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(See page 12)

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P.O. Box 2112, Grand Central Station, New York, N.Y. 10017

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

The Radio Club of America, Inc.

BOX 2112, GRAND CENTRAL STATION, NEW YORK, N.Y. 10017

Price $2.50

Organized for the interchange of knowledge of the radio art, the promotion of good fellowship among the members thereof, and the advancement of public interest in radio.

TREASURER'S FINANCIAL REPORT FOR 1977 — PRELIMINARY SUMMARY

	Amount	1977 Budget
Income:-		
Dues Received	$ 4,105.01	$4,750.
Sales of Pins and F. Certificates	415.50	375.
Advertising in 2 PROCEEDINGS	$ 3,540.83	$ 3,500.
Contributions Received	425.00	900.
Interest and Dividends Earned	552.54	950.
TOTAL INCOME:	$ 9,038.88	$10,475.
Expenses:		
Rent for facilities	500.04	500.
Printing of PROCEEDINGS (1 Issue)	2,538.09	4,500.
Postage and Stationery	470.61	650.
Misc. Administration Expenses	534.29	575.
Expenses of Meetings	858.23	900.
Pins, Plaques, Certificates	811.25	600.
Newsletters and Ballots Expenses	300.63	200.
Executive Secretary Fees	2,100.00	2,100.
Contributions	1,000.00	1,000.
TOTAL EXPENSES:	$ 9,113.14	$11,025.

Excess of Income over Expenses: -(74.26)
Appropriated Income: Advance Dues Received
For years 1978, 1979, and 1980 . . . . . 1,415.99
Adjusted Excess of Income Over Expenses: $1,341.73
Outstanding Items:
Receipts:
(1) Interest and Dividends (Estimated 382.50
(2) Advertising in Oct. 1977 **Proceedings** 242.50
TOTAL OUTSTANDING RECEIPTS . $625.00
Expenses:
Publication Expenses of OCT. 1977 Proceedings: 2,500.00 (Est.)
Total Outstanding: $-1,875.00)
Estimated 1977 Deficit from Operations: $-(533.27)

David Talley

Jan. 25, 1978

BROADCASTING A.D. 2000

(This paper was presented by Mr. Jacobs at the National Association of Business and Educational Radio (NABER) Senior Communications Symposium, held in cooperation with the Radio Club of America, in New York, NY, November 18, 1977.)

By GEORGE JACOBS, *Fellow*

Fifty years ago, Lee de Forest, inventor of the Audion vacuum tube, attempted to predict the future of radio and television broadcasting.

This was in 1929, when radio broadcasting was still in its infancy and television was in a rudimentary, crude experimental stage. His remarks appear in the book *Radio and Its Future,* edited by Martin Codel, and published in 1930.

De Forest had this to say:

2 "I often feel that, although radio reproduction has made remarkable strides in the past few years, there is still ample room for improvement. If we compare the reproduction with the original, whether it be human voice, orchestra, band, or organ, we are immediately aware of the wide discrepancy. Nevertheless, listening to radio reproduction day after day, we mentally set up false standards for these various kinds of music and become convinced that we have attained the ultimate of perfection in radio reproduction. It is the unemotional sound analyzer of the laboratory that tell us definitely, in quantitative terms, just how far removed our loud-speakers are from the original sounds—and you may be certain there is ample room for improvement . . . . . and broadcasting will eventually achieve utmost realism."

In the language of today, de Forest was "right on" in his 1929 prediction, (many years before high-quality stereo FM broadcasting) that radio in his future would be of higher technical quality and more lifelike in its sound.

De Forest had this to say about television:

". . . . I am sure television must develop along the same broad lines (as radio): first, the experimental days, with the experimenters taking part with home-made equipment; then the gradual crystallizing of a practical system, based on knowledge gained in actual work; followed by mobilization of the essential capital, personnel, and production facilities for the creation of an industry quite as well as the founding of a national institution . . . . And when television (is a reality), it will find many applications. I look forward to the unfolding of world events on the home television screen, just as they are happening and not several days or weeks later. I expect the living image of the public man to join his voice in the future home radio (or television) set . . . . . Television, of course, will have an enormous field in the presentation of actual events, particularly sporting events . . . .

Lee de Forest said this in 1929! He continued with a further prediction about radio broadcasting. Said de Forest,

"We are on the verge of international broadcasting (via the shortwaves), when the entire world shall become a single audience taking part in a universal forum of enlightenment."

That's how Lee De Forest saw the future of broadcasting in 1929. The events of the past fifty years have proven him to be quite correct.

What will radio and television broadcasting be like in the future? Taking the start of the 21st century as a convenient reference point (that's just 23 years away), let's take a look at present day engineering developments in broadcasting and allied fields and expected technical advances and see if fact, imagination and deduction can be balanced to paint some sort of picture of what radio and television broadcasting might be like by the year 2001.

Expanded AM broadcasting

Let's first take a look at the familiar AM, or standard broadcasting band, between 535 and 1605 kHz, where nearly 4500 stations are now operating in the United States.

A major international telecommunications conference is coming up in 1979. It will be convened by the International Telecommunication Union in Geneva, Switzerland. The ITU is a specialized agency within the United Nations. The conference is officially called a *World Administrative Radio Conference,* and is more commonly abbreviated as WARC-1979.

The ITU consists of more than 150 member nations, and WARC-1979 is expected to be the most important con-

ference to be held in the 115-year history of the Union. The conference will review regulations, agreements and frequency allocations for the entire radio spectrum through 40 GHz, and possibly beyond. The results will remain in effect, and will shape the course of all forms of radio communications, through at least the early years of the 21st century.

The "frequency pie" will be recut at the conference, and there's no telling how the pieces will be redistributed. The one-country, one-vote rule that governs ITU conferences is almost certain to lead to a clash between the technical and the political aspects of telecommunications. Under these rules little Fiji has as much voting power as the United States!

In the U.S. preparation for the conference to date, certain proposals have already been drafted. There're not final by any means, and they may undergo considerable change before final proposals are submitted to the ITU. The draft proposals appear in the Federal Communications Commission's "Fifth Notice of Inquiry In Preparation For A General World Administrative Conference in 1979." The NOI discusses draft proposals for the entire radio spectrum. As far as AM broadcasting is concerned, the FCC proposes to expand the present AM band to 525 to 1800 kHz. This 20% increase in the band will permit 20 additional channels, which would be capable of handling a considerable number of additional AM stations.

There is also a proposal for a new broadcasting band, at least as far as the United States is concerned, although it is the grandfather of all broadcasting bands in Europe. It's called the *longwave* band, and the FCC proposes an allocation for the western hemisphere in the segment between 115 and 190 kHz.

When broadcasting began in Europe after the first world war, it began in the longwave band. Today, most of Europe's very high power stations, some as high as two megawatts in power, operate in this band. There is an advantage to broadcasting on longwave, since skywave propagation over relatively long distances is possible both day and night. The FCC proposal would permit seven channels for longwave broadcasting in this hemisphere.

Another innovation that might change the family and car AM radio by the end of this century is AM stereo. Several systems for producing stereophonic reception on AM have already been field-tested, and the FCC recently issued a notice of inquiry to explore potential public benefits and technical considerations.

More shortwave broadcasting

Im many areas of the world shortwave broadcasting is very popular. More than 100 countries use shortwave as part of their domestic broadcasting effort; at least 90 countries, including the United States, use the shortwave bands for international broadcasting, along the lines envisioned by Lee de Forest fifty years ago.

It's estimated that there are approximately 130 million shortwave receivers throughout the world and that at least 50 million people tune to shortwave broadcasts regularly. In the field of international relations, shortwave broadcasting plays an important and unique role. It is the only broadcasting medium capable of direct, universal, personal, and immediate communication between peoples of the world. Only shortwave broadcasts are capable of crossing frontiers, spanning oceans and bridging continents.

The worldwide popularity of shortwave broadcasting has risen to the point where the present bands are severely overcrowded, and interference often intolerable. The FCC, in the 5th NOI, proposes an expansion of about 25% in these bands, and chances are good that other countries will propose a greater expansion. If this comes to pass, shortwave receivers will—by the beginning of the new century—contain wider bands, and perhaps several new ones. These will permit clearer reception of shortwave broadcasts.

Quadraphonic FM

In 1929 de Forest predicted that radio broadcasting in the future would tend more and more to greater realism and higher quality. His words are as true now as they were then. Present day FM stereo is almost certain to blossom into FM quadraphonic—or polyphonic—sound reception by the end of this century. Each time another prefix is added to the word "phonic", broadcasting will become more realistic and more lifelike. The FCC has already studied several proposed methods for quadraphonic FM broadcasting, and has recently issued a notice of inquiry to further study the merits of various quadraphonic techniques. It seems safe to predict that by the beginning of the 21st century quadraphonic, or perhaps polyphonic FM broadcasting will be a reality.

TV home communications center

What will television sets look like by the year 2001? According to expert testimony given this past summer before the Subcommittee on Communications of the House Interstate and Foreign Commerce Committee, the family TV set is likely to be transformed remarkably by the end of this century. It will not simply be a television set, but may become the center of a home communications system consisting of a TV receiver, a video tape recorder, two-way cable TV and a home micro-processor computer, all interconnected to offer a variety of entertainment and services.

The video tape recorder, or VTR, explosion seems to have already begun. Prices are coming down, and they are expected to become even more affordable in the near future. More than half a dozen famous manufacturers are offering cassette models for under $1000, and at least one manufacturer is offering a complete home VTR system, including a camera, for less than $1500. Home VTR's ability to record programs off the air for later playback relieves viewers from a fixed time schedule, and the cassette feature opens a completely new source for specialized entertainment and educational programs on a subscription basis.

Micro-processor computers, which are a step beyond the hand calculator, are already available in relatively easy-to-assemble kits and at affordable prices. These simple computers, which use a TV receiver screen for readout, can store more than enough data to handle a family's bookkeeping and record-keeping needs. By the turn of the new century they're expected to be even smaller and cheaper, and a part of the home communications center.

Two-way cable TV

The final ingredient in the home communications center of the future, two-way cable TV, is already a reality, albeit on a very limited basis. Warner Cable's *Qube* experimental system began operating in Columbus, Ohio during late 1977. The experiment, representing a reported investment

of more than $10 million, is likely to determine the cable industry's future, and the forecast is optimistic.

The control panel for the Qube system being installed in Columbus homes offers a choice of 30 channels, equally divided between conventional television stations (local and out-of-town), community television and premium programming (with a variety of new and classic movies, sporting events, educational courses, etc., on a pay-per-view basis.)

Added to these are five "response" buttons (yes, no and three multiple choice), which allow subscribers to participate as contestants in local game shows, vote on referenda, purchase products, etc. A "home security option", for fire, burglary and emergency service, will be available in 1978. The posibilities that such a two-way system might offer by the year 2001 seem to be limited only by one's imagination!

Ceefax

In Great Britain, the BBC is presently transmitting an electronic newspaper to subscribers via television. Called *CEEFAX*, the data is transmitted simultaneously with conventional programs, and requires the installation of a special decoder for proper reception. *CEEFAX* news broadcasts are continuously updated by the BBC, so that the latest news is always available to subscribers. In this country, the FCC has allowed the use of a similar system for captioning broadcasts for the benefit of viewers with impaired hearing. By the end of this century it is very likely that such electronic systems will be in common use for producing on the face of home TV receivers not only newspapers and magazines, but electronic mail as well.

Optical fiber cable systems

The biggest drawback to date in the widespread use of home communication centers has been the lack of available spectrum space. There just aren't enough coaxial cable, microwave or radio and television channels to "wire" the nation together. But optical fibers seem to hold a promise for providing an almost umlimited amount of spectrum in the future.

Optical fibers propagate laser-driven light waves in much the same way that coaxial cables transport radio waves. Light waves are capable of a much greater number of communication channels than is possible with radio waves.

Optical fiber cables are prohibitively expensive using today's raw materials and manufacturing and installation techniques, but new methods for fabrication already on the drawing board can reduce future costs drastically. In Japan, the homes in a new city being developed from scratch will be wired together for communications with optical fiber cables. Many experts predict that much of the United States will be wired similarly by the year 2001.

Direct broadcasting satellites

Television receivers at the turn of the century will in all probability have a "12 gigahertz (GHz)" band for direct reception of broadcasts from satellites.

A major conference convened by the ITU during early 1977 assigned channels in this band, and corresponding orbital slots, for direct broadcasting satellites to every country in Europe, Africa, Asia and Oceania. A similar conference, scheduled to the held before 1982, is expected to assign channels to the United States and the other countries in the western hemisphere.

The television system envisioned for the 12-GHz band is not compatible with present day terrestrial systems. It will employ FM video and a greater bandwidth than present signals, and will require a converter for use with existing receivers.

The reception of 12-GHz TV signals from a direct broadcasting satellite has been successfully demonstrated with the US-Canadian CTS satellite. Good-quality signals have been received on conventional home TV sets, using nothing more than a relatively simple and cheap signal converter and an outdoor disc antenna about a meter in diameter. The Japanese plan to inaugurate a 12-GHz direct broadcasting satellite system by 1979, and most of the developed countries of the world may have similar systems by the beginning of the 21st century.

There is also a good chance that future TV sets will have stereo sound and possibly three-dimensional video. Stereo sound is technically possible today, and systems employing two independent sound channels are in limited use in some countries where there is more than a single national language. Three-dimensional video systems may be more difficult to achieve, and would probably require special eyeglasses for viewers, similar to those used at one time for three-dimensional movies. But both Westinghouse and CBS have developed circuitry that allows two color television pictures to be transmitted over a single channel. This could be the basis for three-dimensional television in the future.

TV receivers of the future are also expected to have improved selectivity and sensitivity, particularly for the reception of UHF stations, and better color stability and control.

In summary, a crystal-ball look into the future sees by the year 2001 a family or car AM radio with more channels, a new longwave band, and stereo capability. Shortwave radios will have more channels and new bands for easier and clearier reception. The FM radio of the future will be capable of at least quadraphonic reception, and perhaps polyphonic sound, and television sets may have stereo sound, three-dimensional display and the capability of receiving direct broadcasts from satellites.

The use of optical fiber cable systems, video tape re - corders and micro-processor computers is expected to transform the family television set into a two-way home communications center offering a wide choice of entertainment and educational options closely tailored to a viewers taste, as well as having the capability for electronic shopping, banking and mail, receipt of continuously updated visual newspapers, medical checkups without the need to leave home, information retrieval from data banks with a greater store of information than is now available from conventional libraries, home bookkeeping, budget and record keeping, and home security.

Just as this paper began with an assessment of Lee de Forest's predictions for the future of radio and television broadcasting made in 1929, an assessment of the predictions contained in this paper will have to await a similar review to be made by members of the Radio Club of America at the beginning of the 21st century.

It has been said by a noted historian that the past and the present often quite accurately predict the future. Time will tell!

The Ekofisk Project

By JOSEPH F. WALKER, Sr.

The paper below was presented by Joseph F. Walker, Sr., at the "Round Table '77" Radio Club session on the afternoon of November 18, 1977. Mr. Walker is Supervisor of Radio Operations, Phillips Petroleum Co., Bartlesville, OK., and Vice-President of its subsidiary, Phillips Communications, Inc. He has been head of Phillips Petroleum Co.'s domestic and worldwide operations since 1951.

The Phillips Ekofisk project in the North Sea is a $5 billion complex of oil and gas production facilities, crude oil pipelines, gas transmission pipelines and process plants extending from England to the Norwegian sector in the middle of the North Sea and to the Federal Republic of Germany.

Ekofisk has the most complex electronic production control, monitoring and communications network in offshore waters. A $20 million radio system designed and installed by Phillips Petroleum Co. provides all communications via a combination of tropospheric forward scatter radio, microwave and satellite.

Although other radio systems are used throughout Ekofisk, this article is limited to a brief description of the four major systems: Ekofisk to England; Ekofisk to Germany; the field microwave system and the Ekofisk to Norway satellite system.

Ekofisk-Teesside System

The first system was for the Ekofisk to England *one million barrels of oil per day* crude oil pipeline. This required highly reliable communications. After research of virtually every conceivable communications possibility, tropospheric forward scatter radio was selected for the first radio system. This would be a single-hop, 215-mile link from Ekofisk to England. Our path calculations were based on two recognized methods, NBS Technical Note 101 and CCIR recommendations. Minimum performance criteria were established:

1. Annualized time availability, a minimum of 99.9%.
2. Channel signal-to-noise ratio to be 42 dB or better.
3. Maximum data bit error rate to be better than 1 in 10^5 at a rate of 2400 BPS.

With Ekofisk located in the Norwegian sector and the land terminal in England, a private international communications system was involved, requiring approval by both governments. The Norwegian telecommunication administration advised the system concept would be approved by Norway provided the United Kingdom concurred. Approval by the U.K. Home Office Division of Telecommunication was granted with two conditions.

1. The channel capacity of the system would provide communications for possible future users, and
2. The system design would inhibit interconnection to the public telephone network of the U.K. Both conditions were acceptable.

A 96-channel system was designed. It was limited by several factors. Among these were number of frequencies and transmitter power. The frequency used in the North Sea is in the 2.5 gigahertz band with a power limitation of 1,000 watts. Frequency diversity systems are not permitted. It was determined that a system utilizing quadruple space diversity with polarization protection, pre-detection combining and threshold extension capabilities could meet our needs.

An 800-foot escarpment on the east coast of northern England was selected as our land terminal. At this site, two 40-foot parabaloids were erected, each illuminated with 1,000 watts; one in the vertical and one in the horizontal plane, providing an effective radiated power of 50 megawatts. Due to space limitations offshore antennas were smaller. The size on each platform was 30 feet at heights of 150-feet.

Intermediate pumpstations located at 70-mile intervals are served by offsetting feed horns to radiate a portion of the signal from Ekofisk and Teesside to the individual stations. The return paths to Ekofisk and England are relatively straightforward systems.

The Ekofisk-England system has now been in operation more than one year. All design objectives have been achieved. Due to bandwidth required to accommodate the 96-channel capability, an acceptable degradation in signal-to-noise ratio occurred in our voice circuits. A bit error rate of better than 1 in 10^5 at 2400 BPS in data transmission is maintained.

The tropo land terminal is linked to our Teesside, England plant by a 1.5-gigahertz microwave system.

Ekofisk-Emden System

The gas from Ekofisk is delivered to Emden, Germany, through the largest subsea gas pipeline in the world. It is capable of delivering 2.3 billion cubic feet per day. The line, 274 miles in length, is equipped with two compressor

stations located at 95-mile intervals and is served by a 2.5-gigahertz tandem multihop scatter system designed to CCIR specifications. Two frequencies were allocated for the system. Stringent specifications were also and placed on antennas at Emden. The latter necessitated addition of serrations to the periphery of the 40-foot antennas to redistribute backward radiation.

The two-frequency system posed the possibility of internal interference, requiring application of a new technique. An automatic power control was developed, permitting the receiver to control the amount of power being radiated by the distant transmitter. Performance is then optimized to predetermined signal set points with levels maintained through a dynamic range of 50 decibels. The system was commissioned in early 1977. Performance has been highly satisfactory.

Ekofisk Field System

The Ekofisk field system utilizes duplicated microwave, operated in the 13 gigahertz band and designed for 99.99% time availability (CCIR). The range is approximately 20 miles, with antenna heights of 180 feet at nine outlying platforms. A combination of frequency, space and polarization diversity is used. The antenna gain is 39.5 dB with a 1.7-degree 3-dB beam width. This system was commissioned in 1976 with required performance the same as that specified for other systems. Infrequent heavy snow in the Ekofisk field causes some signal degradation. Other precipitation has no effect.

Ekofisk-Norway Satellite System

Variation in oil-to-gas ratio in the Ekofisk wells can influence the crude oil flow to England. To provide the capability of field optimization, well test data are recorded for computer storage at Oslo, Norway. Production may then be programmed by computerized information. To provide this, a communication link between Ekofisk, the operations headquarters at Tanager, (Norway) and Oslo was required for this and other communication. The distance from Ekofisk to Norway is 230 miles. The Phillips group and the Norwegian Telecommunications Administration (NTA) agreed to the provision of communication channels via satellite between Ekofisk and Norway.

Norsat, the satellite entity of NTA, leased a half transponder from Intelesat for use by the oil industry. The system operates with nonstandard earth stations and is capable of operation into space segments both in the Atlantic and Indian oceans. Antenna step tracking is used to accommodate space segment orbit variations. Parametric amplifiers are used. The transmit power amplifiers are capable of 1.5 kW output but are operated at lower levels to reduce intermodulation products.

The system utilizes dedicated single carrier per channel for maximum flexibility. The primary modulation is two-phase phase shirft. Secondary voice mode is delta modulation. Data is transmitted at 24 kilobits with an 8-kilobit error correction based on two 2400 BPS data channels multiplexed with 24 50-baud teletype channels. Voice activation of the carriers provides a capability of approximately 120 two-way channels.

Eight channels in the satellite system are now activated. A ninth data channel is used for the transmission of weather data from Ekofisk to the Netherlands for use in North Sea weather research.

The entire communication systems of Ekofisk, including tropo scatter, microwave, satellite, VHF and HF communication have fulfilled all expectations. The integrated systems provide a capability of automatic instantaneous communication between any of 1,000 locations throughout the three-nation network over a distance in excess of 1,000 miles. The systems have been designed with expansion capabilities to meet not only current but long-range North Sea communication needs.

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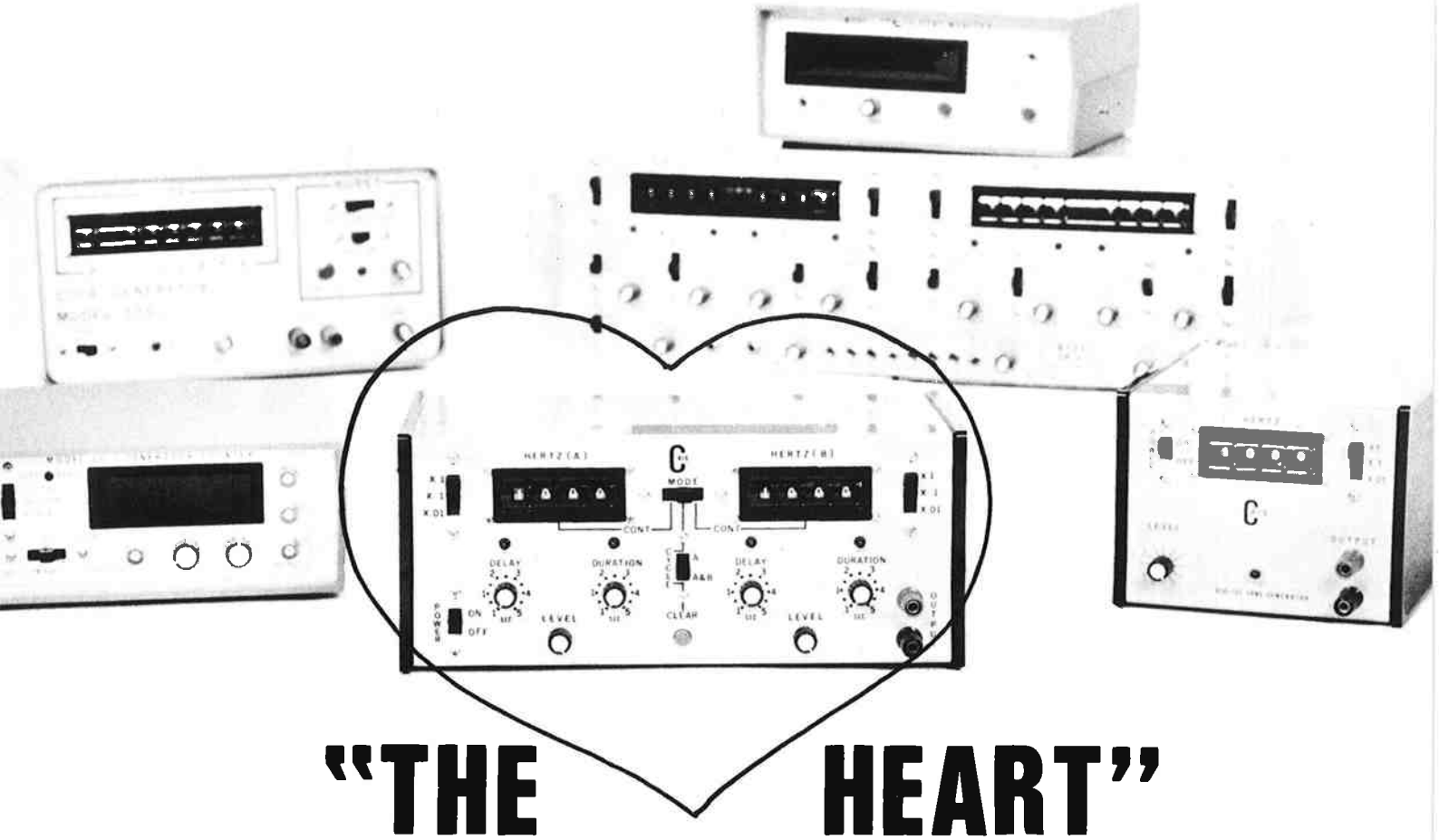

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Model 2TSG-1	$375.00
Model DTG-1 Digital Tone Generator	$185.00
Model RM422 4 Tone, 3 Tone, 2+2, 1+1 Generator	$900.00
Model TCM-34 Tone Channel Monitor	$395.00

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COMMUNICATIONS and Air Traffic

"As O'Hare Goes, So Goes the Nation"

By WILLIAM FLENER
Associate Administrator, Air Traffic and Airway Facilities, FAA.

I've been flying a long time—perhaps not as long as Collins or Lear—but several years ago I was flying from Belgrade to Lyublyana, in Yugoslavia. I was flying in the right seat in a Lear Jet with a Collins panel. We were waiting for fog. They're giving 90 meters (almost 300 feet) and a mile visibility. Then finally the ceiling got up to the minimum. We took off from Belgrade and flew on to Lyublyana.

Now in Lyublyana, you make a VOR approach, then you go to a DF off an H marker, then you go to a compass locator, then you pick up an ILS and intersect it and go down. And we went through fog to what would be in our figures 300 feet. And then it was 200 feet—no way! You have to understand, I'm sitting in one of the front seats; I can't speak any Serbian. The Serb can say "hello, goodbye" and "airport" in English and that's all, and I couldn't say anything. But he and I had been flying together for about a week, and we understood each other. He would point and I would point and so we made approaches to Sarajevo and Dubrovnik—several places—and we didn't do too badly. We swapped seats back and forth. I remember that they called him Little Boy—I forget the Serbian name for it. And he did know what he was doing—he was an ex-Luftwaffe pilot. (I found that out later from a former German pilot.)

Anyway, we're going down the ILS and we went through minimums, and a hundred feet below that . . . nothing. And I kept looking at him. We had a jet chart that says you go around, you make a missed approach, you do this, that, and so on. I'm looking at him—boy, we'd better get out of there because I'd seen the tops of the mountains as we went down, and Little Boy's just driving right on down there. Then all of a sudden, he picked up an open patch of ground to his left and started to cut to it and then I saw lights to the right. I said "Airport,"—a word he understood—and we touched down. I'd say we didn't have more than 30 or 40 feet ceiling at the most and maybe, oh, a quarter of a mile for visibility.

We touched down, and we taxied in. Now we had a Lear Jet, we had a Collins panel, but the ILS was French and I got in a truck and went and looked at it. Parabolic Thomson CSF equipment—not bad at all. It could have been American and we would probably have done as well. But I never forgot that.

But that has nothing to do with my speech. We're back to avionic systems, the airplane systems of the world. And if they're done right and are handled properly—and it was in his case—you survive and you do quite well systemwide, worldwide.

Now most people don't consider communications per se as that sort of thing—but that's what it is. Avionics is a system—a system in an aircraft. Now I'm an aviation type, and Art Collins and Bill Lear are. Everything that went into that Yugoslavian system (it's a small part of the whole world, but it was important to me when my little rear end was riding down toward that airport) worked and worked well. It worked not only because guys like those two, but like people who are sitting here in this audience have developed these systems. And people in other nations of the world have done very well at developing systems: ILS systems, communications systems, panel systems, airplanes, like Bill Lear and Art Collins. All of them—very important to the guy who's carrying passengers behind him.

I came here this morning on an airline 727. He was 30 minutes late getting off National. I don't know why. I didn't go up front and ride with the crew. But he was 30 minutes late. He made up 10 minutes. He flew it like a cowboy—full throttle all the way. Not bad, but, boy, he really gave that airplane a workout. He knew what he was doing.

The point is, you can do that sort of thing. You pick up time, you lose time sometimes, you get into delay problems. I'm not going to answer the problem of why we have delay problems—there is no answer, but we do have delays. The system works and it works very well, notwithstanding the problems. I went through a briefing this morning. Eighty-two percent of the delays in the U.S. are due to the weather. Now I can't do anything about the Lord—but 82% are due to thunder-storms, lighting, severe turbulence, mild turbulence, wind shear—what have you.

Two percent are due to systems problems, ILS failures, VOR failures, communications failures, which you don't have very often, thanks to Collins and such people. We do very well on that system and I've worked that problem very hard.

Let's take a simple thing. At O'Hare—as O'Hare goes, so goes the nation—and I'm serious. If O'Hare goes to minimums, it's not unusual to have 60 aircraft holding—at four points, stacked, all of them in the O'Hare area. O'Hare is—well, I'll give you a short lesson in traffic control. O'Hare is a throughport—so is Atlanta. One out of every three aircraft goes through Atlanta or O'Hare. Not true of Los Angeles, San Francisco, JFK. They're at the end of the line—98% of the aircraft terminate there. Very few go through. So what happens at O'Hare or Atlanta controls the system.

If the weather goes down at O'Hare we have 12 instrument landing systems—and notwithstanding the bureaucratic nonsense you get into, we now have seven Category II ILS systems at O'Hare that will take you down to ceiling of 100 feet decision height at a quarter of a mile visibility. There are only two CAT II lighting systems. The bean counters back in Washington said to me, "You can't do any more than that." I said, "The hell I can't" and I'm putting in all 12 CAT II's into Chicago, all solid state, all the same, just to make sure we cut that 8%—it's already down to about 4%, and we'll get it down to 1%. Now that will pulse the whole system. Bill, I didn't intend to give a lecture on CAT II, but it's important that people understand.

The name of the game is to improve the equipment in the system—the total system. Now we have 16,000 navaids, 12,000 primary aids, radars, centers, towers, communications stations, remote air-ground stations —that sort of thing. Three billion dollars—your taxpayers' money, a $3 billion investment in this system. Today's Friday—on my Friday afternoon at some time between 4 and 8 o'clock, there are 14,000 aircraft moving in the system. Over a quarter of a million people are locked in those airframes. That's a fair-sized city.

The airlines last year moved more than our total population. That's about 215 million. We moved 216 million people just in airlines. And that doesn't account for all the business jets and all the other jetcraft like Bill Lear builds. You hear figures of 100 to 150 million general aviation passengers. There are 20,000 military aircraft, and Lord knows how many people move in those planes. But the grand total is something like 350 million people every year. It's a big, complex and very involved system.

The delays? Over the weekend (I went through the figures this morning) just here in New York—five or six airports—we had 584 delays of 30 minutes or more over the three days, most of them due to weather. Now, we consider that a lot of delays. A 747 wiped out its nose gear and lost an engine, went off the runway at JFK and mired down in the mud—tied up a runway. Yesterday a Swearingen aircraft came in, wiped out its nose gear, clipped an engine, tied up the runway for two hours. A two hour delay, plus the 747, both of them at JFK, are enough to tie up that airport something tremendous. A simple thing like blowing tires or an engine loss, wiping out props or whatever can really put the system out. It's a finely tuned system that can get bound up very rapidly.

And tens of thousands of passengers are real upset—don't understand the problem. They say, "What the hell's happening?" and some airline reservation clerk says, "the air traffic controllers are slowing down," or else, "the system is all boggled up." Yes, it is—because something has happened to some aircraft or the weather's gone to the ground. Most people do not understand how critical some airports are. Those airports are critical to the entire system. Over the weekend when we backed up in New York, we really backed up! Chicago, Philadelphia, Washington, Atlanta, Norfolk, all had airplaines sitting on the ground at gates because JFK went down due to the 747, due to the other aircraft, due to just plain miserable weather. (The Swearingen was warned not to fly in the first place. Don't go—and he went and it was so turbulent and so difficult with hail and ice and everything else, he declared an emergency and went back and looped on the runway.) So you have a problem that most people don't understand—what's happening to the total system.

Now let me have one final word. Without good communications, thanks to the guys up here on the platform, we would never made it. We have to have—and we do have—excellent, outstanding communications with these aircraft. Very rarely do we lose either ground communications or communications from the aircraft to the ground. You must understand, when you see bad weather, it's affecting more than just you. Remember the story about the old sailor: "Pity the poor landsmen on a night like this!" Well, pity the poor guy in an airplane on a night like this! He's having nothing but trouble. His avionics works very, very well, thanks to those people and thanks to the system and thanks to maintenance. We run a 99.9% maintenance system, but it's a problem, a difficult problem.

Thank you very much.

William P. Lear

Land Mobile Radio Week

Denver, Colorado, March 20-24

More than a dozen groups combine to make Land Mobile Radio and Vehicular Technology Week the outstanding technical event of the season. The week begins with a National Business Radio Dealers Conference sponsored by *Communications* magazine. Tuesday continues the conference, with four symposia and two tutorial sessions. On Wednesday the Vehicular Technology Society activities begin with several parallel sessions, and the same course is followed through Thursday and Friday.

The week's highlight—at least to Club members—is the joint Radio Club of America and IEEE Denver Section Banquet. The committee handling the Banquet—as previously noted in the January *Newsletter*—includes two Club Directors, Mal Gurian and Joe Walker, and local Club members John Tary and John Shafer. Judy Lockwood is Banquet coordinator chairperson and Stuart Meyer Master of Ceremonies.

Keynote speaker Wednesday evening is our own Fellow Bill Lear, who was recently awarded the Club's Sarnoff Citation for his accomplishments in advancing the art of electronic communications. A selection of his achievements appears below.

Chronological History

1902. Born June 26 in Hannibal, Missouri.

1912. Listened to the radio account of the Titanic disaster and decided then and there on a career in electronics.

1915. Built his own battery charger and went into business charging batteries at 25c each.

1917. Graduated from eighth grade, quit school and left home. The following year he joined the Navy—lying about his age—and became a radio technician. After an early discharge he became the fastest Western Union operator in Chicago but left for a job without pay that offered possibilities of learning to fly. He was a grease monkey for the U.S. Air Mail, which used the Loop lake front as a landing field.

1926-1930. Developed the Radio Coil and Wire Corp. and traded it to Paul Galvin for 1/3 interest in the Galvin Manufacturing Company; both of Chicago. (During this period developed the first automobile radio. It put Motorola Corporation, formerly Galvin Manufacturing Company, into business.)

1930. President of Lear Developments, later known as Lear, Inc.

1940. Awarded the Frank M. Hawks Memorial Award for the design of the Lear-o-Matic radio navigation system for airplanes.

1942. Married January 5—in Greenwich, Connecticut—to Moya Marie Olsen, daughter of the late Ole Olsen of "Helzapoppin" fame.

1950. Awarded the Collier Trophy by the President of the United States for "the greatest achievement in aviation in America during the previous year."

1951. Received from the University of Michigan the honorary degree of Doctor of Engineering.

1954. Received the Horatio Alger Award "for having pulled himself up to the top of his field by his bootstraps."

1960. Moved his family to Geneva, Switzerland, where the concept of the Lear Jet was born. In Stockholm he was presented Sweden's Thulin Medal for his contributions to the aircraft industry.

1960. Also awarded the Great Silver Medal by the City of Paris for his aid in developing the autopilot for the Caravelle jetliner.

1962. Sold all interests in Lear, Inc. for $14,300,000 in order to produce a small business jet aircraft. Lear Jet was established at Wichita, Kansas.

Also established Avionics Division in Grand Rapids, Michigan, and a Stereo Division in Detroit, where concept of eight-track stereo sound tape was first developed.

1963. Maiden flight of the Lear Jet on October 8.

1968. Bought Stead Air Force Base at Reno, Nevada, for $1.3 million and established Lear Motors Corporation for research and development of low-pollution power systems.

1969. Received the "Engineer of the Year" Award for 1969 and a commendation proclamation from the Los Angeles Board of Supervisors.

Was the recipient of an honorary Doctor of Science award from Art Center College of Design.

1970. Elected an Honorary Fellow in the American Institute of Aeronautics and Astronautics.

1972. Recipient of the Gold Plate Award by the National Academy of Achievement.

Awarded the Cresson Medal by the Franklin Institute of Philadelphia.

Received an honorary degree of Doctor of Engineering from the University of Nevada.

Received the Spirit of St. Louis Award by the city of St. Louis and St. Louis University.

1973. Awarded the American of the Year Award.

1974. Recipient of an honorary Doctor of Engineering degree from Notre Dame University.

1975. Recipient of an honorary Doctor of Science degree from Northrop University, Inglewood, California.

1976. Recipient of an honorary Doctor of Engineering degree from Carnegie-Mellon University Pittsburgh, Pa.

The 1977 Awards

The two highest honors of the Radio Club of America went this year to two distinguished workers in the radio aircraft field: the Armstrong Medal to Arthur A. Collins and the Sarnoff Citation to Bill Lear. Their work in aircraft communications systems, radiolocation instrumentation and automatic electronic piloting apparatus and instrument landing is well enough known to make repetition here unnecessary. The Ralph Batcher Memorial Award, for preserving the history of radio, went to John F. Rider, whose Perpetual Trouble Shooters Manuals document the progress of the radio art from the earliest broadcast receivers. (Illiness in the family prevented Mr. Rider from being present.) The Pioneer Award was received by Wm. E. D. Stokes, a founder and first president of the Club, whose testimony at a Senate hearing against the Depew bill is credited with preserving the very existence of amateur radio. Some remarks of the recipients follow:

Arthur Collins Remarks

The Armstrong Award of the Radio Club of America has a very special meaning. For me it is a deeply personal expression of shared values and a great honor.

It is also a gracious expression of encouragement not only for me, but more important, for other and younger people to carry forward the work needed to realize the tremendous opportunities that lie ahead.

As you might expect, this expression has led me to recall several especially stimulating discussions I had with Howard Armstrong and to think about his work. Armstrong's work can be viewed in many ways. I like to think of it as a classic example of systems engineering. This view is particularly meaningful in respect to his development of the superheterodyne and wide-band frequency modulation. The litigation involving his oscillator has tended to identify him as an inventor of distinct circuit ideas. These were important but the full scope of his contributions can be appreciated only in a wider sense.

I have spent the last few days rereading Armstrong's many papers presented before the Radio Club of America and the Institute of Radio Engineers. What always comes through after such a reading is the picture of a man who set the highest standards for himself—to understand the physical behavior of system elements such as the vacuum tube and the radio medium itself, to take great

Arthur Collins (right) receives the Armstrong Medal from Frank Gunther.

Bill Lear holds his Sarnoff Citation, left. President Fred Link to his left.

pains to search out and eliminate any spurious effects that might compromise his results, and, only after this was done, to lay out and test a system arranged in the cleanest, most straightforward way to realize his system concept. These are the methods of a man of great professional commitment to what he called "the truth"—a word he used not only in a scientific but also in a moral sense.

Not every engineer has Armstrong's gift of imaginative genius, but his methods and his professional commitment to searching for the truth are accessible to everyone.

This Club is unique in that most of us here can remember how meager was the technical knowledge of the early days of radio. For example, the September, 1915 Proceedings of IRE contains the paper, "Some Recent Developments in the Audion Receiver" by Edwin H. Armstrong. The first paragraph contains a figure showing "the fundamental operating characteristic of the audion". Few such characteristics had been published earlier because not even its inventor, de Forest, had taken the pains to measure a tube relatively free of erratic gas discharge effects.

Few engineers working today can imagine that it was ever necessary to begin a technical paper with an explanation of such elementary relationships. To them it is part of the body of knowledge known from ancient times. Armstrong goes on to explain the regenerative receiver in terms of its physical behavior. The phenomenon he described so clearly was, nonetheless, a very subtle one. Not until 1932 was a mathematical model of the behavior of regenerative amplifiers presented by Nyquist.

In like manner superheterodyne receivers, wideband FM, and the relation between channel bandwidth and signal to noise ratio are today commonplace concepts. That this was not always so is easily forgotten.

Yet we can remember when these ideas were innovations of the first order. Like most innovations, they upset the established order of things and for a time they survived precariously.

Members of the this Club have been a part of the "heroic age" of radio exemplified by the intensely human and dramatic personality of Howard Armstrong. Starting with a heritage of largely European science you have seen and personally contributed to the great development of the radio art and industry. We have seen that invention and innovation are the driving force of our industry. It is an industry that lives and grows on ideas. To a very large degree these are an affair of the individual creative mind.

I would like to suggest because we have had the privilege of living across this exciting and sometimes turbulent span of history—because we have seen so much grow from such stark beginnings—that perhaps we may be able to perceive the signs of fundamental change more clearly than others. This is very difficult because we stand today in the midst of a bewildering mass of electronic gadgetry. Wher would we expect a young Armstrong to start today to build a simple, useful, new set of system concepts?

Clearly these concepts will embrace not only communication but also tools for enlarging and extending other human faculties as well. It is unlikely that they will take the form of the massive machines we use today. Instead, they will be built in the new micro-world of exceedingly small integrated semiconductors and related devices.

New concepts are needed to show how systems are to be designed, manufactured, sold and used. Many

Morgan McMahon, last year's Batcher Award recipient, with his 1976 award. Ray Griese looks out from the rear. Stu Meyer at right.

W.E.D. Stokes, a founder of the Club, at right, receives the Pioneer Award from Harry J. Dannals, president of the A.R.R.L.

of these ideas are now emerging but they are not yet widely understood.

New system ideas introduced today may (like Armstrong's innovations) tend to upset the established order. Some may imply basic changes in the way industry is organized and managed. The pace of innovation in these matters always tends to lag the pace of technical development.

We live today in an exciting and challenging time—a time for innovation. It is a time, also, to recall the work of Armstrong; the same dedication, the same searching for simple truths and the same adherence to fundamental principles are needed today.

Mr. Stokes acceptance

I am overcome by the glowing introduction Mr. Dannals has delivered in presenting me with this wonderful award. Coming from the President of the American Radio Relay League makes it even more important. My first Navy job after leaving Annapolis was Assistant Communications Officer on a warship in the North Sea, and I am well aware of the important work the Relay League amateurs did in keeping track of the shipping in the Atlantic.

First off, I want to thank the directors and members of the Radio Club for carrying the ball all these years to perpetuate the purposes for which we youngsters started the Club way back in 1909. These purposes may be summed up briefly: to improve the art of Wireless.

I am happy to have played a small part in this project. I think the three patents I secured at the age of 15, while they did not make millions, at least stimulated the other members to go out and do likewise. I do not have to remind you of the wonderful patents secured by members of the Radio Club, some of which *changed the course of human events!*

Much has been accomplished but much remains to be done. As an old Navy officer I am very much interested in the recent developments for communicating with submarines below the surface of the ocean. It is too bad that a few stupid people up in Michigan, where a ground antenna 200 miles in circumference is to be buried, have tried to block the project. This sort of thing is counter-productive to our purposes.

I can think of other counter-productive examples. When I turn the dial on my radio I hear the most horrible music. The newscasts are not all that good, either. Fortunately, my ancient HRO receiver, which is hooked up to an extensive antenna on the roof, provides me with excellent worldwide coverage. This morning I listened to a newscast from Australia that gave me more information than I could get in the *New York Times.*

Again, many thanks for this wonderful award and, as we used to say in the Navy—Happy Landings!

Radio Club Elects Twenty New Fellows

Fourteen of 1977's 20 new Fellows of the Radio Club were presented with their certificates at the Annual Banquet November 18, 1977. Those pictured above are, left to right: Rear row: Val Williams, Morgan McMahon, Alan Armitage, Richard Quantz George Jacobs, John Daly and George Mitchell.

Seated, front row: Rex Bassett, Nat Pfeffer, Ben Tongue, Charles Davison, Robert Batts, Ray Griese and Thomas McMullin.

Some of the Fellows travelled long distances for the ceremony. Ray Griese and Morgan McMahon came from California, Tom McMullin from Texas and Richard Quantz from the State of Washington.

Not present were Gary David Gray, R.W. Johnson, James McLean, Travis Marshall, John Robinson and Raymond Spence.

(Citations to the 1977 Fellows are on page 8 of the October, 1977, *Proceedings.)*

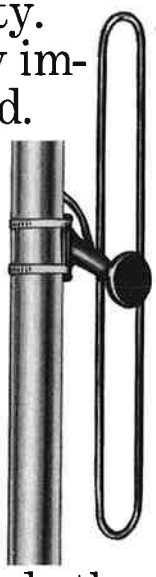
Committee Heads and Partial Committees, 1978

Afilliations. . . . . **Charles Summers,** Jack Poppele
Awards. . . . . **Jerry Minter,** Jack, Poppele, Sam Harmatuk
Banquet . . . . . **Jack Poppele,** Mal Gurian, Loren McQueen, Ray Griese
Constitution . . . . . **Joseph Rosenbloom,** David Talley
Finance . . . . . **David Talley,** Nat Schnoll, Stuart Meyer
Meetings. . . . . **Mal Gurian,** Stuart Meyer, Dean George Hill
Membership . . . . . **Vivian Carr,** Charles Summers, Loren McQueen, George Apfel
Nominations . . . . . **Sam Harmatuk,** Jerry Minter
Papers. . . . . **Wm Fingerle,** Ero Erickson
Publications . . . . . **James Morelock,** John Rider, Ero Erickson, Jerry Minter
Research, etc . . . . . **John Rider,** Henri Busignies, Jack Poppele, David Talley
Proceedings . . . . . **Fred Shunaman,** Ken Bourne, Ero Erickson
Publicity . . . . . **Ero Erickson,** Ken Bourne, Judy Lockwood, Al Menegus, Robert Tall
Advertising Manager. . . . . **Stuart Meyer**

Committee heads are in boldface. Committee membership is not fixed, and is subject to modification by the heads of the committees.

Bill Bryson for Phelps Dodge: one way to fight rising base station antenna costs is to spend more money on base station antennas.

A contradiction? Not at all. As I see it, if you're about to specify a new base station antenna, you must consider the total cost of the system. Add up the cost of the antenna, the tower and the cable, plus the time necessary for installation. Then anticipate the number of maintenance-free years you can count on. Some antennas will last a year or two. In ten's of thousands of installations ours have performed for more than ten years and many for over twenty. That's a really impressive record.



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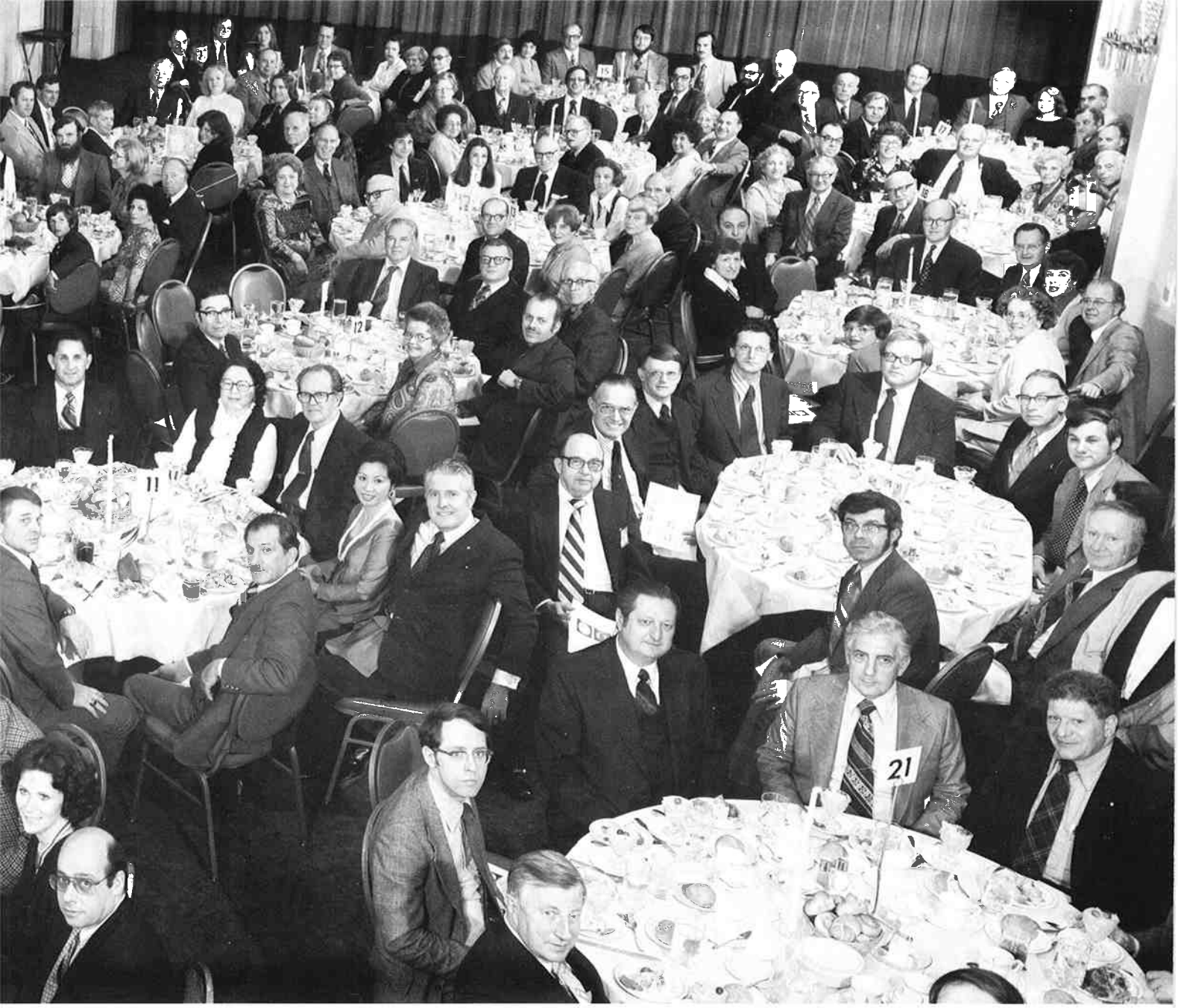
Club Spirits Soar at

The free-flight feeling of the wide blue yonder dominated Trip No. 68 of the Anniversary Dinner and Awards Presentation of the Radio Club of America at the New York Sheraton Hotel on Friday, November 18, 1977. Everyone appeared to feel that good buoyant fluffy stratocumulus tending towards CAVU (ceiling and visibility unlimited) blithness of spirit among those pioneers present who once flew by "the seat of their pants" and who revolutionized flying into a safe electronically automated worldwide system.

The awards program was lead off by Sarnoff Citation Award winner, William P. Lear (Fellow, 1969), pioneer in electronic flight navigation leadership, and prolific inventor and aviation innovator, who was recognized "for significant contributions in electronic communications." An expert in automatic aviation direction finding and landing systems, Mr. Lear's credentials include a half dozen academic honorary degrees recognizing his work as an aviation engineer. It includes the Lear jet and the invention of the eight-track tape player in the consumer market.

The highest honor of the Club went to Arthur A. Collins (Fellow 1975), who received the Armstrong Metal in recognition of his "important contributions to radio art and science," much of it being in the field of aviation communications. His company, Collins Radio, founded in 1931 in Iowa, became an important supplier of equipment to radio amateurs, commercial and military services. Recently he developed a completely automated computer-controlled 250-kW broadcast transmitter. He now resides in Dallas, Texas and operates as WB5MAR in the amateur bands.

Keynote speaker was William M. Flener. With a lifetime of flying experience, Mr. Flener was named



68th Award Session

Associate Administrator for Air Traffic and Airway Facilities, FAA in 1974. A captivating speaker, he related fantastic facts about the number of people who are airborne each Friday evening in "The System" of commercial carriers. The smooth operational flow in the whole system is dependent on whether O'Hare airport in Chicago is open or closed due to weather and safety considerations, he said; adding that this is because it is a "thru-put" terminal.

Eighty-two-year-old W. E. D. Stokes, as spry as ever, was awarded the Pioneer Award, and for good reason. He was the first president in 1909, of the Junior Wireless Club, which later became the Radio Club of America. He was granted four radio patents before 1920, and served as communications officer on the USS Delaware during World War I.

The Ralph Batcher Memorial Award "for accomplishments in preserving the history of radio" went to John F. Rider, one of the best known names in technical radio literature. Mr. Rider started his radio writing career in 1921. In 1929 he formed his book company and published the annual "Perpetual Radio Trouble Shooters Manual." His active call is W2RID. Unfortunately, he was unable to attend due to family illness.

Director Emeritus for Life went to Dave Tally W2PF, who has been Treasurer since 1969 and who helped shore up the financial security of the club. A radio amateur since 1915, he is an expert on carrier telephone design and operation and has written several books on switching systems and related subjects. He recently made a permanent move to Florida.

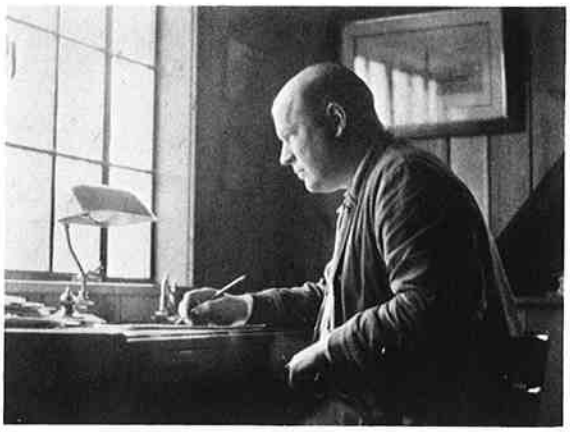
Also Director Emeritus for Life, Harry Houck—who worked with Major Armstrong in Paris—was

Continued on Page 28

Allen B. Du Mont

"The man Responsible for Television"

By P.S. CHRISTALDI and T.T. GOLDSMITH*



Dr. Du Mont in his office.

Part I of this article, printed in October 1977 issue of the Proceedings, described Du Mont's early years, his work with Westinghouse as tube engineer, and as Chief Engineer of the de Forest Radio Co.; later his work on cathode-ray tubes and his introduction of the first practical cathode-ray oscillograph (his word for what is now the oscilloscope) and his earlier experiments with television (interrupted by World War II).

Part II

During the early 1940's television manufacturing was at a halt. Experimental Station W2XVT, transmitting at 50 watts from the basement of the Passaic plant, was manned from midnight to 9 am, starting in 1938. Test patterns, slides, and a occasional movie were transmitted to test out new equipment, and many bleary-eyed engineers and technicians spent their days first on commercial and then on military electronics, and their nights operating W2XVT. When regular TV programming was introduced at the New York World's Fair in 1939, Du Mont receivers were on the market, field tested by W2XVT, and Du Mont's W2XWV (later WABD) was set up in New York City.

Meanwhile, production of radar indicators, mortar-fire locators, electronic timers for *Loran C* equipment, and general-purpose and militarized oscillographs, continued. There were no materials and no manpower for television, but many refinements and techniques were borrowed from television and applied to advancing the capabilities of oscillography, radar displays, and related devices. Video amplifiers gave wideband response for pulse analysis for radar and other needs; special oscillographs were supplied for the Manhattan project, Oak Ridge and Los Alamos Laboratories, Sandia Corporation, and others engaged in the development of nuclear weaponry. Triggering and sweep circuits from television practice were adapted to instrumentation. New types of cathode-ray tubes were developed, including polar deflection types for radio-locators and ultra-high-frequency types utilizing coaxial lead structures to deflection plates.

Throughout this period of urgency and crisis, Allen Du Mont followed closely the work in his laboratories and in his production shops. On his frequent circuits of the plant, usually with an unlighted cigar between two fingers, he would stop to ask "How's it going?", to offer a suggestion for the solution of a knotty problem, or to express pleasure at a job well done. A quiet man,he displayed every sign of self-confidence and of confidence in those working for him. His own personality and example had much to do with the unusualy high level of capability, performance, enthusiasm, and dedication exhibited by his staff. He led a simple, prudent life. One associate remarked that he usually carried a slide rule in his breast pocket and that he would be unlikely to commit himself on how much was 2 times 4 without consulting the slide rule.

Once during these years of hard work and belt tightening (the company showed a profit in only one of its first eleven years) his wife pressed him to redecorate his office, equipped with battered furniture that he had used for years. He retorted: "You know,ever since we got successful, all the young fellows in the plant want big, fancy offices. I figure leaving mine this way saves me a lot of arguments".

The Beginning of Television

When World War II came to an end, Allen B. Du Mont once again was able to concentrate his attention and energies on his long-time objective—a practical commercial electronic television system. He had participated in the establishment of standards for the 525-line system now used in this country, based on recommendations of the National Television Systems Committee (upgraded from the 441-line system in use two years earlier when regular broadcasting began). Never one to back away from a controversy,Du Mont had urged adoption of a flexible system that would permit future improvement in picture resolution without making existing receivers obsolete, but his recommendations, though supported by impressive field-test demonstrations, in the end were not accepted.

With the transmission standards fixed, and with nine commercial television stations on the air, the age of television had arrived—on paper. It remained to design, produce, sell, and install the many transmitters and receivers necessary to make it a reality.

To this end Du Mont rearranged his internal organization to set up separate operating divisions to produce the

*Fellows, Radio Club of America

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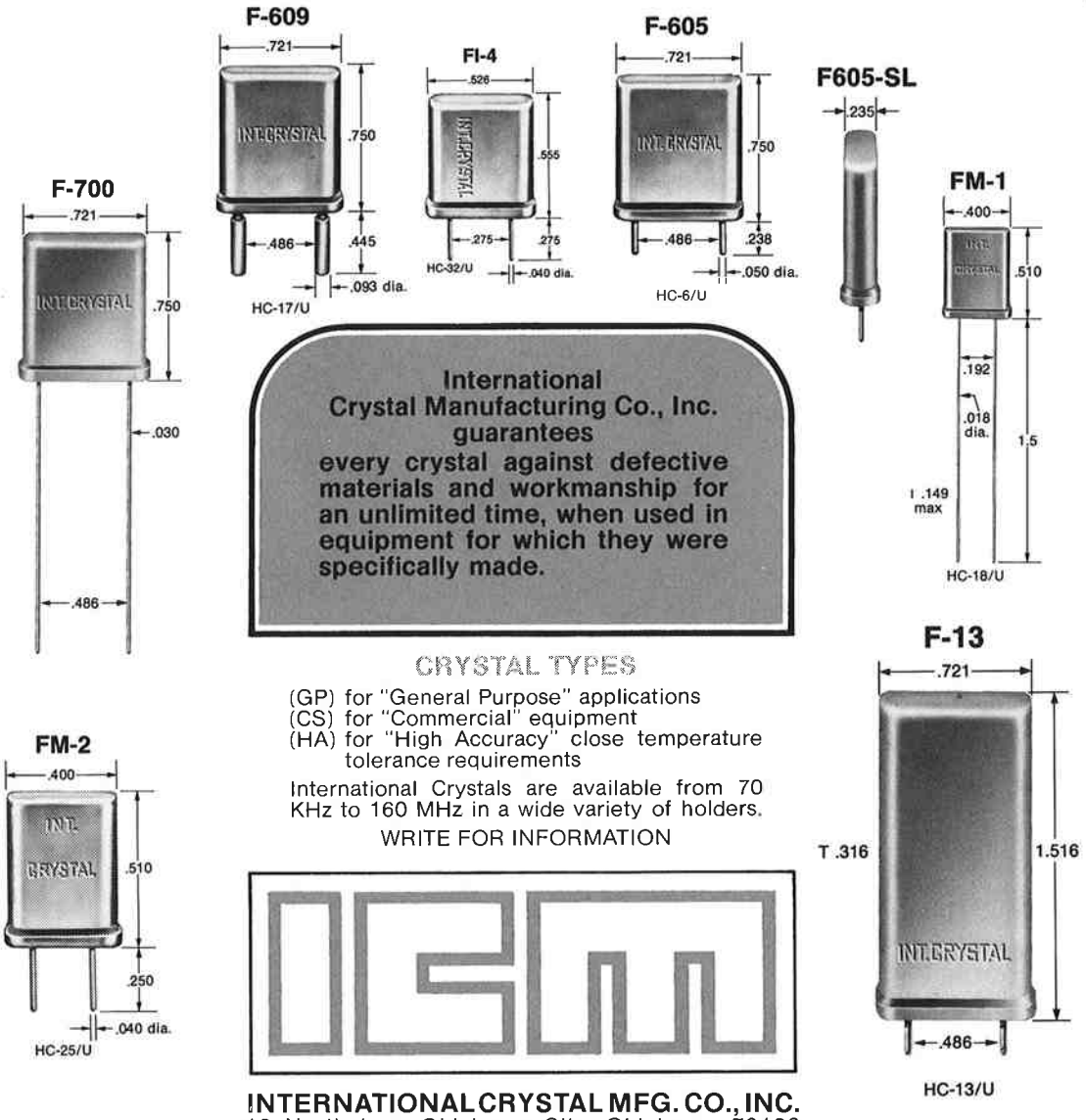

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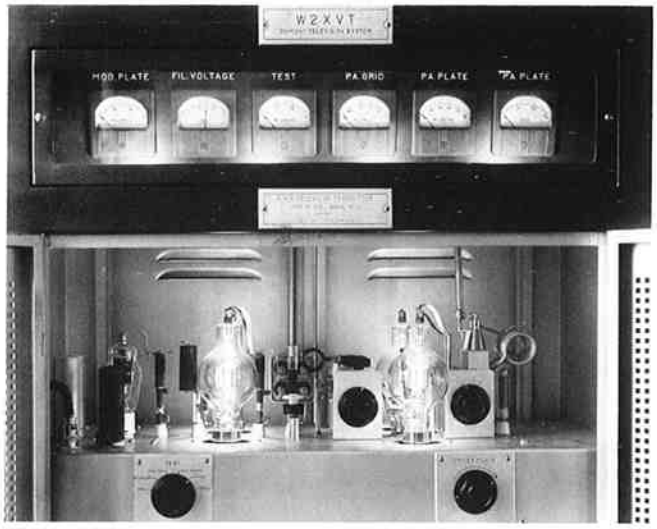


Final stage of experimental transmitter W2XVT

major product lines: tubes, receivers, transmitting equipment, and instruments, and proceeded to enlarge his technical staff to carry out the job. Supplementing these four was the television broadcast division. It was not difficult to recruit an outstanding staff, because Du Mont Laboratories had established an excellent reputation for quality and innovation during the war years. The postwar Du Mont technical staff was perhaps one of the finest ever assembled by a company of such size, and it produced very effectively, a tribute to the leadership and inspiration provided by Allen B. Du Mont.

The Receiver Division concentrated on the design of high-quality 12-, 15-, and 20-inch receivers. The Transmitter Division refined the studio equipment that had been in use since pre-war times, up-dated it, and added image orthicon camera chains, high-power vhf transmitters, and started development of uhf transmitters. Design of large-screen magnetic deflection tubes was the assignment at the Tube Division, switching from the electrostatic types used in pre-war sets. The Instrument Division happily found a pent-up demand for cathode-ray oscillographs to replace the suddenly defunct military market, and it continued to produce most of the income to support the television activities during those expensive days of redesigning, retooling, re-equipping, and preparing for large-scale production. Broadcast operations were expanded, and a network of affiliated stations was developed, that at one time was the largest in the country.

That these preparations for television were expensive is an understatement. Sales in 1946 amounted to a little over $2 million, with an operating loss of $1.5 million. Yet the potential was such that approximately $4,000,000 was raised through the issurance of stock; the company at last was on its way to the big time. The following year sales jumped to $11,000,000. By 1949 they had reached $45,000,000, and in 1953 nearly $100,000,000. So goes the Horatio Alger success story, at least in terms of annual sales. Allen Du Mont did, in fact win the Horatio Alger award in 1950, a tribute to achievement built on ability, planning, and dogged determination.

While the business was a-building, it was not a case of "All's quiet back at the plant". Study, development, and innovation continued apace. Allen Du Mont continued to encourage an extensive search for new applications of the cathode-ray oscillograph, with a generous supporting budget. Although 1939-40 development of a cathode-ray electrocardiograph, encephalograph, and a stimulator proved premature, postwar studies included the application of television to microscope viewing, an electronic counter of bacterial cultures, and even a study of the determination of fertility in unincubated eggs.

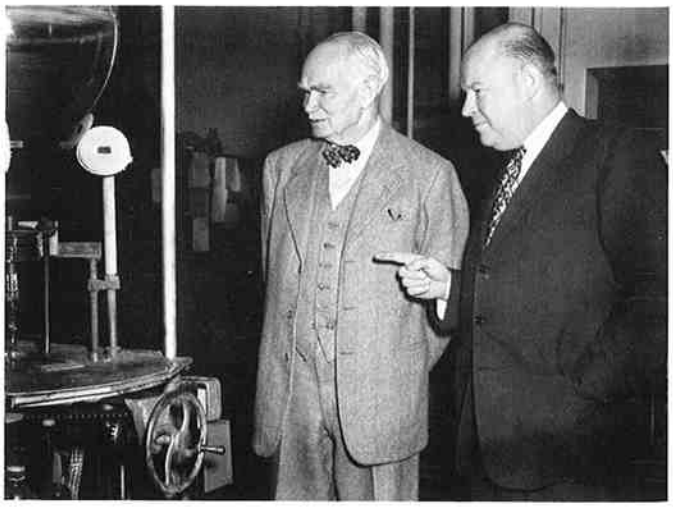
Further refinements were made on the *Cathautograph,* invented by Allen Du Mont more than a decade earlier as a means for transmitting signatures or other information via wires for display on a remote cathode-ray tube.

In the field of cathode-ray tubes there were many innovations for both oscillography and television. To overcome the frequency limitation resulting from transit time of electrons in electrostatic deflection systems, distributed deflection plates were used, borrowing from transmission line theory. Improved phosphors were developed, and extensive applications notes were published on the photographic recording of oscillographic traces.

The search for the TV picture on the wall display resulted in techniques for light multiplication. Color crt's took a large share of development effort, and many approaches were explored, the Lawrence tube showing unusual promise. However, it failed to win sufficient support from some of the corporate directors, and funding ceased.

The broadcast equipment engineers contributed their share of new ideas. One of these, the *Electronicam,* offered a means of recording on film with TV techniques. Another, largely the brainchild of Allen Du Mont, was *Photovision,* a method for transmitting sight and sound on a beam of light.

As broadcasting grew and new stations came on the air—there were 37 by 1948—, it became apparent that the existing plan for allocating broadcast channels was inadequate. Accordingly, the FCC put a freeze on the licensing of new stations, and thereby a damper on the industry. Then the question of color television was taken up, prolonging the freeze, and the FCC authorized a non-compatible mechanical system that would obsolete all existing receivers. There was an immediate protest from industry, and the fight was on for a compatible all-electronic system. Needless to say, Allen Du Mont was in the thick of the


De Forest and Du Mont discuss a new tube exhausting and sealing machine in the Du Mont factory.

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Du Mont's Achievements and Awards

1945—Marconi Memorial Award of Achievement for Pioneering Work in the Field of Communications—Veteran Wireless Operators' Association

1947—Gold Medal—American Association for the Advancement of Science

1950—Boston Jubilee Award for Industrial Statesmanship

1950—Horatio Alger Award—American Schools and Colleges Association

1951—Placed No. 4 in a list of 12 Outstanding Business Leaders, in a survey by Forbes Magazine of Business, trailing only Rickenbacker, T. J. Watson, and Benjamin F. Fairless. Led RCA's Sarnoff 2:1 as the "Greatest Name in Television"

1952—Chevalier, Order of the French Legion of Honor

1958—Engineer of the Year—New Jersey Society of Professional Engineers

1959—"Outstanding Citizen" Award at the Second Annual Breakfast Roundtable Forum sponsored jointly by the Bankers National Life Insurance Company and Montclair State College

1962—Public Member, Board of Governors, American Stock Exchange

fight, and his inimitable way demonstrated at an FCC hearing just how monstrous—and dangerous—would be a mechanical scanning system for a large-screen receiver, complete with 5-horsepower motor to drive the color wheel. In due time a compatible system was adopted.

Financial Problems

Television receiver business peaked in the early 1950s. Prior to that time Du Mont was supplying luxury receivers to an expecting market. As the market became saturated and sales began to level off, low-cost sets were produced in competition with large companies having well-established dealer networks. In broadcasting, a limit to the number of Du Mont-owned stations that resulted from the financial relationship with Paramount Pictures stymied growth. As the situation worsened, for reasons that have had wide discussion, the pressures on Allen Du Mont grew stronger. One might speculate whether the possibility of more independent action would have led to a different outcome. In 1955, the Broadcast Division was separately incorporated and sold to Metropolitan Broadcasting Co. Three years later the receiver business was sold to Emerson Radio and Phonograph Corp., and TV tube production was discontinued. The Fairchild Camera and Instrument Co., purchased the surviving Instrument, Tube and Government Divisions in 1960, with Dr. Du Mont serving as Senior Technical Advisor.

Allen B. Du Mont was the recipient of many awards and honorary Society of Sigma Xi upon graduation from Rensselaer Polytechnic Institute. Later, the Institute awarded him the honorary degree of Doctor of Engineering, in 1944, as did the Polytechnic Institute of Brooklyn in 1949. The degree of LL. D. was conferred on him in 1955 by Fairleigh-Dickenson University and in 1960 by Montclair State College. New York University awarded him the degree of Doctor of Science in 1955.

He was for many years a Life Trustee of Rensselaer Polytechnic Institute and vice-president of the Board of Trustees.

More directly concerned with television were his many years of activity in professional and trade organizations. These include membership from 1940 to 1944 in the National Television Systems Committee, on the New Jersey Television Commission (concerned with the state TV network), and service as United States Delegate to the CCIR, an international standards body, concerned with television standards.

Dr. Du Mont was a Fellow of the Radio Club of America, the Institute of Radio Engineers, the American Institute of Electrical Engineers, the Society of Motion Picture and Television Engineers, and the Television Society of England. He was the first president, in 1943, of the Television Broadcasters Association (TBA). Other organizations of which he was a member include the Radio and Television Executive Society, Veteran Wireless Operators' Association, American Rocket Society, Radio Pioneers, Television Pioneers, De Forest Pioneers (Past President), Montclair Society of Engineers, Sigma Delta Chi, Champlain Society, Hugenot Society, Holland Society, Eastern Cruiser Association (Commodore 1955-56).

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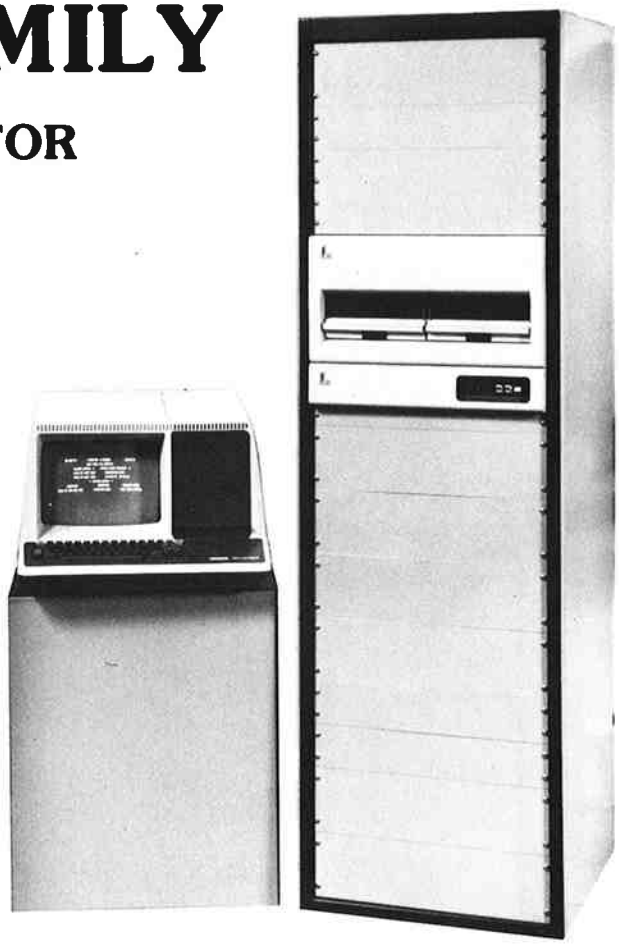

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24 NEW MEMBERS

Ashby, Frank, W6AJU. President, Palitron Corp., Box 3716, Modesto, CA 95352.

Bailey, H.E. National Major Accounts Manager, Repco, Inc., 1940 Lockwood Way, Orlando, FL 32854.

Bondon, David. President, Prodelin, Inc., P.O. Box 131, Highstown, NJ 08520

Danhour, Robert E. Superintendent of Radio Engineers, Denver Police Dept. 881 South Tejon St., Denver, CO 80223.

Dano, Jerome M. Director of Marketing, Transportation Control Systems, Hazeltine Corp., Greenlawn, NY 11740.

Dugan, Martin J. President, Warner Communications Co., Upper Montclair, NJ. 100 Long Hill Road, Little Falls, NJ 07424.

Samuel R. Eisenberg, W2OA. Executive VP, Gen. Mgr., U.X.L. Corp., (Corona, NY). 3356 Demott Ave., Wantagh, NY 11793.

Ettinger, Les. President, Cal-Com Systems Inc., San Jose, CA. 3835 Perie Lane, San Jose, CA 95132.

Goldberger, Gerald M. President, Simpson Electric Co., Elgin, IL. 1015 Greenbay Road, Highland Park, IL 60035.

Gordon, Edward J. Director of Sales, General Aviation Electronics Inc., Indianapolis. 3906 Glenview Drive, Indianapolis, IN 46230.

Gross, Al. Marketing Sales Manager, Fiberglas Div., True Temper Corp, Cleveland. 6717 St. Clair Ave., Cleveland, OH 44103.

Hertzberg, Bob. Publication Consultant, Writer. 1068 S.W. 13th Place, Boca Raton, FL 33432.

Jones, Morrison H. Regional Operations Manager, General Electric Co., Palo Alto, Ca. 570 Pinecrest Drive, Los Altos, CA 94022

Jubon, Jan D. Vice President, Comp Comm, Inc., Cherry Hill, N.J., 25 Hazelhurst Drive, West Berlin, N.J. 08091.

Lawyer, Tiffany, III, W2BLE. District Sales Manager, Motorola Comms. & Elecs, Glen Rock, NJ. 27 Braemore Rd., Upper Montclair, NJ 07043

Metzger, Sidney. Assistant Vice President and Chief Scientist, Comsat, Washington, DC. 9505 Barroll Lane, Kensington, MD 20795.

Minichiello, Ray N. President, Lapp Co. Inc., Wakefield, MA. 51 Perry Avenue, Lynnfield, MA 09140.

Petrutsas, George. Chief, Ind. & Public Safety Rules Div, FCC. Washington, DC. 12800 Kernel Circle, Bowie, MD 20715.

Quintal, Richard. New England District Manager, E.F. Johnson Co., Hopkinton, MA. Maple Avenue, Hopkinton, MA 01748.

Reiser, John W., W4ARL. Senior Electronic Engineer, FCC, Washington, DC. Box 19424, Washington, DC 20036.

Ryals, Byron G., W6MTA. National Sales Manager, Cushman Electronics, Sunnyvale, CA. 442 Madera #3, Sunnyvale, CA 94086.

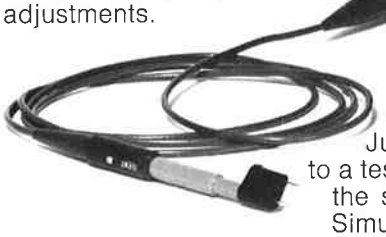
Talley, Edward S. Assistant Director, Financial Planning & Control, Grumman Data Systems, Bethpage, NY. 762 Preston Road, East Meadow, NY 11554.

Whiting, John V. President and Chief Executive Officer, Repco, Inc., Orlando, FL. Andrews Drive, Altamonte Springs, FL 32701.

Wiesner, Edward P. Vice President, Communications Pub. Co.; Englewood, CO 80110.

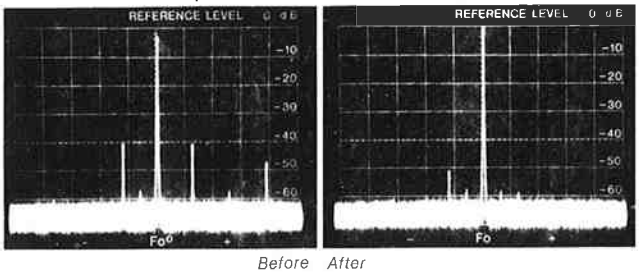
Visual Troubleshooting. Accurate signal measurements you can see and hear.

The CE-15 is more than a spectrum analyzer. It's also a tunable RF voltmeter with absolute level accuracy that allows you to see, hear, and measure signals at any test point in a radio. When you're troubleshooting, there's no faster way to pin down problem circuits or components than to be able to visualize the signals involved. And with simplified front panel controls—a Cushman exclusive—there are few operating adjustments.



Just touch the RF probe to a test point and you'll see the signal on the screen. Simultaneously, any other signals, spurs, or harmonics within the selectable frequency band are also displayed. You see exactly what's happening. Imagine how easy it is to tune an oscillator while watching the signal peak and the spurs fall away. And you can hear test signals or actual FM or AM transmissions with a built-in speaker.

In minutes you can run through a whole series of critical measurements. Check oscillator alignment, LO injection levels, LO radiation, multiplier operation, front end response, IF bandpass, and more. You can



Before *After*

It takes only minutes to align a two-way radio while watching the results on the CE-15. In the example, the output power has been peaked and the spurs reduced significantly. Final adjustment put the spurs 10 to 20 dB further down from the carrier.

even look for defective components more easily than ever before.

The CE-15's other specialty is making off-the-air measurements for identifying and eliminating interference. It's tunable from 1 to 1000 MHz, has a sensitivity of less than a microvolt, and measures absolute levels to at least ±3 dB accuracy.

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Cushman

Directors Emeritus Harry Houck (left) and David Talley display the certificates they received at the Annual Meeting and Banquet last November 18. (Mr. Houck has been a Director of the Club since 1928.) At right, Stuart Meyer, Master of Ceremonies at the Banquet, who made the presentations..

(continued from page 19)

recognized for his long service as director, which started in 1928. He designed the first second-harmonic superheterodyne receiver to be placed on the market and began as a radio amateur in 1909 at age 13.

President Fred Link personally presented 20 Fellow citations at the close of the Banquet. These included; Alan L. Armitage, Rex Bassett, Robert L. Batts, John Daly, John H. Davison, Gary David Gray, Ray Griese, George Jacobs, R.W. Johnson, James McLean, Morgan McMahon, Tom McMullin, Travis Marshall, George Mitchell, Nat Pfeffer, Richard Quantz, John T. Robinson, Raymond Spence, Ben Tongue and Val Williams. Mr. Williams, of the National Association of Business and Educational Radio (NABER) of Washington, responded in behalf of the recipients.

Stewart F. Meyer, Executive Vice-President of the Radio Club presided as master of ceremonies in a masterful manner which kept the flow of events pleasureable. Mal Gurian dispensed the special door prizes. Much credit goes with appreciation to the reception hostess committee of Vivian Carr, Ming Ashton and the Poppele ladies, Pauline, June and Lorraine Poppele Flower, who helped assure us all of a flawlessly enjoyable evening and memorable occasion.

——*Ero Erickson, Fellow*

NEW CLUB PINS NOW AVAILABLE

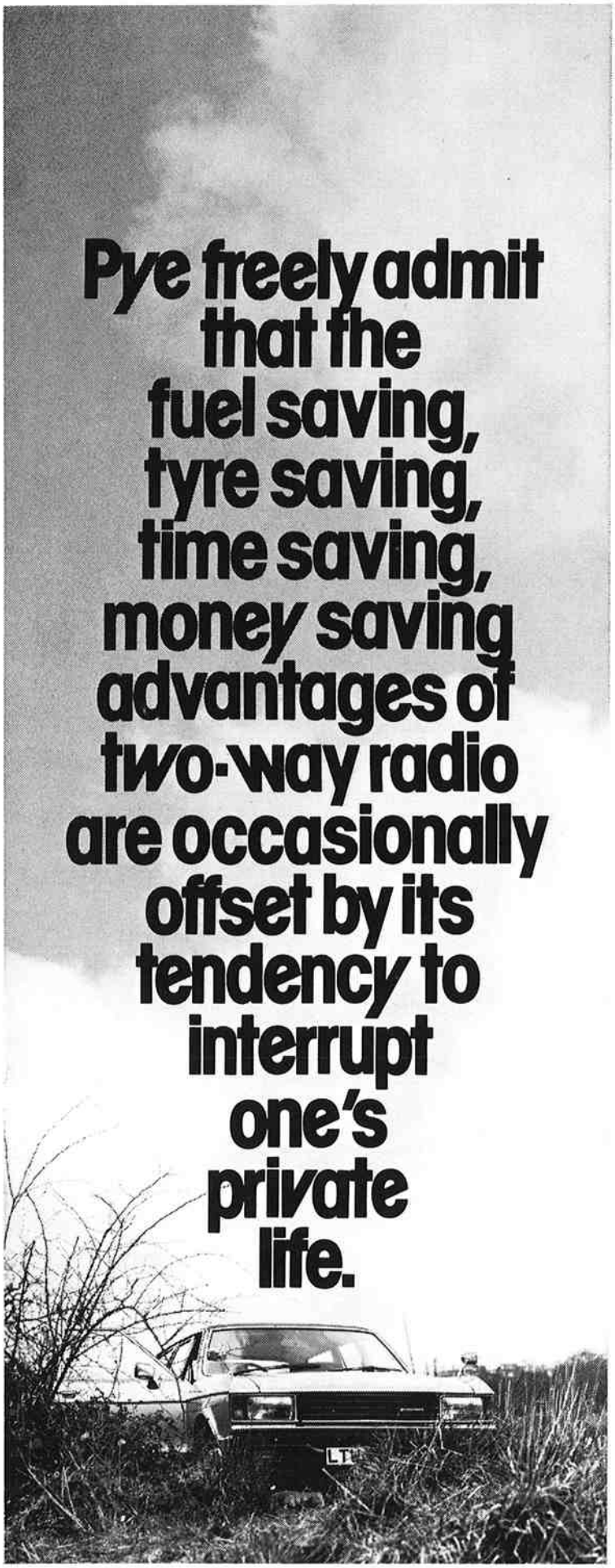
A new die-cut high-quality Club Pin, in both Tie-Tac or lapel pin and Tie-Clasp designs, is now available. The Member pin is two-tone silver with polished border and logo; the Fellow pin is gold finish with polished border and logo and dull background, to make it stand out. The tie bar clasp emblem is so mounted as to give it an excellent classic appearance.

Pins can be obtained by forwarding a check made out to the Radio Club of America, to George Apfel, P.O. Box 312, Park Ridge, N.J. 07656.

Member or Fellow Tie or Lapel Pin $3.00

Member or Fellow Tie Bar Clasp. . . . . $.5.00

(All members elected after January 1, 1978, will receive a pin automatically, included in the new revised $10.00 entrance fee.)



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Obituaries

W.W. Watts

Douglas J. Johnson

We have received word of the passing of eight of our members since the last *Proceedings* was printed:

W. Walter Watts, retired senior officer and Director of RCA Corp, died in Boca Raton, Florida, November 15, 1977. A Member of the Club in 1960, he was made a Fellow in 1963 and an Honorary Member in 1972.

He was born in Chicago in 1902. Turning to radio early, he attended the Lane Technical School and the Chicago Telegraph Institute. His first amateur call was 9BP, at Evanston, IL. While in the Chicago area, he acted as mail order sales manager, radio and electronic equipment for Montgomery-Ward, and was Vice President of the Wincharger Corp.

During World War II he served as comanding officer of the Signal Corps distribution agency. After the war, in 1945, he joined RCA. He was elected a Vice President in 1946, and Group Executive Vice President 1969. Retiring from that position in 1970, he continued to serve on the RCA board of directors for another year. He was a strong proponent of color television, and is credited with playing a major role in its development by RCA.

In 1958 Mr. Watts was confirmed by the U.S. Senate with the rank of Brigadier-General, USA Reserve. He was a Past President of the AFCEA and founder of the Philadelphia chapter, and a member of IEEE, ARRL, the Society of Naval Engineers, American Ordnance Association, Broadcast Pioneers and VWOA.

Douglas J. Johnson, (Member 1972, Fellow 1977) died of a heart attack while skiing, December 29, 1977. At the time, he was chairman of the committee for the Radio Club sponsored Banquet in Denver during Land Mobile Radio Week, in conjunction with the IEEE/VTS Conference.

Vice President for Marketing, Western Tele-Communications, at the time of his death, Mr. Johnson was responsible for a number of advances in the communications field. Under his direction Western Tele-Communications was the first specialized common carrier to build and operate a data voice system in the post-Docket 18920 era.

Earlier, while with Collins Radio, he directed efforts in establishing the first common carrier computer-based store and forward switching center in London, England. He also supervised implementation of the first use of tropospheric scatter in long-distance communications, for Shell de Venezuela, while Vice President of Collins International.

We have just heard of the death, in 1976, of **Charles J. Hirsch,** (Member 1947, Fellow 1952, Life 1971). He was a Fellow of the IRE-IEEE and the SMPTE as well as of the Club. A research engineer, he was at one time a Vice President of Hazeltine Corp, and was later on the RCA corporate research staff, in Princeton, NJ. He retired in 1967.

During his career he was granted more than 30 patents for inventions in color television, electronics and moving pictures. An internationally recognized authority on color television, he made important contributions to national and international

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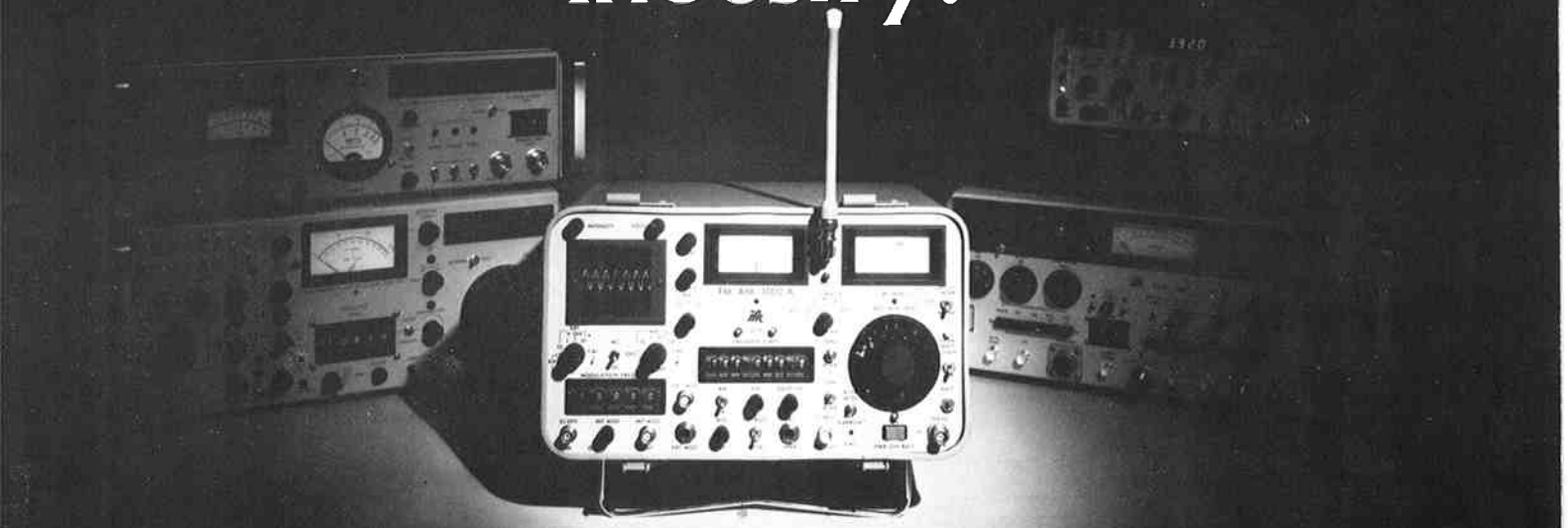
The Same Precision Technology of Avionics Testing Is Now Available to Communications Industry!



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News of the Membership

Raymond C. Trott (Member, 1976) has established his own business, Antenna Systems Engineering Co., in Dallas, Texas. He was formerly Vice President of Engineering at Decibel Products Co. of Dallas.

David L. Bondon (Member, 1977) has been elected President of Prodelin, Inc., of Hightstown, NJ. He has worked in the company for more than 15 years, and was most recently Division Vice President in charge of Prodelin's fiberglass manufacturing operation in Santa Clara, CA. A graduate engineer of Stevens Institute of Technology, he has completed courses in business administration at Santa Clara University.

Jim McLean (Member 1968, Fellow 1977) has been elected President and a Director of Teletronics United, Inc., Riverside, CA manufacturer of a range of telephone equipment which includes the PortaCall cordless extension telephone. McLean is a graduate of M.I.T., a former President of Stromberg Carlson and Senior Vice President of General Dynamics Corp, also having served as Vice President of Philco Corp and President of Hoffman Electronics Inc.

John J. Tary (Member, 1974, Fellow, 1978) has just received the 5BWAS (5 Band Worked All States) Award from the ARRL. This award was made by the League after checking 250 reports covering the 50 States and the five bands. Tary is an electronic engineer with the Department of Commerce's Institute for Telecommunications Sciences at Boulder, CO. His call is K0HPE.

The **Elmo Neale Pickerill** collection has been given to the Broadcast Pioneers Library of Washington, DC.

Pickerill, radioman and aviator, was one of the earlier members of the Radio Club of America. He had been a radioman since 1905, when he built a 10-station wireless network for de Forest in Colorado. In 1910, he was the first to transmit from an aircraft to ground, and was the chief radio operator on the first toll-paying ship to pass through the Panama Canal (in 1915).

After World War I, Pickerill joined RCA, becoming head of its aeronautical department in 1929. He retired in 1950 and died, at age 82, in 1968.

(continued from page 30)

standardization of color television and stereo sound.

John Wehner, W2CHJ (Member 1962) died suddenly October 20, 1977, on his way home from his work at Thomas Electronics. He was 59 years old. Mr. Wehner had formerly been an engineer at DuMont-Fairchild, Clifton, NJ.

Stephen H. Fuller (Member 1975) died August 4, 1976. He was Director of Communications of the Barnstable County (MA) police radio system, a position he had held since 1968. He had worked for a number of years—on either a full or part-time basis—with the Barnstable police system before becoming Director.

A Past President of the Eastern States Police and Radio League, and secretary-treasurer of the Alantic Chapter of APCO, Mr. Fuller was active in other communications and community organizations.

Marcus A. Felt (Member 1964) died suddenly of a heart attack January 26, 1978. He was 58 years old. A retired teacher of history, he had been a ham since 1940, and was a former Navy operator. His latest call was W2GY, formerly W2GYQ. In recent years he was an avid student of radio history, and had an extensive collection of radio books and equipment dating to the pre-Marconi period.

Thomas J. Styles died February 7, 1978, at the age of 90. He became a radio amateur in 1908, a commercial radio operator in 1912, and a seaplane radio operator during World War I. Between 1916 and 1927 he served three terms as Secretary of the Radio Club of America. Entering Edwin Armstrong's laboratory in 1924, he remained with Armstrong until 1954, and remained active until 1973 as Secretary-Director of the Armstrong Memorial Research Foundation.

Wayne Wainwright (Member 1976) of RTS Communictions, Santa Clara, CA, died January 29, while under observation at the Santa Clara Medical Center. His age was 64. At one time field engineer for Hazeltine, he was a manufacturers representative for electronic equipment. He leaves a wife and seven children.

Mementos from West Coast Meeting

The figures above are Lucille Vette, Bill Vette, K6TXR, of Lockheed; Fred Link; Jim Lamb of Lamb noise silencer and TV interference prevention fame, and Leo Sands, a director of the Club and prolific author of two-way radio books.

The occasion was the Fall Meeting of the West Coast Section of the Radio Club, attended by some 63 members and guests of the Club.

Radio Club Honors Youngest Amateur

A special plaque was prepared, on the initiative of the Club's Washington Section, for America's youngest amateur, Guy Mitchell of Buckingham, IA, who received an FCC Amateur Radio Novice license at the age of 5. The plaque was presented to Dean George Hill, Chairman of the Washington Section of the Radio Club of America, at the November 18 Banquet, for transmission to the recipient. Mr. Hill arranged with the management of WMT-TV of Cedar Rapids, Iowa to have the plaque presented to Guy Mitchell with the congratulations of the Radio Club.

Club Scholarship Goes To New Jersey Student

A scholarship of $250 was presented to Abram Hillson, a computer science major at Essex County College, Newark, New Jersey, on December 13 last. This was the first award in what will be an annual scholarship grant which is to be presented to students of high scholastic standing who need financial assistance to carry out technological studies.

The scholarship was personally presented to the student by Jack R. Poppele, Director of the Club and President of TeleMeasurements, Inc., Clifton, NJ.

Mr. Hillson, an active member of the college's student body, is treasurer of the Student Government Association and the Information Processing Society and is the student representative on the college's Self-Study Committee.

Club Shows Up On License Plate

"Chief" William P. Keel, Senior Radio Engineer of the Flint, Michigan Police Department, sends us this photo of his license plate. The significance: Radio Club of America, Life Member. The Chief says he has run into some confusion with people who believe the plate has some reference to a large Radio Corporation.

There should be no confusion now. While many members believe the Radio Corporation imitated the Club logo for their trademark in the 'teens, now that the Corp has adopted a Greek lambda for the third letter of their style, their is little danger of mistaking one for the other.

Book Review

Basic Carrier Telephony—Revised Third Edition, by David Talley. Hayden Book Co., Inc., 50 Essex St. Rochelle Park, NJ 07662. 6x9 inches, 224 pages, soft cover $6.85.

In this new edition of the standard work on carrier telephony, statistical data on the growth of the telephone industry has been updated. Included are also new cable carrier systems, developments in transmission and signaling methods and improvements in PCM techniques. Special attention is paid to interconnections of cable carrier systems, especially the broadband types.

Edison O. Jackson, VP for Student Affairs at Essex County College, student Abram Hillson and J.R. Poppele hold the scholarship check. At left is Dennis Barnes, Aide to the VP for Student Affairs.

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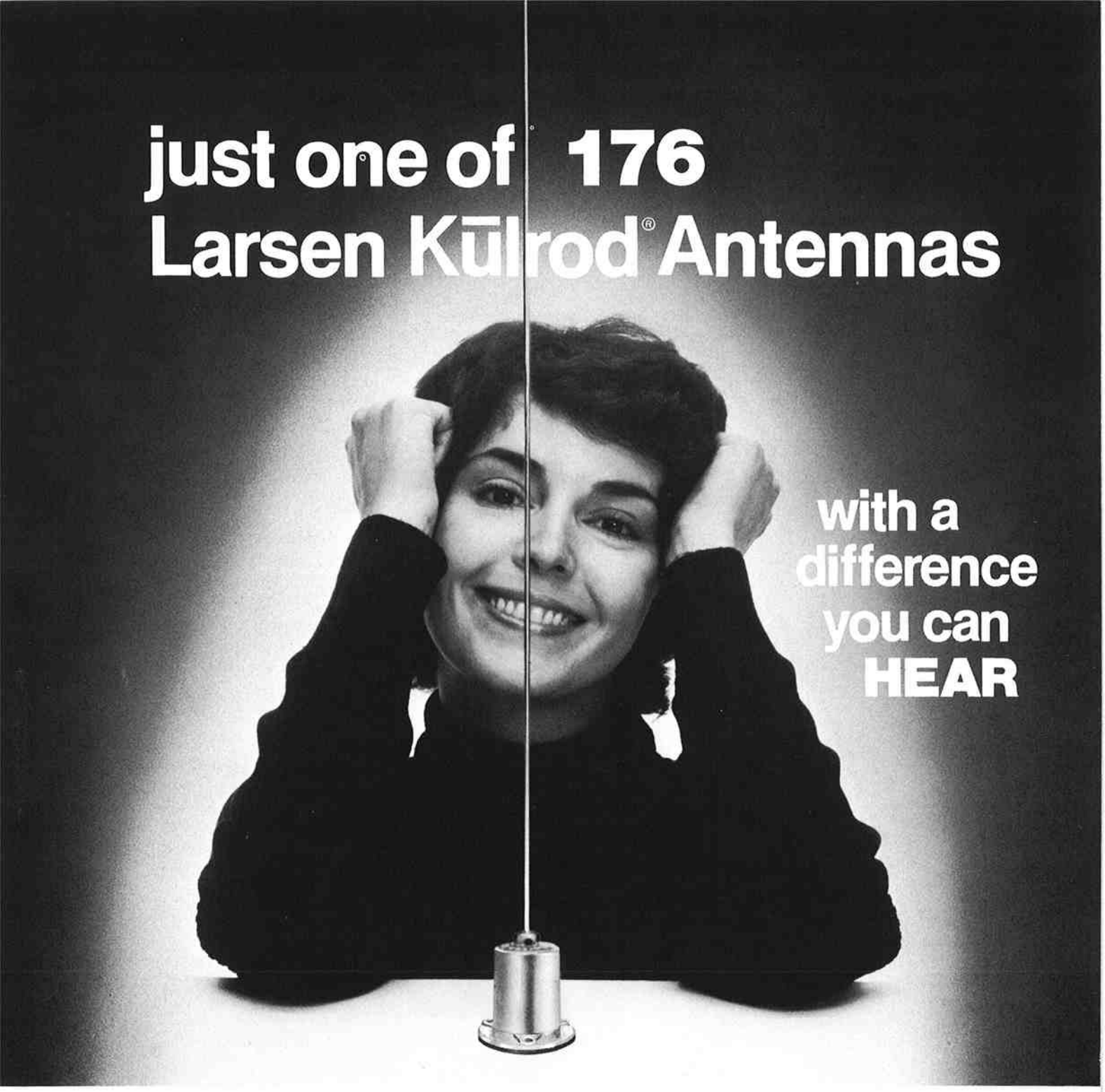

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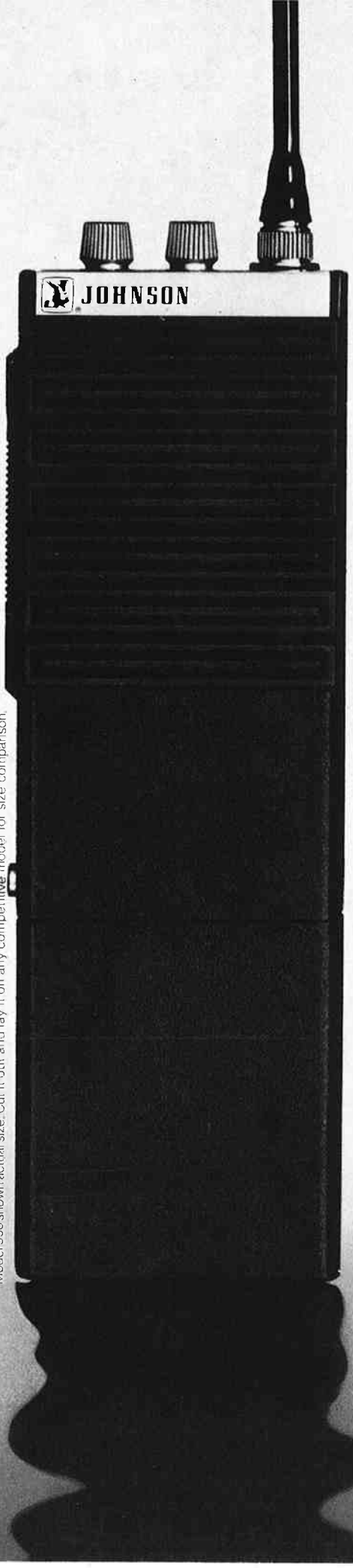

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