	54,873
Mutual and Closed End Funds	124,898
Corporate Bonds	20,190
US Government Bonds	90,117
TOTAL Assets	**$442,973**

LIABILITIES

Prepaid Dues	$23,017
Accounts Payable	3,732
Scholarship Funds - Principal	229,855
For Distribution	18,057
General Funds - Operating Balance	91,193
Reserve for Operating Deficiencies	23,074
Life Member Fund	29,844
Legacy Fund	12,469
Other Assets & Liabilities (net)	11,731
TOTAL Liabilities	**$442,973**

* Other adjustments include contributions to funds, scholarships and grants awarded, earnings on funds and changes in values of investments. Interest rate sensitive investments increased in value by $7,107 during the fiscal year

SCHOLARSHIPS & GRANTS FUNDS

	Capital	Available for Distribution	Totals
Opening Balance October 1, 1997	$198,765	$16,013	$214,778
Contributions	31,090		
Interest Earned		14,544	
Scholarships & Grants Awarded		(12,500)	
Ending Balance September 30, 1998	**$229,855**	**$18,057**	**$247,912**

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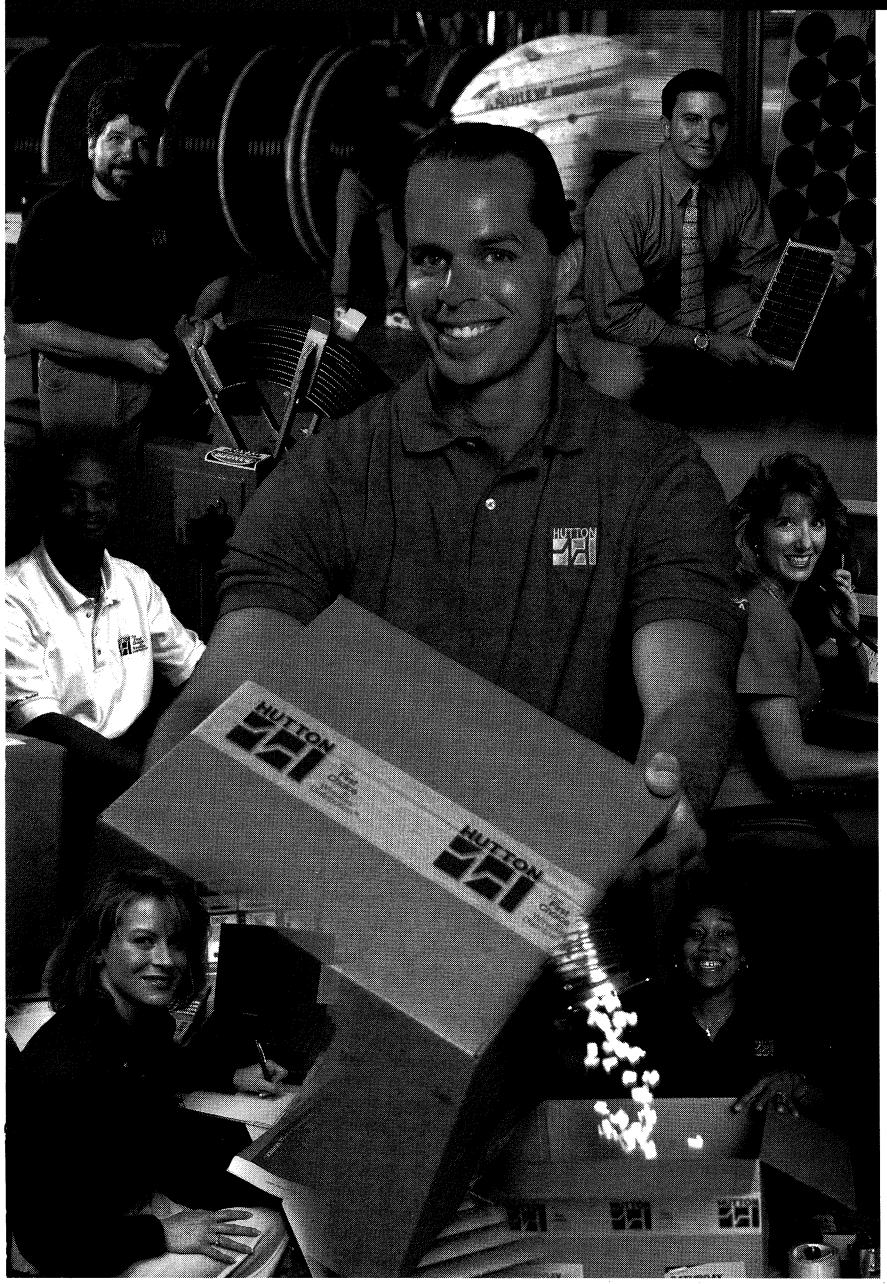

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1930	Louis G. Pacent
1931	Harry Sadenwater
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1933	Charles W. Horn
1934	Harry W. Houck
1935-1936	Ralph H. Langley
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1939	Paul F. Godley
1940	Keith Henney
1941	John L. Callahan
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1994	Mal Gurian
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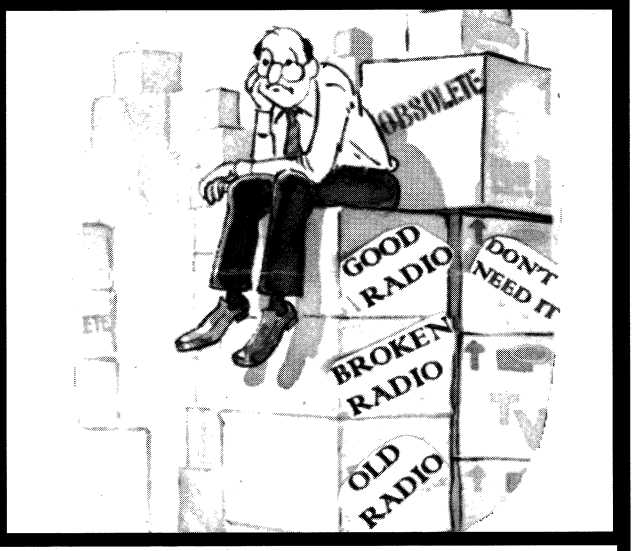

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