PROCEEDINGS of

THE RADIO CLUB OF AMERICA, INC.

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

SPRING 2001

Al Gross: The Passing of a Legend

Also in this issue:

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SPRING 2001

THE RADIO CLUB OF AMERICA, INC.

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

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By Steve Aldinger

Preserving the Past Preparing for the Future

From time to time, people have asked me to explain what the Radio Club is about. This has occurred more frequently lately, as acquaintances have learned of my elevation to president. Due to my experience on the membership committee, I usually reply that many simply join for social reasons, to be part of a prestigious industry association where they can periodically break bread with their peers. And, yes, the reference to an RCA membership also looks good on the resume. Some, like me, are particularly interested in the living history that the Club represents. For them, there is immense satisfaction in being able to meet and talk with the pioneers of wireless, who built the foundation of the major global industry we have today.

Recently, I've given more thought to my response about what the Radio Club does. This was driven by my desire to have some clear goals for the Club for 2001. Over the last two months, I've talked with many members about what the Club is as well as what they think it should be. I've refreshed my memory of the constitution and bylaws including the specifically stated purpose of the Club "to study and contribute to the development of radio communication". This brought me to the conclusion that The Radio Club of America is about preserving the history of wireless and preparing for its future.

All of the Club's major activities support one, or both, of these objectives. The Club's own records provide a rich history of the evolution of wireless, as our members are the inventors and implementers of many radio and TV innovations. The Radio Club's grants-in-aid program provides scholarships to deserving technical students, playing a role in the preparation of tomorrow's workforce.

Many of the Club's activities simultaneously support past and future. Our *Proceedings* discuss technical advances and lead the way to new wireless applications, while the *Proceedings* archive provides a detailed technical history. The Technical Symposium, held in conjunction with the annual banquet, dedicates part of its agenda to past accomplishments and part to future technologies. And our annual awards program honors significant wireless achievements, past and present, of members and non-members alike.

So, getting back to those goals for 2001. I would like the general membership to be more active in Club activities and support our efforts to preserve the past and prepare for the future. Go to our website (www.radio-club-of-america.org) and check out the various committees and the work they do. If something strikes your fancy, contact the chairman and discuss joining or at least volunteer for a limited time or special purpose. At the next RCA trade show breakfast inquire of other members what activities are underway to which you might contribute. And last, but not least, provide input to the committee chairs and Club officers on opportunities of which you are aware that would allow us to "contribute to the development of radio communication".

Why should you become more involved in RCA activities? Besides the altruistic satisfaction of giving something back to the industry that supports you, there is at least one other good reason. Members have found that helping the Radio Club can help them further career goals. It can't hurt to join other industry leaders in being an active part of preserving the wireless past and preparing for the wireless future.

By Gloria Everett

Keynote Address

Delivered by Gloria Everett, executive vice president of operations and sales for Globalstar LP

I would like to thank you all for inviting me here. When you are introduced as having more than 30 years experience in telecommunications, it's not easy to lie about your age. I realize that only a few of you in this room are as old as I, and for the rest of you, don't worry, it just keeps getting better. These have absolutely been my "fabulous fifties".

I have never really experienced life as I do now. I have experienced so much change and so much excitement and seen my children grow up. But perhaps the most important reason is because of the excitement of working in this industry.

> *Telecommunications and radio especially, have enriched the lives of more people in the world, in more ways, than any of us can possibly imagine.*

The Demand for Telecommunications

Telecommunications and radio especially have enriched the lives of more people in the world, in more ways, than any of us can possibly imagine. As a youngster getting through the static on the ham radio and suddenly hearing somebody from across town or across the country or across the world, was so very exciting.

We take voice telecommunications mostly for granted today, particularly in this country. However, there are more than 3 billion people who lack basic telephone service in the world today. According to the ITU, 50 million people are on registered waiting lists for telephones. There are significant areas of the world that have no cellular service, estimated to be about 3.6 billion of the population.

In the United States, about 50 percent of the landmass does not have cellular. That is an interesting statistic. Only 5 percent of the landmass in Australia has cellular service and there are more than one million people living in the outback with little or no coverage, at all.

Some examples of things that are going on today that I am familiar with are payphones that are wireless that are actually using satellite. In Central America, these payphones are actually fixed units in the little villages and in the stores and they charge the user 75 cents equivalent a minute for a call. The storekeeper has to pay the satellite provider 65 cents a minute for the call. The storekeeper actually uses a stopwatch to time the call. And the storekeeper has never made as much money as he is now on that 10 cents a minute. People for the first time are able to communicate with other people and family around the world.

It may never be economically practical to build out traditional cellular infrastructure in Brazil, China, Russia, Eastern Europe, parts of Canada, Mexico, Alaska, and even Colorado or the state of Washington. There are 11 different cellular operating standards worldwide. So if we still look at cellular and we still pray for 3G, it is still going to be a time before cellular as we know it today is really ubiquitous.

Bottom line, the estimated market for mobile satellite services (MSS) worldwide is between 30 and 40 million users. Is there a market for mobile satellite services? You bet there is. And there is room for a number of players. We are not worried about competition. In fact, the worst thing that can possibly happen to GlobalStar is for Iridium to go bankrupt. And I'm just talking about voice, let alone data.

There is room for the geo-stationary (GEO) type satellite system and there is room for the low-earth orbit (LEO) satellite system. We know that GEO systems today are used for television, voice and data applications. I will focus on voice and maybe some data applications. I was warned not to use this platform to sell the GlobalStar phone. But you'll have to forgive me because the only low-earth orbit satellite system that is being used today commercially is GlobalStar. And so I am going to have to use the GlobalStar LEO technology, as a point of reference.

For voice in the GEO system today, some of the experience would show with their voice latency there is delay. It relies on a single satellite. There is limited geographical coverage. But in spite of these difficulties, systems like ACES which just turned up service and is now serving Asia, is not too bad.

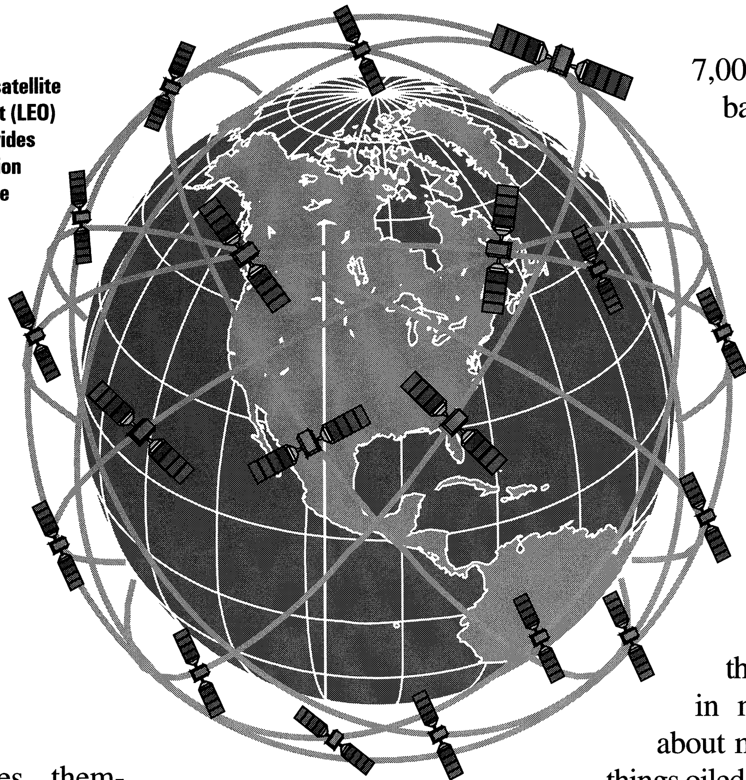
I don't know how many of you have been able to use it. There is a little bit of a delay and it's not the highest quality but it isn't bad. The phone is smaller than this one. It serves the Asian market and it is a dual-mode. It serves GSM cellular as well as satellite. It is mostly voice but it will be offering paging across the Internet. It will offer fax and data in the near future. Plans for the coverage are as much as 11 million square miles and it plans to be able to roam on the GSM system. And that is a GEO system.

Thuraya is not in service yet, but they are making some very big splashes now. It plans to be a voice system and it will offer short message services, data, fax and GPS for location. It is planned to launch late next year. The target markets are primarily Europe, Africa, the Middle East, Central Asia and India. The GEO systems are making headway with voice.

GlobalStar's Satellites

Let me talk for a bit about the LEO's or low-earth orbits which, are the ones that I know the most about. Let me talk about GlobalStar and what we have and what the LEO is like. There are currently 48 satellites in orbit that are actually providing commercial service today. In addition to the 48 there are 4 imported spares which makes a total of 52. They are about 1,414 kilometers up — that's about 763 nautical miles. It takes about 114 minutes to make one orbit around the earth. They actually cover the earth between 7 degrees south to 70 degrees north latitude so no, they do not cover the pole.

Almost always, there are least two satellites in sight, most often there are three. It is based on a CDMA [code division multiple access] technology so therefore there is cap diversity which means that you do not always have to have line-of-sight to one satellite. It has very high signal quality and availability. And it has of course, a dynamic power control etc, that you would expect from a CDMA system.



The Globalstar 48-satellite low earth orbit (LEO) constellation provides wireless communication services including voice and data, paging and messaging to areas of the world under-served by existing terrestrial systems.

The satellites themselves are not very large. They are made in a trapezoid type of configuration. The reason that it is a trapezoid configuration is so that we could put four of them on a launch vehicle at the same time. You don't have to remind me that we tried to launch 12 and we lost all 12 two years ago. After that, we only launched four at a time and we were successful every time until we got to 52.

There are two solar panels. The satellite is three axis stabilized and consists of a trapezoidal type main body. There are two deployable solar panels and if you go from wingtip to wingtip, it is about 439 inches. The actual satellite in the middle is only about 70 inches. They are really quite small. The satellite mass is approximately only 450 kilograms and it requires only about 1,100 watts of power for normal operation. It was originally designed to last seven years but because we have not lost a satellite since the initial launching in 1998, we now look at the life as being ten years, which is very good news for us.

In terms of the bands, the user to the satellite links, we use the L and S bands for the user link, about 1,600 MHz from the user to the satellite and then from the satellite back to the user terminal it's around 2,500 MHz. We use the C band for the feeder link which is 5,000 MHz to 5,200 MHz for the gateway to the satellite and then 6,800 MHz to 7,000 MHz from the satellite back down to the gateway.

The satellite antennas are configured with the typical 16 fixed array. The user terminals are on the directional and the amp antennas move. This has been very interesting for us. We currently have about 23 gateways in operation. The gateways have from three and four antenna dishes. You realize that these dishes have to follow the satellites so they are always in motion. One of the things about maintenance is to keep those things oiled. I'm an operations person before I'm a sales person and it is interesting because we know that we have to pay a lot of attention to the antennas because they are clearly always in motion.

A Look Back At Cellular

If you look at what is going on with the LEO, we are able to offer services within fixed and within mobile. What is next? Let's go back to the beginning of cellular. I was the director of engineering when we deployed the analog system in St. Louis for the1984 Olympics.

For those of you involved in cellular then, if you recall, we put in very high antennas. We put in as much power as we could, we put them high and we covered as much territory as we could because it took a long time to get antennas built and we didn't have a demand problem. We also didn't have any capacity issues. So that is what we did initially.

And then what happened? We got the demand. People didn't think that they would ever want a phone in their cars and suddenly cellular took off. So when there was a need, what we had to do was to lower these antennas. I am quoted back in 1984 as saying, "We will never be able to have cellular antennas less than one mile apart."

That was because of the interference. Of course today, they are blocks apart and buildings apart. What happened due to the people in this room and

many of our colleagues? We improved radio. We actually have better interference management, we have power control and the hand-off algorithms became such that we could hand-off much faster.

We were actually able to make them closer together and improve the technology. We were able to provide not only analog but we were able to provide digital — GSM, TDMA and CDMA — and who knows what is next? Data was developed and we see people using data, particularly in the GSM environment.

Complementary Satellites

Now the advantages of GEOs are supplemented with the advantages of LEOs. We see that the latency issues probably will be overcome. How? I'm waiting for one of you to find out for us. The multipath diversity is there with LEOs. We know that the line-of-sight limitations have been overcome because of path diversity. And GlobalStar will offer packet data at 9.6 kilibits per second (kbps) in December. You will be able to put a regular card in to your PC and you'll be able to actually access e-mail and the Internet. We have been doing that in trials already.

Now it is only at 9.6 but an amazing thing happened. Rockwell came to GlobalStar and said, "Could you help us? We want to have e-mail and Internet access on our airplane. We want to have live television broadcasts on our airplane. We looked at that and basically with multichannels literally putting 32 channels of 9.6 kbps together, we were able to increase the speed to 200 kbps.

In September in San Diego, we actually demonstrated at 30,000 feet in the air, Internet and e-mail access on PCs on an airplane. We were able to use the GEO satellite in order to use LEOs to get down to the earth to say which TV program do you want to watch? And then you use the GEO's to transmit or broadcast that TV show live.

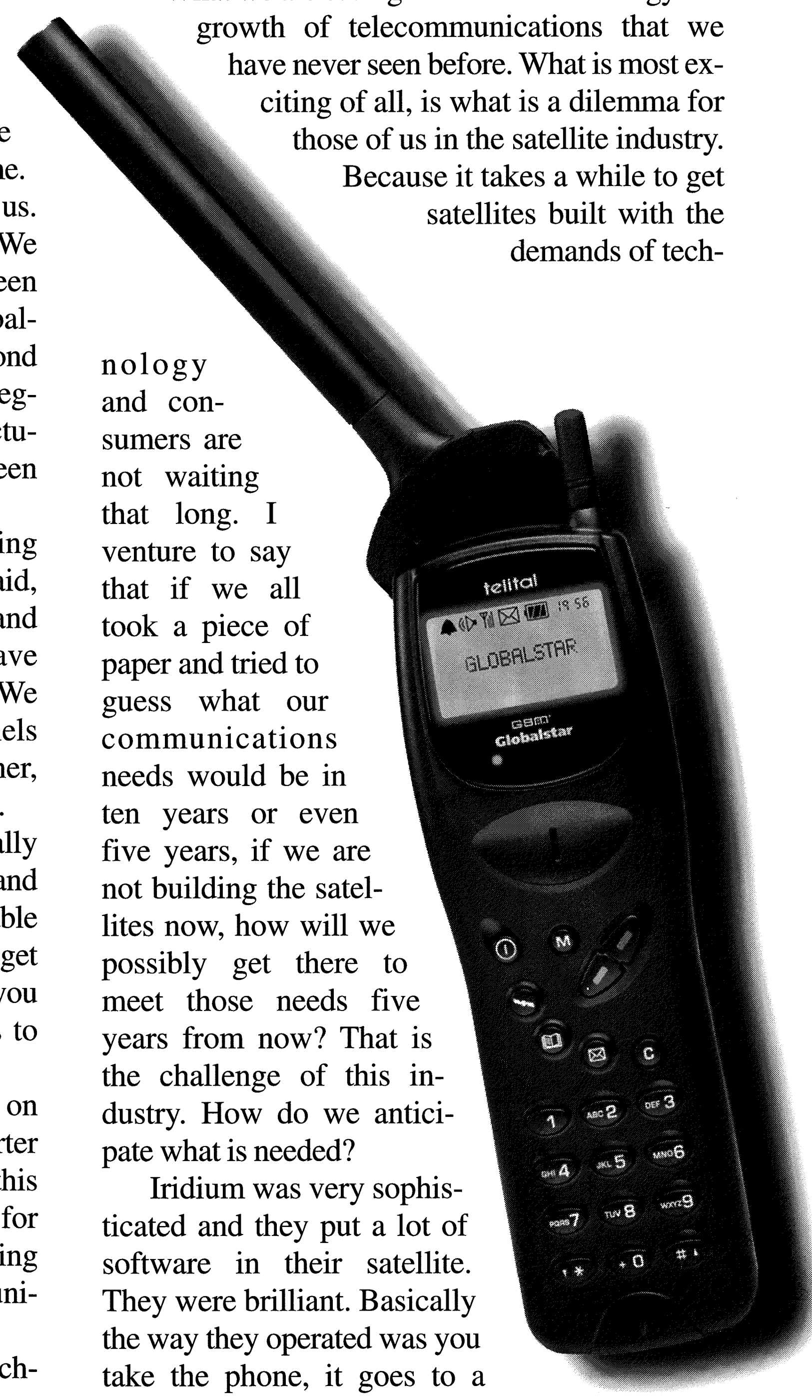
We hope that we will be able to trial these on some planes as early as the end of the first quarter next year. But clearly by the end of the year, this will be available. Other agencies are looking for additional aeronautic kinds of things happening with satellites and particularly with telecommunications satellites.

It is the combination of the GEO and the technology. Just like this phone is the combination of analog, which is what I had to use in New Orleans two weeks ago because they didn't have CDMA available. I could use CDMA in this room on this phone and I could use the satellite portion of this phone if I were to go outside or if I were to go to a remote area.

I thought you might like to see this phone, it does look terribly big doesn't it? Basically though it is not much bigger than my cordless at home.

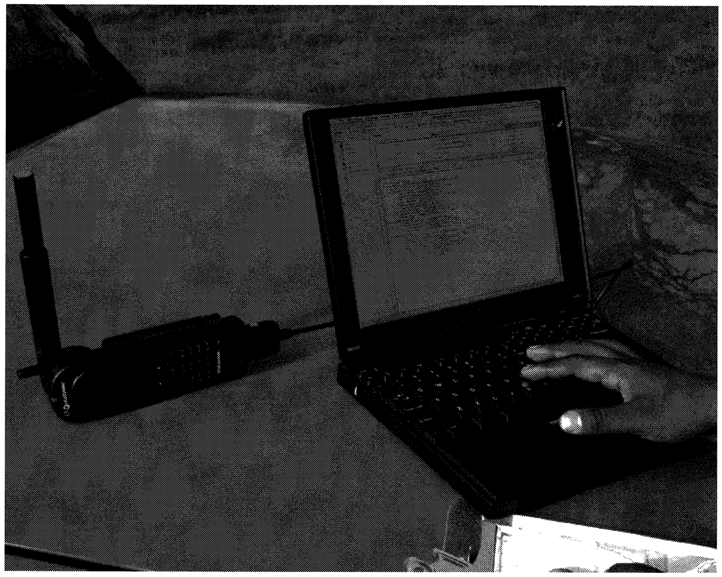
What we are seeing in satellite technology is a growth of telecommunications that we have never seen before. What is most exciting of all, is what is a dilemma for those of us in the satellite industry. Because it takes a while to get satellites built with the demands of technology and consumers are not waiting that long. I venture to say that if we all took a piece of paper and tried to guess what our communications needs would be in ten years or even five years, if we are not building the satellites now, how will we possibly get there to meet those needs five years from now? That is the challenge of this industry. How do we anticipate what is needed?

Iridium was very sophisticated and they put a lot of software in their satellite. They were brilliant. Basically the way they operated was you take the phone, it goes to a



satellite and if you are calling China, basically it never hits the ground again until it gets to the gateway nearest China and it completes the call. That means you have to pass all of the information from satellite to satellite all the way through and those satellites are moving. And if by chance, have some software fail on one of those satellites in the meantime, your call fails.

In our case, we have what people call down satellite. I'm not really a satellite person although I work with a lot of rocket scientists, I'm still pretty much a ground person. In our case, what we do is the call goes up to the satellite, it comes down to the nearest ground-station and to procure the nearest groundstation you have two choices: one is Clifton, Texas and the other is Smith Falls, Canada. It comes down to Clifton and uses the landline network to complete the call. So whether I'm calling Russia or California or the Middle East, it will basically use the landline network to get there. That is basically how the system works so that all of the software is in the groundstation. That is how we are able to do data.



Future Challenges

So what are we going to do to meet broadband requirements as well as those in the future? That really is our challenge and for the entire industry. It is not easy to predict what is needed. All we know is that we need a lot more spectrum efficiency. The limiting factor is the spectrum. How broadband can we be? How can we continue to offer more frequencies to those who need them? And some of you in the room will help to decide that.

Having said that, it is a very exciting place to be and we are finding more uses for the technology as it exists today but we are looking for those secrets. Who would have thought that the Internet would be here, that e-mail would be here and it would be literally free?

How are we going to continue to make money with the challenges before us? I am pleased to see the young people who have won scholarships. They are basically going to provide the answers for us and we will continue to all share the knowledge that we have. It is an exciting time for satellites because I believe that they are a major part of the future, they are a major part of bringing peace to the world so that we can share communications. The world is excited about being able to use telecommunications and it is interesting that even Russia, where we just turned up the last gateway so we cover the entire country, is asking for data.

Not only will it be easy to have Internet access and e-mail access but part of what the satellites are going to be doing in December is telemetry. Interestingly enough we almost closed on a deal with a major train company and a major construction company to use telemetry on their tractors back to their home office using the satellites to tell them when maintenance is required. So it is a data type of application. We know that this is a worldwide application that really does require satellite technology.

This is an exciting place to be. Please keep the excitement, keep the smile and the enthusiasm that the radio people of this world have always had and you have done that without the accolades. I think about fiber when people used to get so excited and hyped and for some reason they never got as hyped about radio. And yet isn't it interesting that it is wireless? Thank you again and have a wonderful evening.

By Rikki Lee

Radio Club Holds 91st Fete

Call it "the dinner of champions." Surrounded by plaques displaying the winners of numerous sports competitions, a few hundred Radio Club of America members and their guests gathered at the New York Athletic Club on November 17 to recognize outstanding pioneers. Despite ushering in the waning days of the first year of a new millennium, RCA's 91st annual awards presentation remained steeped in traditions of formal attire and a multi-course banquet.

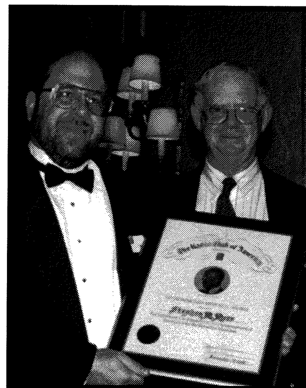
With roots in an age when "wireless" meant "telegraph," the Radio Club of America promotes cooperation among those interested in the advancement and scientific study of radio communications. The association's membership spans multiple generations and covers the spectrum of RF industries, from radio and TV broadcasting, two-way and amateur radio, paging and messaging, and wireless voice and data.

At its annual dinner, RCA gives awards named in honor of RF luminaries from days gone by. Among this year's winners:

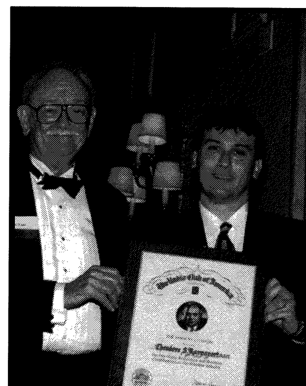
• The Special Recognition Award: radio engineer and inventor Jerry Minter, for 57 years of service to the Radio Club;

• The Jack Poppele Broadcast Award: third-generation WOR Radio talk-show host John Gambling, for long-term contributions to broadcast improvements;

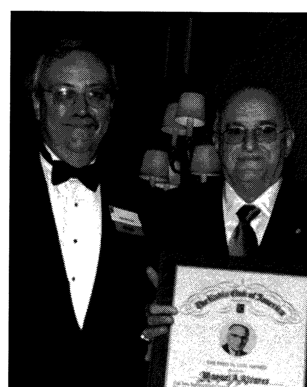
• The Ralph Batcher Memorial Award: U.S. National Marconi Museum Chairman Raymond Minichiello, for sub-



THE HENRI BUSIGNIES MEMORIAL AWARD
Stephen M. Meer

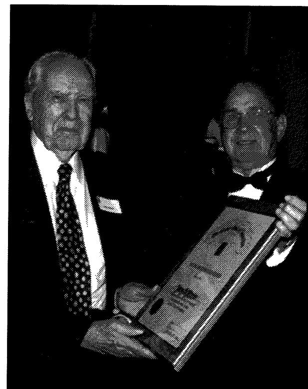


THE SARNOFF CITATION
Theodore S. Rappaport

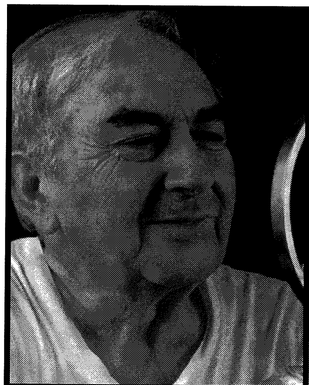


THE FRED M. LINK AWARD
Manuel A. Alvarez

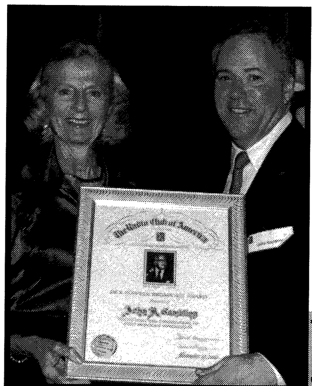
THE BARRY M. GOLDWATER AMATEUR RADIO AWARD
Jim C. Hirchman, M.D.



THE SPECIAL RECOGNITION AWARD
Jerry B. Minter



THE RALPH BATCHER MEMORIAL AWARD
Raymond Minichiello



THE JACK POPPELE AWARD
John R. Gambling

stantial assistance in preserving the history of radio and electronic communications;

• The Henri Busignies Memorial Award: SCC Communications Corp. Co-founder, Vice President and Chief Technology Officer Stephen Meer, for significant contributions to the advancement of electronics for the benefit for mankind;

• The Fred M. Link Award: Beam Radio Inc. President Manuel Alvarez, for substantial contributions to the advancement and development of land mobile radio and communications;

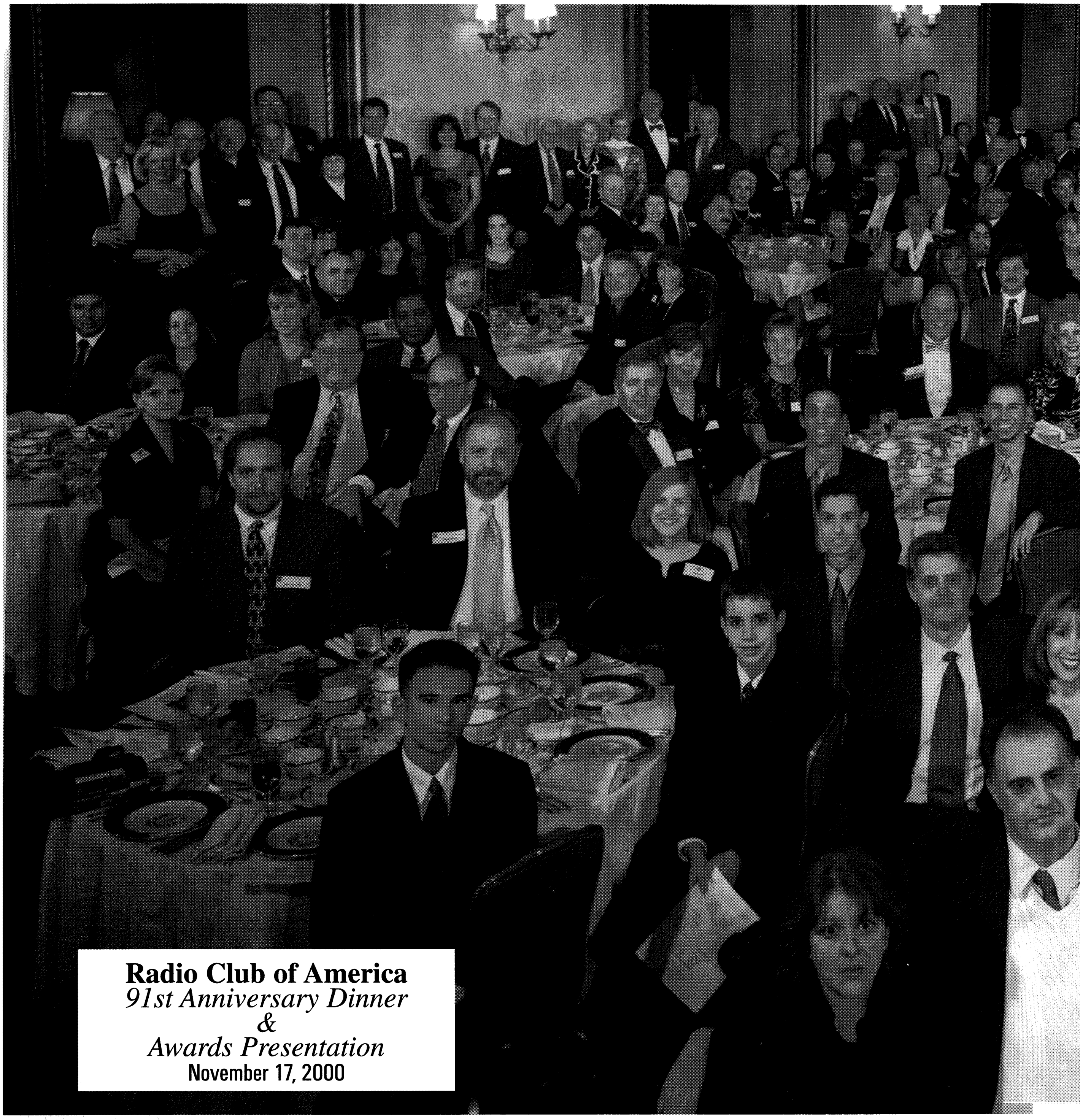
• The Sarnoff Citation: Virginia Tech's Mobile & Portable Radio Research Group Associate Director and Founder Theodore Rappaport, for major regulatory and business contributions to the wireless industry;

• The Barry M. Goldwater Amateur Radio Award: life-saving ham operator/physician Dr. Jim Hirschman (K4TCV), for major contributions to the amateur radio service.

The Radio Club also inducted 17 members to the grade of fellow, including former APCO President Joseph Hanna; analysts Andrew Seybold and Jane Zweig; marketing consultant Bob Chapin; former CTIA Senior Vice President Elizabeth Maxfield; attorney Leonard Kolsky; and RF engineer Richard Biby.

Not just looking into the past, the Radio Club also glimpses into the future of RF technology via its keynote speakers. Wireless veteran Gloria Everett, executive vice president of operations and sales for low-Earth orbit mobile satellite services firm Globalstar LP, delivered an upbeat message about her company's offerings. She cited statistics that validated the need for mobile satellite services (MSS), such as 3 billion people (half the world's population) living without basic telecommunications and about 50 percent of the U.S. land mass not having cellular coverage. "It may not be feasible for traditional cellular in some parts of the U.S.," Everett said. She estimated the global addressable MSS market as 30 million to 40 million customers.

Before closing, RCA Director and PCIA President Jay Kitchen boasted about how the awards dinner kept within its three-hour time allotment - demonstrating yet another of the radio society's winning ways.



Radio Club of America
91st Anniversary Dinner
&
Awards Presentation
November 17, 2000

By R. Scott Baxter, Fellow Respondent

Response for Fellows

President Brennan, directors, distinguished members and our guests:

Good evening. It is a pleasure for a "boy down under" to respond on behalf of the Radio Club's Year 2000 Fellows. I am honored to have been made a Fellow of the Radio Club of America, the industry's oldest and most prestigious society.

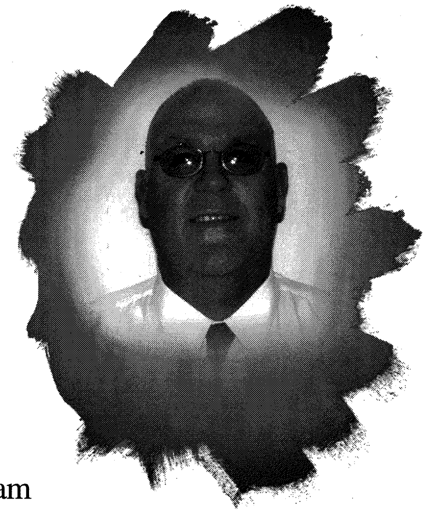
In his address in 1998, I read that Philip Casciano said, "We spend more time at our jobs than at anything else, unless, of course, you are a golfer." Well, I am a golfer, as I imagine many of you are. I am grateful that my colleagues in the radio industry have continued to explore the potential of radio technology so that you and I can enjoy this outdoor pleasure while still keeping in touch via pager/cell phone, etc. Australians thoroughly endorse the philosophy of mixing business with pleasure.

FELLOW AWARD RECIPIENTS:

Back Row (left to right): Roman Kikta, Scott E. Slater, Andrew M.Seybold, Robert C. Chapin Jr., Andrew A. Conte, Bruce S. Marcus, Joseph L. Hanna and Robert Harvey

Front Row (left to right): Leonard S. Kolsky, Rikki T. Lee, R. Scott Baxter, Jane Zweig, Elizabeth F. Maxfield, James M. Mozley and Mortimer Rogoff

Not Pictured:
Douglas M. Aiken, Richard P. Biby, William J. Byron



Americans and most of the world tend to consider their own continent as the focal point of the planet. We Australians tend to think the same about our own ocean bound continent. Recently, over a two week period, Australia was the focal point of the world with more than 4.5 billion people viewing daily what went on in my own home state.

Australian expertise ensured quality presentations using satellite technology so that you could watch Maurice Green - the fastest man, Marion Jones - the fastest woman, Ian "Torpedo" Thorpe - the greatest swimmer, and Kathy Freeman, our pride and joy, thrill the world with their performances. The Sydney 2000 Olympic Games allowed Australian engineers to showcase their talents to the world.

I have been involved for more than 30 years in the radio communications industry down under and I am privileged to have played a part in an industry that has made the greatest advancements of all time in technology. You and I are fortunate to have lived in this era.

In the new millennium - who knows what's ahead? On behalf of the Year 2000 Fellows and our predecessors, I commit to continue to research and develop the emerging technologies.

2000
BANQUET CONTRIBUTORS

We acknowledge with thanks the support of the following persons and companies to whose contributions may be attributed the success of the banquet.

Air Comm

Allen Telecom/Decibel Products

AMTOL Radio Communications Systems, Inc.

ArrayComm, Inc.*

Aurora Marketing Company

Beam Radio

C. Meade Sutterfield, *Fellow*

Carroll Hollingsworth, *Fellow*

Charles Adams

Christina Larsen, *Fellow*

Components Corporation

Denise Archer

Dettra Communications, Inc.

Dr. Eric D. Stoll, *Treasurer RCA*

George Jacobs, *Fellow*

Hutton Communications, Inc.

Intertec Publishing Corp.

John E. Brennan

Jonathan C. Kummer

June P. Poppele, Fellow - *In memory of Jack Poppele*

Kahn Communications, Inc

LBA Group, Inc.

Lloyd B. Roach

Lorraine Poppele Flower - *In memory of Jack Poppele*

Manon Engineering Inc.

Mobile Radio Technology

Mountain Union Telecom

PanData Corporation

PMC Associates

Radio Frequency Systems

Radio Resource

RadioMate Corporation

Regional Communications, Inc.

RF Design

Richard F. Kirby, *Fellow*

RJR Wireless

Roger Block, *Fellow*

Roman Kikta

Scala Electronics

Site Management & Technology

Tele-Measurements, Inc.

Telewave, Inc.

Terry G. Daniels

Thomas H. Traynor

Trott Communications Group

William O. Hunt Investments

Wireless Marcom

Wireless Review

Wireless Valley Communications, Inc.

Wireless Week

** Cocktail reception co-sponsored by ArrayComm, Inc. and the Radio Club of America*

By Roger Lesser

Al Gross: The Passing of a Legend

You may have heard a lot about who may have invented the communications devices that we depend on as an afterthought today. Well, if there is any question as to who that was, let me settle it here. His name was Al Gross.

I first heard from Al following an article I had written about government communications. The focus was mostly on military communications and that's what got Al's attention. He called me after reading the article to just talk about it. I didn't know who he was and thought he was just a design engineer and a reader. That is until he began to tell me about Joan and Eleanor.

Prior to World War II, while most designers concentrated on frequencies under 100 MHz, Al was looking at higher frequencies. He demonstrated it was possible to develop miniaturized components and built a number of battery-powered handheld transceivers. Some devices operated at 300 MHz and had a range of up to 30 miles.

Then WW II came.

The Office of Strategic Services (OSS) (the forerunner of today's CIA) became aware of Al's work and invited him to join them. The OSS was in desperate need of a way for their agents working in occupied Europe to communicate without being caught by the Gestapo. That's when Al came to the table with a two-way radio system he called "Joan and Eleanor."

The system allowed agents to transmit a signal up to high-flying aircraft without spreading the signal out. This kept the Nazis from using triangulation to pinpoint the agents' location. As head of the project, Al made the system a reality by developing a miniaturized receiver circuit. Yet, it wasn't until 1976 that the public became aware of the system when documents from the era were declassified.

In 1949 he developed the pager and in the 1950s wireless mobile telephony.

Ahead of his Time

Al was a visionary. Following the war, Al's energies focused on personal communications. In 1949 he developed the pager and in the 1950s wireless mobile telephony. But, as he told me, the world was not ready for such devices.

But they were ready for one of his futuristic concepts. In 1948 Chester Could, the cartoonist of Dick Tracy, came across Al's wristwatch transmitter. He asked Al for permission to use the concept in Dick Tracy cartoons. Al gave his permission, and the rest is cartoon history.

Al was very much an amateur radio buff (W8PAL, SK) and member of the National

Association for Amateur Radio. According to Fred Maia's The W5YI Report, Al's interest in radio began when he was only 12 when he turned his parents' basement into an amateur radio station. To show just how much of an innovator Al was, the equipment he used came from a junkyard.

A Diverse Legacy

Of course, Al won a number of awards. These included a presidential commendation from President Reagan in 1981, the IEEE's Century of Honor Medal in 1984, and the Marconi Gold Medal in 1995. The first time we talked, he mentioned he had just won the 2000 Lemelson-MIT lifetime achievement award and recognition from the FCC for his life's work. It goes without saying there were a number of other honors.

Al and I only talked a few times, but I was so impressed by his open-mindedness and insights concerning today's technological advances, that I invited him to join the *RF Design* editorial board. He accepted, but before we could make it a reality he passed away on Dec. 21, 2000, at the age of 82.

I've been fortunate enough to meet a number of heroes. They range from Douglas Campbell (WW1 ace) and Jimmy Dolittle (Medal of Honor winner and the first to demonstrate instrument flying) to Mercury astronauts Alan Shepherd and Wally Shirra to Fred Link (communications pioneer) and Chuck Yeager (WWII ace and first man to break the sound barrier). These men shared one thing in common-they were humble about their achievements. When I met Dolittle, I was so awestruck that I couldn't even say hello. He reached out for my hand and said, "Hi, my name is Jimmy."

When I received the call from Al, he said, "Hi, my name is Al. I'd like to talk to you about your article." No pomp. No assumed spin on their achievements. They were just men who did what they did best and made the rest of us thankful for their coming into our lives, even if we didn't know it. Without Jimmy, we wouldn't have instrument flying and avionics today. Without Al, we'd still be talking on the "long line."

And we probably haven't heard the last about Al's advances in design. Don Bishop, editorial director for *RF Design,* said there are probably other things he designed that are still classified. I hadn't thought of it, but I bet he is right. Joan and Eleanor is probably just the tip of the communications tower in his designs.

So the next time you check your pager, use your cell phone or use a mobile radio, do me a favor and just give a nod toward heaven as a way of saying, "Thanks, Al."

Finally, in honor of his contributions and as *RF Design's* way of saying thanks, Al's name will appear in our editorial board lineup for the remainder of the year.

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By Dr. Max C. de Henseler, HB9RS

On Marconi's Trail in Switzerland

From an early age Guglielmo Marconi was interested in science. During his late teens, while at his home in Pontecchio on the third floor of the Villa Griffone, he worked relentlessly in his experimental laboratory trying to transmit a wireless message using electromagnetic waves.

In the book *My Father Marconi,* Degna Marconi recalls that the Marconi brothers spent part of the summer of 1894 in the mountains of Biellese in the Italian Alps of Lombardy, at a remote and charming place called Santuario d' Oropa. One day Guglielmo was reading an Italian scientific journal probably borrowed from the university library of Bologna. The journal contained an article written by Augusto Righi, whose lectures Guglielmo had attended the previous winter in Bologna. The article was about Heinrich Hertz's extraordinary work with electromagnetic waves. Hertz had recently died on January 1. Reading the article was a turning point in Marconi's life.

> *According to Maurice's account of the experiments, Marconi was stationed on top of "La Pierre Bergère" with a small transmitter, while Maurice gradually moved further away with a receiver which sounded a bell when a signal was received.*

Experiments in Salvan

Once he returned to Pontecchio, Marconi worked more intensively than ever. By the end of the winter in early 1895 after some encouraging trials, Marconi was ready to experiment outdoors, especially in mountainous areas. During the summer months of 1895, Guglielmo and his brother Alfonso went to the Alps to spend their vacation in the renowned Swiss health resort of Salvan.

Located less than one hundred kilometers away, as the crow flies, from Santuario d'Oropa and nestled in the Swiss Alps about 7 kilometers north-west of the town of Martigny, Salvan is a small village of 1,500 inhabitants. In 1895, the only way to reach Salvan was a mule ride of several hours from Vernaya, down in the valley. Today it is only a few minutes from Martigny by road or by the "Mont-Blanc Express" train.

When Marconi reached Salvan, he was a summer tourist like nearly everyone else except that he transported with great care some strange apparatuses which intrigued in particular, a ten year old boy named Maurice Gay-Balmaz. Maurice became

Marconi's assistant and perhaps the person who held the first antenna.

According to Maurice's account of the experiments, Marconi was stationed on top of "La Pierre Bergère" with a small transmitter, while Maurice gradually moved further away with a receiver which sounded a bell when a signal was received.

Maurice carried the receiving aerial raised on an 8-foot pole, and waved a red flag when the receiver bell sounded. From the Pierre Bergère rock, links were established with the "Rochers du Soir, Ladray, the cret du Serré" and even with a "piece of land at the top of les Marecottes" more than half a kilometer away.

When Marconi arrived in Salvan in July 1895 he had already succeeded in transmitting signals over a few dozen meters. By the end of August, using an earth and an elevated aerial as both transmitter and receiver, he was able to transmit Morse code over a distance of almost one-kilometer.

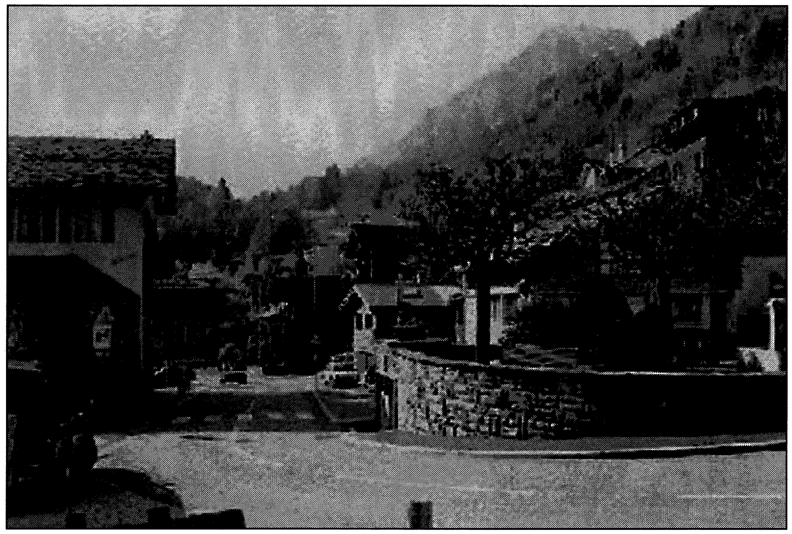
Honoring Marconi

Princess Elettra Marconi-Giovanelli wrote about Salvan, "Your village can pride itself on having offered its ideal setting for the first stages of one of the most important discoveries of our time: wireless telegraphy."

For a long time, in Salvan, Marconi's experiments remained a trivial event passed on by word of mouth within the village. But as Marconi's fame became more widespread, the villagers became more conscious of what they had witnessed. The story was recorded on tape in 1965 through a detailed interview with Maurice organized by the members of the Development Society of Salvan.

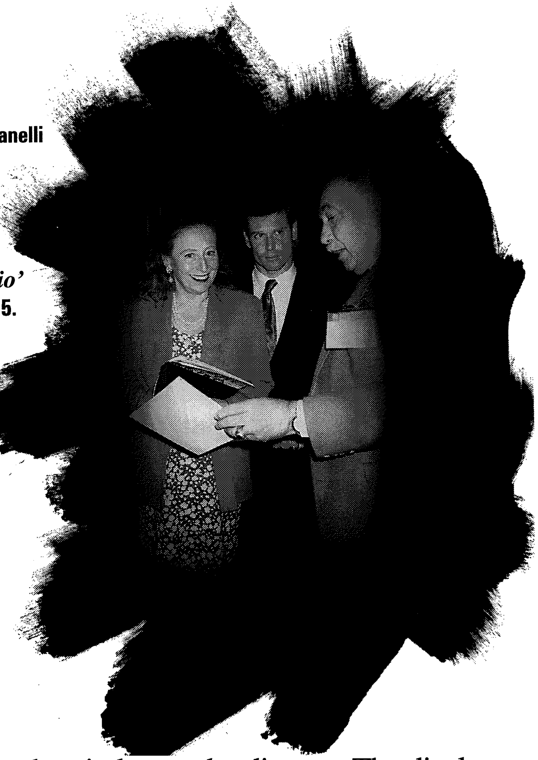
The first official recognition to immortalize Marconi's experiments in Salvan was made on the occasion of his birth centenary celebration in 1974, when the municipality of Salvan decided to place a plaque on the Pierre Bergère. The plaque was unveiled a year later during a ceremony attended by numerous officials of the region and by the vice consul of Italy in Switzerland. This was followed by a final consecration when the authorities decided in 1996, one hundred years after Marconi's sojourn in Salvan, to re-enact Marconi's experiments.

For this event they secured the support of the Swiss Telecom PTT and the Swiss National Audiovisual Museum to set up an exhibition in



"Millionaires' Row", a street in Salvan. Marconi stayed on the second floor of the first house on the left.

La Pierre Bergere, (the shepherdess' rock), an erratic block detached from the Mont-Blanc, dominating the village of Salvan.



Princess Elettra Giovanelli and her son Prince Guglielmo Giovanelli at the International Conference on *'100 Years of Radio'* held in London in 1995. The princess is being presented a research paper on Marconi's early experiments in Switzerland by the author.

Salvan of early wireless and radio sets. The display included the building of a replica of Marconi's transmitter that could be operated, ringing a receiver bell some twenty meters away. One of the notable foreign guests was Professor Gian Carlo Corazza, president of the Marconi Foundation in Italy who presented the Mayor of Salvan with a beautifully engraved silver plaque portraying the Villa Griffone and the Marconi Mausoleum located in Pontecchio.

Marconi's Influence Remains

In 1896 Marconi went to England where he filed the world's first patent for a system of telegraphy using hertzian waves and later established the world renowned Marconi's Wireless Telegraph Company. He never returned to Salvan, but his short stay was the beginning of a long and most profitable relationship between Switzerland and his company, which equipped most of the national broadcasting stations and airport telecommunications facilities during the 1920s and 1930s.

References:

My Father Marconi *by Degna Marconi;*
Salvan - Following Marconi's Footsteps *by Yves Fournier;*
A Marconi Mystery *by Pat Leggatt;* and
My beloved Marconi by *Maria Christina Marconi*

By Joseph A. Huie, K2PEY

The Last Flight of Amelia Earhart and Fred Noonan - *Part 1*

In the early morning of June 1, 1937, Amelia Earhart and Fred Noonan took off from Miami, on the first international leg of their historic around the world flight. Miss Earhart was the world famous pilot who had been the first woman to fly the Atlantic, initially as a passenger and later solo. Noonan had been hired as navigator to aid in this dangerous plan to fly around the world following a near equatorial path.

They flew in a state-of-the-art twin engine Lockheed Electra 10E, which had been built especially for Earhart ten months earlier. Carrying the very latest in instrumentation, radio equipment and a Sperry autopilot, the 10E had been outfitted with extra fuel tanks with a capacity of 1,150 gallons. The augmented cruising range was well in excess of 2,500 statute miles.

Covering 18,500 miles in 28 days they arrived at Lae, New Guinea (then an Australian territory) on Tuesday, June 29th. From Lae, they would fly to Howland Island, a U.S. possession, located just north of the equator and just east of the International Date Line. They believed the distance from Lae to Howland to be 2,556 statute miles, while in fact it is 2,563 miles - 7 miles farther.

Flight Plan

Their strategy was to leave Lae as late in the morning as they dared given the maximum fuel load, the tropical midday heat, the 3,000-foot runway and the take-off capability of the aircraft. Then they would fly all day and all night expecting to arrive at Howland after sunrise. Averaging an airspeed of 150 mph, with moderate headwinds, a flight time of about 18 hours was anticipated.

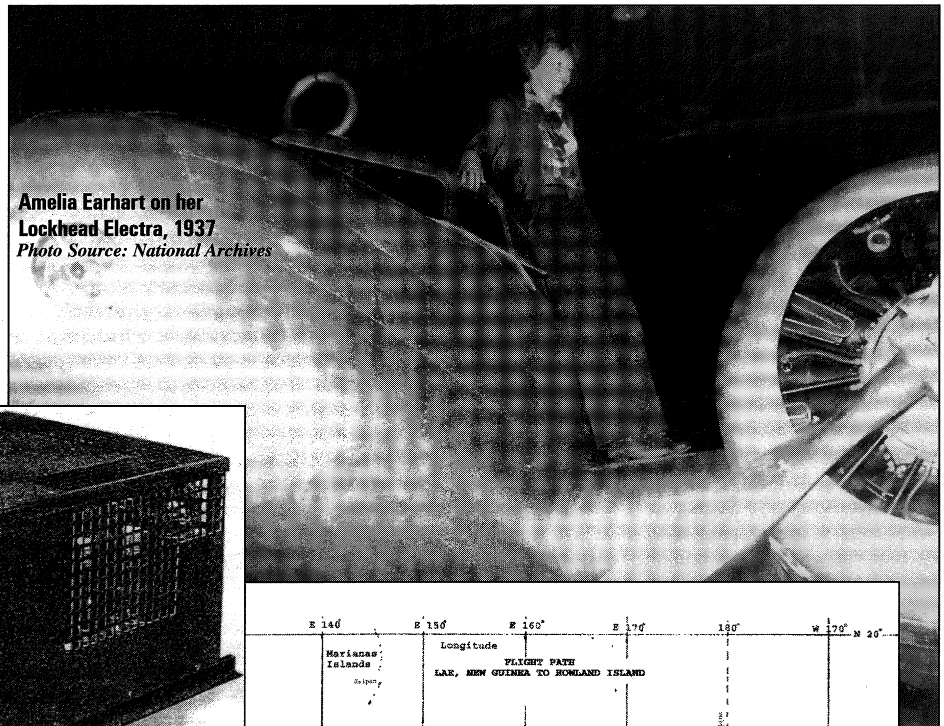
The U.S. government, assisting to a maximum degree, stationed the U.S.S. Ontario, a Navy seagoing tug, at the halfway point to serve as a beacon. The U.S. Coast Guard cutter Itasca was positioned just to the west of Howland to provide communications and also a beacon. Howland is a tiny bit of land only 1.6 miles long (running roughly north and south) and half a mile wide.

To reach the island, Earhart and Noonan would use dead reckoning, celestial navigation and a radio direction finder (RDF) located onboard the aircraft. As backup, an HF RDF was temporarily installed directly on Howland and manned by Frank Cipriani, RM2C. In addition, Itasca itself had an RDF capable of operating at 500 kHz (kcs in 1937 terminology).

Radio Equipment

The three radio sets on the Electra 10E were doubtless the best available at the time. The transmitter was a Western Electric Model 13C providing AM voice and CW capability with a carrier power output of 50 watts. There were three crystal controlled channels tuned for 6,210 kHz (Earhart's "day" frequency), 3,105 kHz (the "night" frequency), and 500 kHz (for emergency operation). The low 500 kHz channel was a special modification made by Bell Telephone Laboratories. Unfortunately, the 250-foot trailing wire antenna capable of radiating a strong 500 kHz signal was removed either in Miami or earlier in California. Two CW keys were also removed from the aircraft.

The transmitting antenna remaining on the aircraft was a wire running from the port trail to a short mast located just aft of the cockpit and then to the starboard tail, total length about 52 feet. The feed point, modified just days before take-off from Miami, was on the starboard side about 10 feet from the center mast. The feed wire ran to the fuselage entering through a hole in the side of the aircraft and then to the transmitter located behind the



Amelia Earhart on her Lockhead Electra, 1937
Photo Source: National Archives

Western Electric Model 208B remote controlled MF/HF receiver.

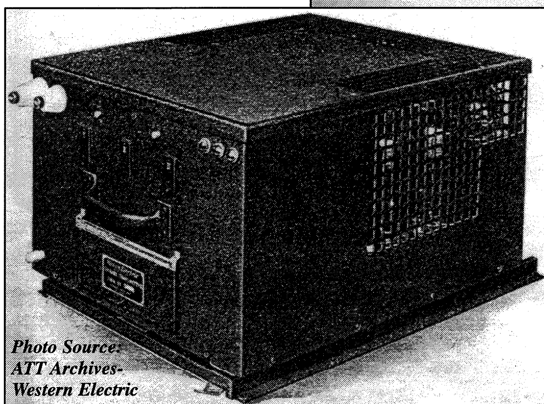
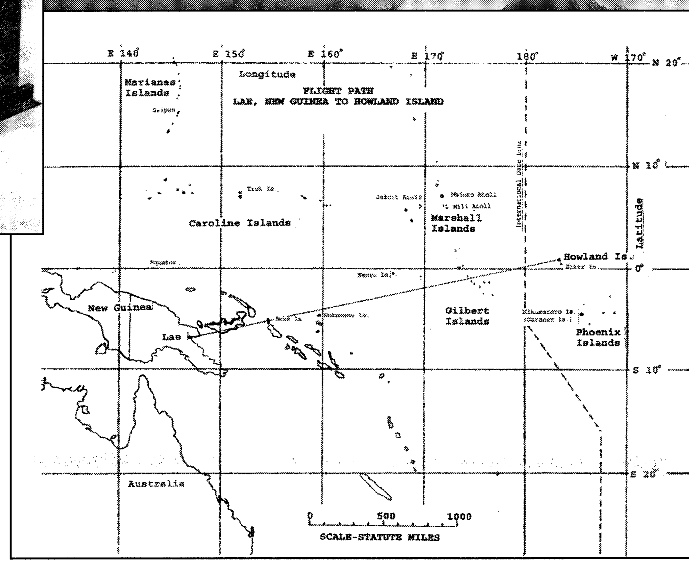


Photo Source: ATT Archives-Western Electric



cockpit area. The dimensions are approximate, scaled from photographs. Impedance matching was accomplished by separate output networks within the transmitter; an external loading coil was added for 500 kHz operation.

We have estimated the overall antenna system efficiency at .06 percent on 500 kHz, 10 percent on 3.105 MHz and 30 percent at 6.210 MHz. Thus, the actual radiated power on the critical 3.10 MHz frequency was only 5 watts (or less considering the optimistic assumptions in our efficiency estimate).

This AM carrier power is equivalent to a 2.5 watt SSB amateur radio transmitter. Those of us operating 75-meter phone would certainly consider 2.5 watts a marginal power level. It is not known whether the 500 kHz channel was actually capable of radiating even at the low power predicted (30 milliwatts) but if it were it might have been sufficient for Itasca to get a fix after daylight when the D layer substantially reduced atmospheric noise.

There were two receivers carried on the Electra. First was the continuous tuning Western Electric Model 20B, covering .200 to 10 MHz in four bands with a gap from .400 to .550 MHz. The 20B had no BFO and so was suitable only for AM voice and MCW reception. The second receiver was an early version of the Bendix Model RA-1 covering .15 to 15.0 MHz in six bands with a gap from 1.5 to 1.8 MHz. This set did have a BFO, and was thus suited to CW reception and could be used in RDF operation. Remote controls for both receivers were located in the cockpit. That for the RA-1 was above the left seat and that for 20B was in the lower part of the instrument panel in front of the right seat. (Note: One researcher has stated that the WE 20B receiver was removed from the aircraft, but we have seen no convincing evidence of this.)

There were three possible receive antennas: the transmit antenna, connecting through a T/R relay in the transmitter, a short wire antenna under the fuselage and a rotatable DF loop mounted above the cockpit. The exact connections and switching possibilities are unknown. Most likely the RA-1 was permanently connected to the loop and the 20B was connected to either the transmit T/R relay or to the underside wire. Note that the RA-1 had an antenna switch on its front panel but this capability was not extended to the remote control box mounted in the cockpit.

Why 7.5 MHz?

On June 26th from Bandoeng, Java, Earhart sent the following message to Itasca via commercial radio: "SUGGEST ONTARIO STAND BY ON 400 KCS TO TRANSMIT LETTER N FIVE MINUTES ON REQUEST WITH STATION CALL LETTERS REPEATED TWICE END EVERY MINUTE STOP....ITASCA TRANSMIT LETTER A POSITION OWN CALL LETTERS AS ABOVE ON HALF HOUR 7.5 MEGACYCLES STOP POSITION SHIPS AND OUR LEAVING WILL DETERMINE BROADCAST TIMES SPECIFICALLY STOP IF FREQUENCIES UNSUITABLE NIGHT WORK INFORM ME LAE STOP I WILL GIVE LONG CALL BY VOICE 3105 KCS QUARTER AFTER HOUR POSSIBLE QUARTER TO EARHART."

Unfortunately, the Electra's RDF loop antenna was intended for MF operation and would not function correctly at 7.5 MHz.

The Flight

At 00:00 hours GMT (10:00 local Lae time) on Friday, July 2nd with the Electra fully loaded with fuel, Earhart and Noonan departed Lae using all of the 3,000 foot runway. There is no record of any communication between Earhart and the Ontario and there is no record of Ontario having transmitted a beacon on 400 kHz as requested.

The Itasca radio log recorded hearing Earhart nine times (all on 3.105 MHz), the first at 14:15 GMT. Signal quality was logged as "unreadable". At 17:44 GMT (06:14 Itasca time) just after sunrise Earhart reported "about 200 miles out..." Everything seemed OK, except they were about an hour behind plan, perhaps due to greater than expected headwinds. Signal quality was logged as "poor".

At 19:12 GMT, Earhart transmitted "KHAQQ calling Itasca, we must be on you, but cannot see you, gas is running low; unable to reach you by radio...at 1,000 feet." Signal quality was logged as "very good" (S5). Earhart believed they had reached Howland, but had not made a visual sighting. The optical horizon at 1,000 feet is 39 miles.

Until Earhart's 19:12 transmission, Itasca, starting at 08:00 GMT, had made some 61 transmissions to Earhart. Approximately 20 were made on 7.5 MHz and the remainder on 3.105 MHz (the Itasca radio log is not always clear). There were 49 CW transmissions and 12 on phone. Earhart had not heard one. Itasca had requested that Earhart transmit on 500 kHz so the RDF on the bridge could be used. Even if she had heard their request, we don't know if her system was functional on 500 kHz. In any case, no signal was received.

Meanwhile on Howland Island radioman Ciprianai had not gotten a fix using the battery operated RDF there. By the time Earhart's first S5 signal was received at 19:12, the log recorded "batteries weak". All hope of measuring a direction must have vanished.

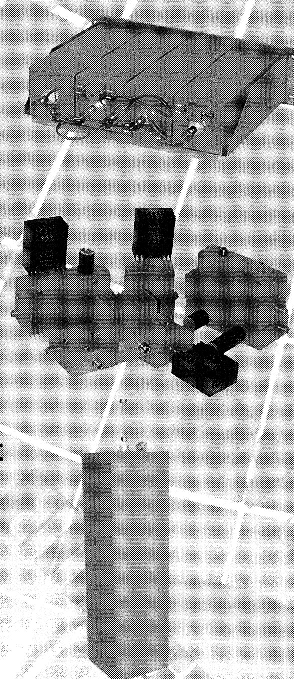
At 19:28 GMT Earhart came in: "KHAQQ calling Itasca, circling, cannot hear you. Go ahead on 7500 with a long count now or on scheduled time on half hour." Immediately Itasca responded on 7.5 MHz CW and at 19:30 Earhart came back: "KHAQQ calling Itasca, we received your signals, but unable to get a minimum. Please take a bearing on us and answer 3105 with voice." The Electra's RDF loop would not function properly at 7.5 MHz.

After a quick radio check with Howland Island (roughly a mile away), Itasca responded by voice on 3.105 MHz: "impractical to take a bearing on 3105 your voice..." No one would admit that the batteries were weak. Once again Itasca (on 3.105 and 7.5 MHz requested Earhart to transmit on 500 kHz. For the next 35 minutes Itasca desperately tried to establish communications with Earhart using both 3.105 and 7.5 MHz.

Finally at 20:14 GMT Earhart was heard: "KHAQQ to Itasca. We are on the line 157, 337. Will repeat this on 6210 kcs. We are running on line. Listening 6210 kcs."

This was the last transmission they heard. At 22:10 GMT Itasca was underway headed north (337 degrees) in search of a downed aircraft. No trace was ever found by Itasca or any of the many other searches that followed.

Look for Part II of *The Last Flight of Amelia Earhart and Fred Noonan* in the Fall issue of the *Proceedings.*



By James A. Craig

Dispatching a Large Taxi System

How were the problems of a large fleet dispatching business — the Detroit Checker Company — solved?

A little more than two years ago, the Link Radio Corporation was engaged by the Checker Cab Company of Detroit Michigan, to design and install a two-way radio system capable of handling the expected traffic.

This was not a simple requirement to meet since the fleet was made up of 897 taxicabs with an exceptionally high ratio of dispatched calls to cruising pickups. Our solution therefore, may be of interest to others concerned with dispatching large fleets.

System Facilities

Assuming that each cab worked two shifts per day, and handled 15 dispatched calls per shift, the radio system would have to be capable of handling 30 calls per cab per day, or a total of more than 25,000 calls per day.

However, since each day has its short peak-load period and longer slack periods, such a figure is not normally to be expected on a 24-hour basis. On the other hand, even if a 24-hour load of one half 25,000 calls per day were taken as representative, this would still mean more than 500 calls per hour, or almost 10 calls per minute.

Since peak loads could easily double the average hourly rate, it became apparent quickly that this would be no ordinary radio system. One base station could not begin to handle so much traffic. More important the workload would have to be split up among many dispatchers. But to realize any advantage, dispatchers would have to be provided with simultaneous access to the radio facilities without mutual interference.

Zoning

Working closely with cab company officials, we divided the city into zones. The ultimate number of zones and the area included was predicated on Checker Cab's traffic experience in Detroit. Every effort was made to distribute the traffic so that the present busy zones would not be overloaded and, at the same time ,to provide zones in the outer fringes of the city that could absorb traffic growth to be expected from population shifts and increased business accruing because of the advantages of taxi dispatching by radio.

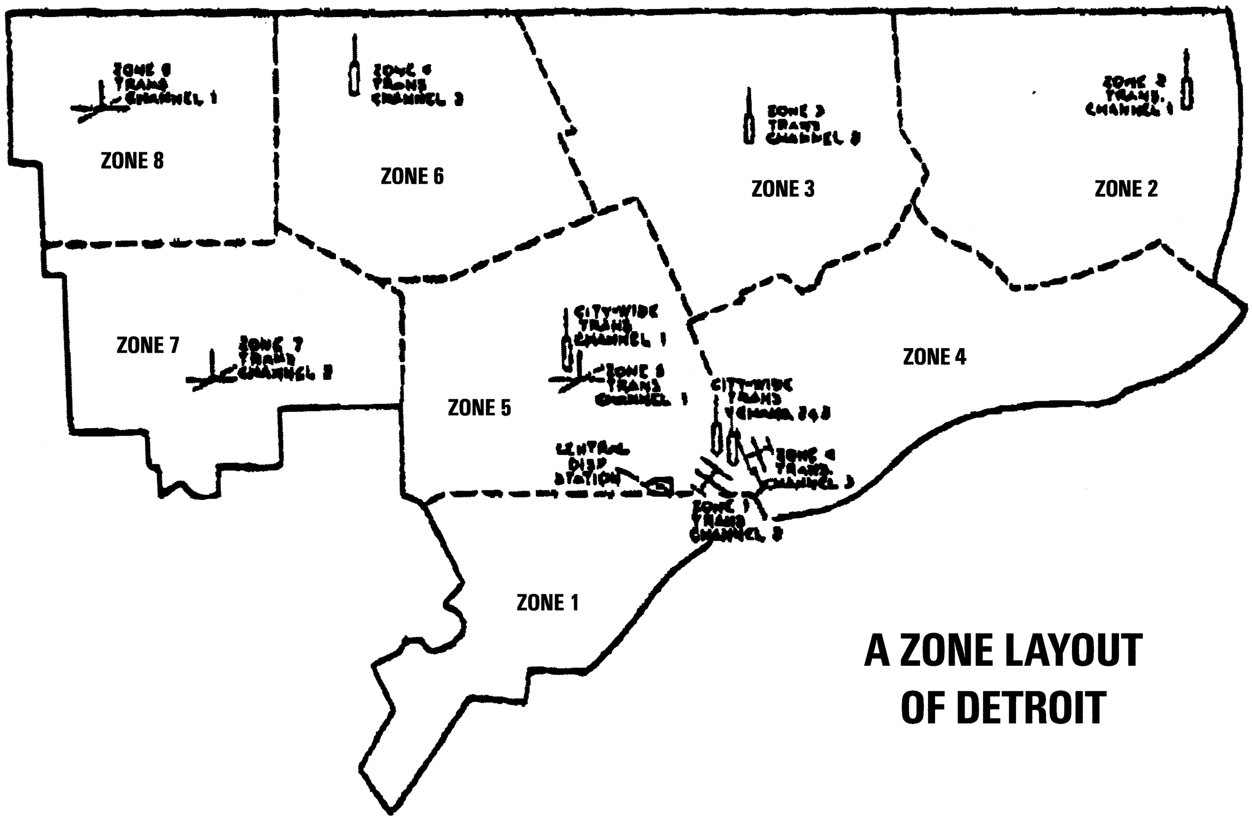
After many changes in the quantity of zones and shifts in the zone boundaries an arrangement was made. Eight zones were utilized and three 425 mc. taxi channels were employed.

Initially, two channels were planned, but it was impossible to arrange zones so that the same channel was not used in any adjacent zones. With three channels, a zone operating on a different channel always separates zones operating on the same channel.

Two requirements were given greatest importance in the development of the zone system: first, complete coverage of each zone by its associated transmitter; second, minimum signal overlap between common channel zones. These requirements are virtually in direct opposition. A certain amount of overlap in one zone from another same channel zone could be tolerated if unavoidable, provided that each transmitter signal would completely capture a receiver within its zone.

Experimenting

Meeting these requirements involved many experimental checks on antenna heights, locations and configurations, and variations in transmitter



A ZONE LAYOUT OF DETROIT

power. It soon became obvious that transmitter power played a minor role in determining coverage at 450 mc. If line-of-site transmission existed on a given circuit path, 2, 20 and 40 watts nearly the same results. Therefore the zone transmitters were all made from standard 20-watt equipment.

Pattern shaping was attempted, using phased coaxial and ground plane arrays, to provide coverage without overlap according to individual zone shapes. Here also, the results were impressive, for the same reason that transmitter power made little difference in coverage. In using phased arrays to create figure eight, cardioid or other patterns, a boost in power in some directions is gained at the expense of power loss in other directions. Such arrays are not intended to form a beam or completely eliminate radiation in any other sector. Even though power had thus been reduced in certain directions, no loss was noticed in mobile contact within the affected area, since power in itself is not that important.

The most important factor affecting coverage, in virtually all cases, was antenna height. Indeed at antenna elevations of 60 to 70 feet, the coverage could be tailored in terms of 4 to5 city blocks by changing antenna elevation 4 to 5 feet.

While this discovery solved a lot of problems, each zone had still to be evaluated on its own merits and peculiarities. Zones 7, 8, 6, 3, and 2 non-directional antennas were used at elevations of 60 to 110 feet. Zones 7 and 8 use unity-power gain antennas ground plane antennas. However, in zones 6, 3 and 2 available transmitter locations with proper antenna height are not centered in the zone. These zones employ stacked coaxial arrays, which produce low angle radiation at a power gain of 3 times.

Zones 1, 4 and 5 all intersect the loop area of Detroit. There are many tall buildings that produce shadows. For that reason the zone 5 transmitter is located as shown on the map, at an elevation of some 300 feet. Overlap in zones 2 and 8 occurs to a minor degree, but this is offset by the fact that complete coverage of zone 5 including its loop area is accomplished with almost no dead spots. In the cases of zone 1 and 4, no structure of comparable height existed in zone 1 although one was available and used temporarily in zone 4. In either event, antenna elevation would have increased overlap difficulties, particularly from zone 1 into zone 7. The final decision in the cases of zone 1 and 4 was to locate both transmitters at the top of the 400 foot

David Stoll Building, located at the center of the loop district. These transmitters excite yaggi antennas trained down the centers of the respective zones. Each yaggi is equipped with a vertical V-shaped metal screen to minimize leakage in back and to the sides of the array.

City-Wide Transmitters

In off load periods such as the early morning hours, when the traffic can be handled by 2 or 3 dispatchers, the simple zone system would necessitate switching on the part of the dispatchers on selecting the zone transmitter proper for each call. To eliminate this objection, 3 100-watt citywide transmitters, one on each of three channels and each capable of citywide coverage, were provided.

At first, all three transmitters were placed on the same building in the loop district where the zones 1 and 4 transmitters were located. Situating the city transmitters at the same location with two zone transmitters was permissible since by the nature of the dispatching technique, the zone transmitters would not be used when the citywide transmitters were in use and vice-versa. However the roof of the Scott Building shadowed the channel 1 signal in the extreme north east corner of the city. This problem was overcome by the simple expedient shifting of the channel 1 transmitter to the location used for the channel 5-zone transmitter.

This system became a possibility only through the combined effort of the Checker Cab Company and the Link Radio Corporation.

Three citywide transmitters are used to provide three methods of operation: Single frequency coverage of the city on channel 2 ; east - west coverage on channel 1 and 2; sector coverage, east, middle and west on channels 1, 2 and 3.This permits complete off-load servicing of the entire fleet by 1, 2 or 3 dispatchers, as required. In practice, the east-west method of operation is normally used, although a city wide transmitter can be pressed into service to cover for a disabled zone transmitter.

All citywide antennas are stacked beacons with power gain of 5. No overlap problem exists under citywide operation.

Equipment and Operation

The zone and citywide transmitters are housed in 31 and 68-inch cabinets respectively. They are remotely controlled via leased two-wire lines from the central dispatching office, but can be operated locally by service personnel. A selector switch on the control panel of each transmitter is used to select remote or local operation and also permits wire intercommunication between service personnel at the transmitter and the dispatch office.

As required by the FCC, automatic instantaneous peak limiting circuits prevent deviation in excess of +/- 15 kc or any desired value below +/- 15 kc. All of the taxicabs are equipped with 10 watt transmitters using vibrator power supplies. Power drain is such that no heavy-duty generators or alternators are required. Each mobile transmitter-receiver is equipped with a sector switch located on the control head convenient to the driver.

By means of this switch, a driver can instantly access any one of 3 channels used in the system depending upon his zone location. The operating frequency of the transmitter and receiver are shifted simultaneously. Change of frequency is not accomplished by crystal switching, but by activating separate crystal controlled oscillators through grounding the cathode of the desired oscillator. A mobile antenna was installed in a taxi cab luggage compartment. Mobile antennas are short whips mounted on the rooftops.

In practice, each driver is given a zone map so that he will become acquainted with the zone boundaries and will use the proper channel corresponding to this location. After a period of a week, the driver has memorized the boundary streets of the zones and the map is no longer required. Boundaries were so arranged as to necessitate a minimum of channel switching in the cabs when traveling down most main streets or avenues.

As traffic loads decrease from peak periods when the zone system has been in use, and the intent is to shift to one of the three modes of Citywide operation, each dispatcher broadcasts a general message to that effect to all cabs under his control. A similar procedure is followed for any other mode shift.

Considerable study was devoted to dispatching and remote control facilities associated with this system. In addition to providing normal switching and audio facilities, it was necessary to furnish means where by the proper zone and citywide could be made available as required by hourly traffic changes. Position 4 is the master position, at which one dispatcher can control one citywide and all eight zone transmitters. At positions 3 and 5 are tied in one of the other citywide transmitters and three zone transmitters. Three zone transmitters can be controlled at each of positions 1 and 6, and two transmitters at position 7. Since all eight dispatchers will be working when positions 2 and 8 are in use, only one zone transmitter can be controlled at these positions.

At multiple positions, the dispatcher has a turret before him on which appears an upper row of green lamps. These light upon receipt of a call from a cab so that the dispatcher can tell in which zone the cab is located at the time. Rectified audio from the received call is utilized to operate a relay which in turn, lights an associated lamp at all positions which this zone transmitter can be controlled. The dispatcher can operate any or all the buttons and listen to cabs in any or all zones whose transmitters are controllable from his position. The extreme right hand button in this row trips all depressed buttons canceling prior selections.

Transmitter buttons are located in the next lower row, each with its corresponding red lamp in the bottom row. By depressing a transmitter button a dispatcher can elect to use any transmitter controllable from his position. No more than one transmit button can be depressed at a time, since each button releases any other button previously depressed. Thus it is impossible to put more than one transmitter on the air at a time.

Each dispatcher is supplied with a personal Western Electric type 52-AW operators head set and microphone, which may be plugged into any table position. Each position has a parallel jack to accommodate a supervisor's operator's set if so desired. A volume control at each position makes it possible for each dispatcher to regulate the earpiece volume to suit his own hearing acuity. Foot switches are used to key the selected transmitter, leaving both hands of the dispatcher free to handle all cards, to rotate which cab took the call, and to time stamp and file the card.

Calls taken by telephone operators are carried by conveyor to markers, who distribute them to dispatchers according to the zone in which each call is to be serviced.

The remote control units proper are located in a separate room. Eleven units, one for each transmitter in the system are mounted on open rack adjacent to the leased line terminations. Spare units are available to replace quickly, any remote chassis in case of trouble. Cables connect the remote control chassis to the dispatching table and are so arranged at the table that terminations can be made at any given position quickly and without tools. This was incorporated in the design so that the zone control terminations could be predisposed at various positions to meet any future changes in traffic and dispatching patterns.

Maintenance

The radio service shop operated directly by the equipment manufacturer, is located in the Checker Cab Building. Facilities to repair and service all the equipment are available. As is the case with almost all such systems, when initially installed, the servicing problem was severe during the first few weeks of operation. Any latent defects in tubes, vibrators, or other components showed up then.

However, after such a break in period the servicing became a matter of periodic frequency checks and preventative maintenance. In fact, even though this system now has equipment in service for almost two years, the maintenance problem has turned out to be much simpler than expected for 450 mc equipment.

As an example, the transmitters all use AX-0003/5894A tubes as triple-amplifiers and power output tubes. Certain doubts existed as to the life expectancy of these tubes, particularly in mobile service. It has been found that they are much cheaper to replace than other tubes, such as lighthouse tubes and service records show an average life in this installation of approximately 5,000 hours; this is 5 times better than would have been acceptable.

Even if no trouble occurs in a taxi radio, it is brought to the radio shop every 6 to 8 weeks for a routine check of frequency, power output and other performance qualities. Experience indicates that this maintenance apparently can be further increased without service degradation.

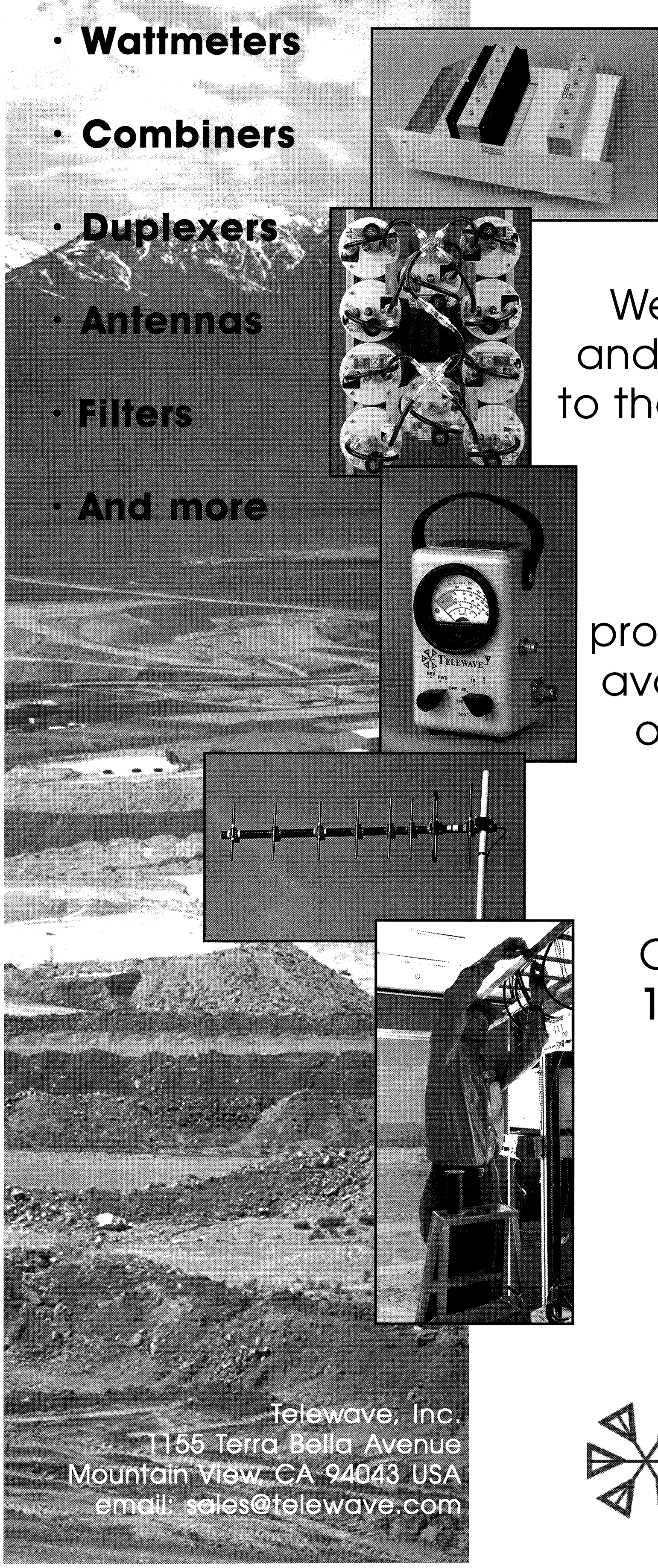
Conclusion

Since this system has now been in operation for better than $1^1/_2$ years, it is possible to evaluate results not only from a radio performance standpoint, but on a business basis as well. A decrease in dead mileage and a general increase in efficiency were inevitable as a result of radio dispatching. It is interesting to note a definite increase in business volume due to other factors indirectly resulting from the use of radio.

Checker is gaining back customers from smaller radio equipped competitors. They are also gaining new customers because of the more rapid servicing of calls. In addition, business is increasing in the fringe area of the city, including zones 2, 6, 7 and 8. This can only be attributed to the fact that previously cab drivers always avoided these areas since cruising pickups were infrequent; but with radio they can service calls in the city outskirts at a constantly increasing rate. The mere availability of cabs in these areas, automatically produces new business.

This system became a possibility only through the combined effort of the Checker Cab Company and the Link Radio Corporation. Mr. Carl H. Anderson, president of Checker Cab and his associates contributed not a little in the form of practical suggestions from an operating standpoint. This made possible through the analysis of their problems, the solution of which resulted in a superior radio dispatching system, tailored to handle efficiently, the high traffic density involved.

"COMING THROUGH LOUD AND CLEAR"



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By John Dettra

Grants-in-Aid: What Does the Radio Club Do?

The members of the Radio Club receive the *Aerogram* detailing current activities of the club and the *Proceedings* covering historical and tutorial articles in the field of radio communications. Certainly as important as delegated in the Constitution of the Radio Club of America Inc., Article 1, Section 2a. is to "provide a scholarship fund for needy and worthy students of the study of radio communications." The President appoints the grants-in-aid committee to administer monetary grants for students at various colleges and universities.

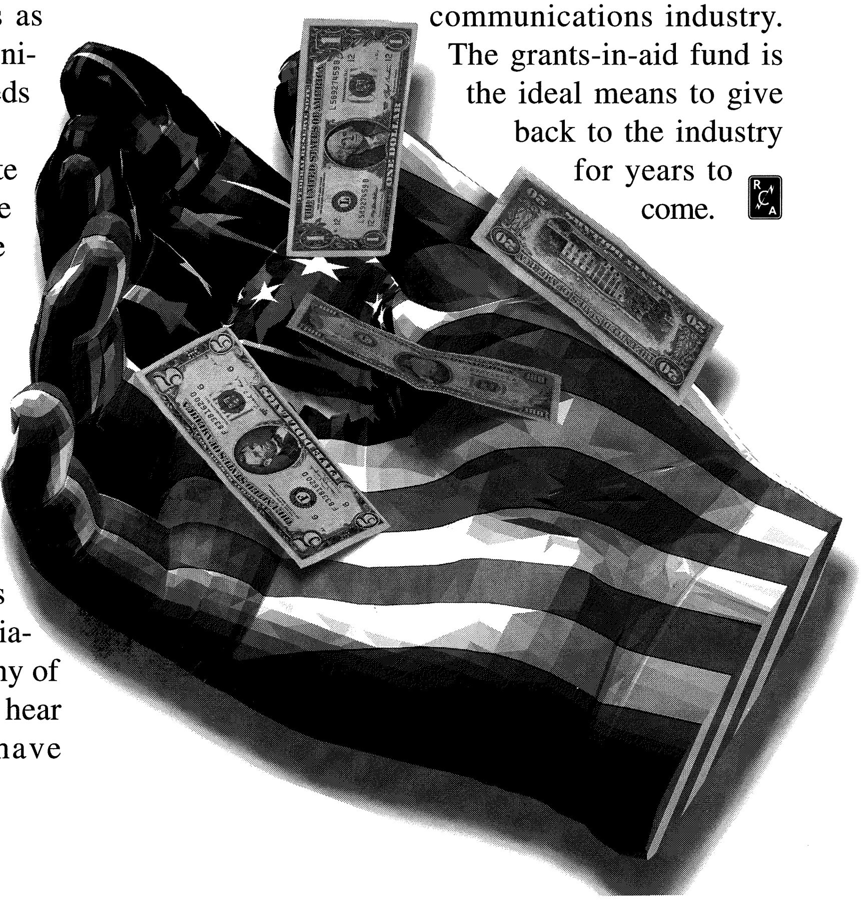
Over the years, members or their heirs have donated to the grants-in-aid fund establishing a named fund honoring that person. We now have named funds honoring such leaders as Popple, Goldwater, Link, Somers, Finch, Gunther, Grebe, Biggs, Meyer and Meyerson. Club sections as well as special breakfast meetings at communications related conventions donate all proceeds to the fund.

The Radio Club treasurer keeps a separate accounting for the grants-in-aid fund and the interest/dividends accrued during the year are reported to the committee. The committee reviews the request for student aid and between 80 percent to 90 percent of the funds available are distributed. Approximately 10 percent to 20 percent of the funds are left to help build-up the fund. The grants-in-aid fund now is approaching $300,000. At no time is this fund used for operating expenses.

Even though the funds are sent to colleges and universities, we receive letters of appreciation from students who have been helped. Many of the letters are heartwarming. We sometimes hear from the student recipients when they have reached some of their goals and relate how important the grant was to them at a time when it made it possible to continue their education. Some have become board members of the Radio Club and outstanding engineers.

This year we will distribute $16,000 for 14 different grants to students at Capitol College, University of Cincinnati, Embry-Riddle University, Fairleigh Dickenson, Montclair State University, Polytech University, Rankin Tech, Stevens, Virginia Polytechnic Institute and the college scholarship fund of the Foundation for Amateur Radio. The Radio Club receives acknowledgement for these grants through the various college publications and catalogues of financial aid.

The Radio Club has been around since 1908. We honor our members for their contribution to the radio communications industry. The grants-in-aid fund is the ideal means to give back to the industry for years to come.



By Eric Stoll

Treasurer's Report

FISCAL YEAR 2000

(October 1, 1999 – September 30, 2000)

REVENUES	
Dues Collected & Applied	$31,410
Other Member Fees	1,482
Banquet (net)	3,723
Advertising Sales	10,092
Pins & Plaques Sales	1,052
Interest on General Funds	6,358
Net Gain on Redemption of Bonds	-0-
Publications Sales & Misc.	424
TOTAL Revenues	**$54,540**
EXPENSES	
Publications	
Printing & Supplies	8,415
Mailing of Pubs.	3,054
Meeting Expenses	3,686
Office	
Printing & Stationery	2,028
Postage	2,403
Office & Computer Expenses	1,485
Trade Show & Web Site Costs	2,198
Executive Sec'y & Other Admin Costs	27,490
Legal & Accounting	1,392
Insurance	2,726
Pins & Plaques Costs	1,559
Miscellaneous	454
TOTAL Expenses	**$56,890**
NET Revenues less Expenses	**($2,350)**
Other Adjustments (net)	**($18,915)**
NET Increase in Fund Balance	**($21,265)**

BALANCE SHEET

ASSETS	
Inventory & Receivables	$4,347
Prepaid Banquet Expenses	3,420
Banquet & Section Funds	37,433
Cash In Bank - Operating	40,811
Investments	
Short Term Money Fund	948
Common Stock	36,341
GNMA Certificates	18,756
FHLM Certificates	52,032
Mutual and Closed End Funds	121,582
Corporate Bonds	77,539
US Government Bonds	68,331
TOTAL Assets	**$461,539**
LIABILITIES	
Prepaid Dues	$23,992
Accounts Payable	-0-
Scholarship Funds - Principal	264,195
For Distribution	17,043
General Funds - Operating Balance	55,744
Reserve for Operating Deficiencies	26,121
Life Member Fund	33,919
Legacy Fund	14,603
Other Assets & Liabilities (net)	25,922
TOTAL Liabilities	**$461,539**

N.B. Other adjustments include contributions to funds, scholarships and grants awarded, earnings on funds and changes in values of investments. Interest rate sensitive investments decreased in value by $6,771 during the fiscal year.

SCHOLARSHIPS & GRANTS FUNDS

Capital available for Distribution	**Totals**		
Opening balance October 1, 1999	$264,195	$17,043	$281,238
Contributions	8,350		
Interest Earned	17,098		
Scholarships & Grants Awarded	(16,000)		
Ending Balance September 30, 2000	**$272,545**	**$18,141**	**$290,686**

KATHREIN INC.

Dan Fowler, *Vice President-Sales Communication Products*

P.O. Box 4580
Medford, OR 97501
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Carl Mathis, *President*

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KENWOOD

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RADIO CONSULTING ENGINEERING

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ITT Industries

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J.C. (Jim) Stratt, (E.C. Tserestopoulos)
Senior Consultant

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Ad Index

The Radio Club of America, Inc.

Founded 1909

WORLD'S FIRST RADIO COMMUNICATION SOCIETY

APPLICATION FOR SENIOR GRADE MEMBERSHIP

Date: ______________________

TO: **THE EXECUTIVE COMMITTEE**
I hereby apply for the Grade of Senior Member of THE RADIO CLUB OF AMERICA, INC. and agree, if advanced to this level, that I will be governed by the Club's Constitution and By-Laws.

____
Full Signature

Full Name: ______________________
(LAST) (FIRST) (INITIAL)

Home Address: ______________________
(STREET)

____
(CITY) (STATE) (ZIP CODE)

____
(PHONE) (FAX) (EMAIL)

PRESENT OCCUPATION

____
(COMPANY OR ORGANIZATION NAME) (TITLE OR POSITION)

____
(STREET) (CITY) (STATE) (ZIP CODE)

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EDUCATION

Institution	Level Achieved	Date	Field

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PUBLICATIONS OF SCIENTIFIC OR PROFESSIONAL PAPERS, BOOKS OR ARTICLES RELATING TO ELECTRONIC COMMUNICATIONS

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OTHER BACKGROUND RELATING TO ELECTRONIC COMMUNICATIONS

____

____

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Professional Awards ____

Professional Engineer's License(s) ____

Other Professional Society Affiliations & Grade of Membership ____

____

Current Amateur Radio Call Sign ____

Other FCC Licenses Now or Previously Held ____

FOR OFFICIAL USE

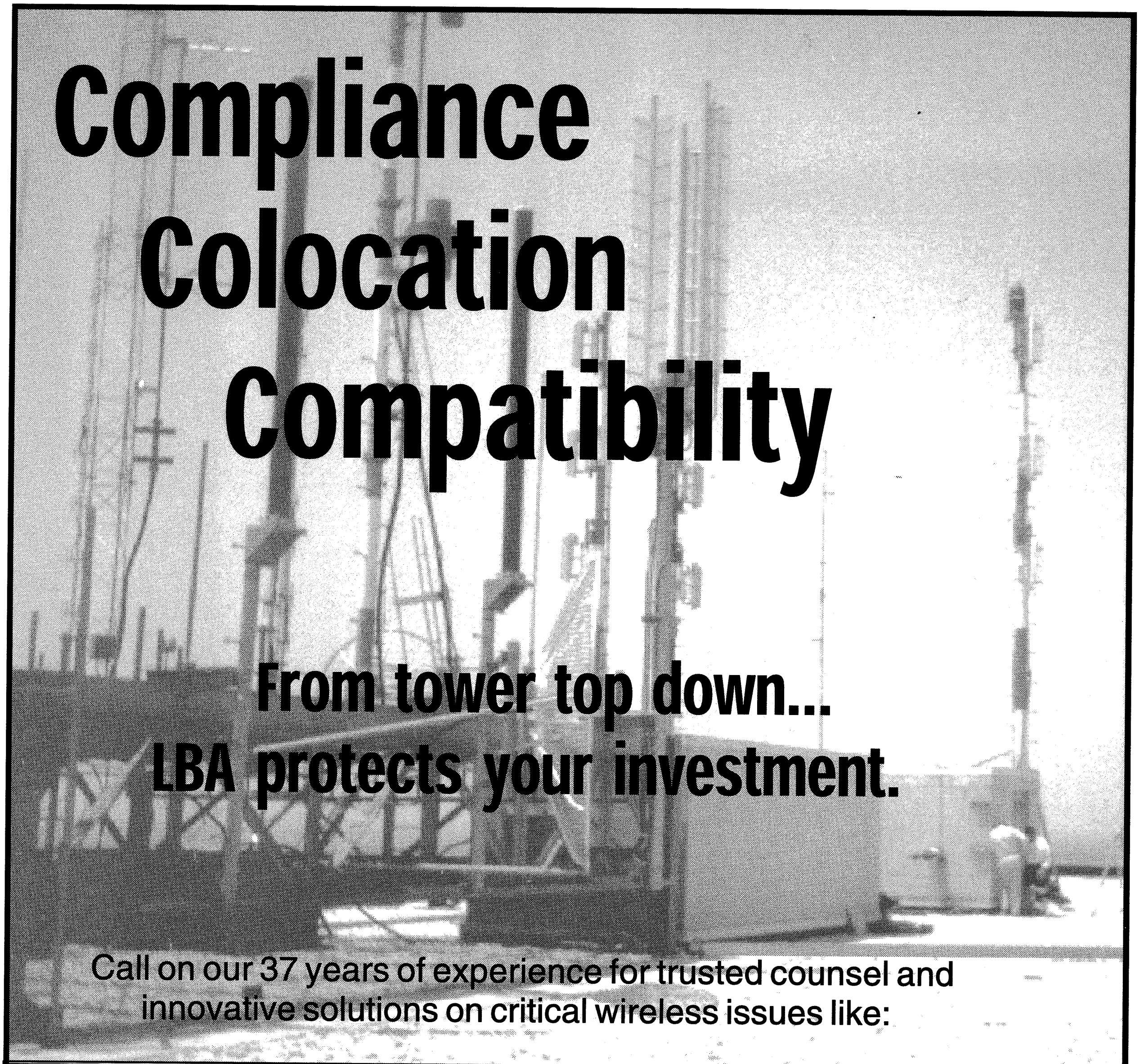
REV-071000

Date Application received:

Amount of Fee Received:

Date Approved by Board:

Certificate & Pin issued on: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