



AUTUMN  
1960

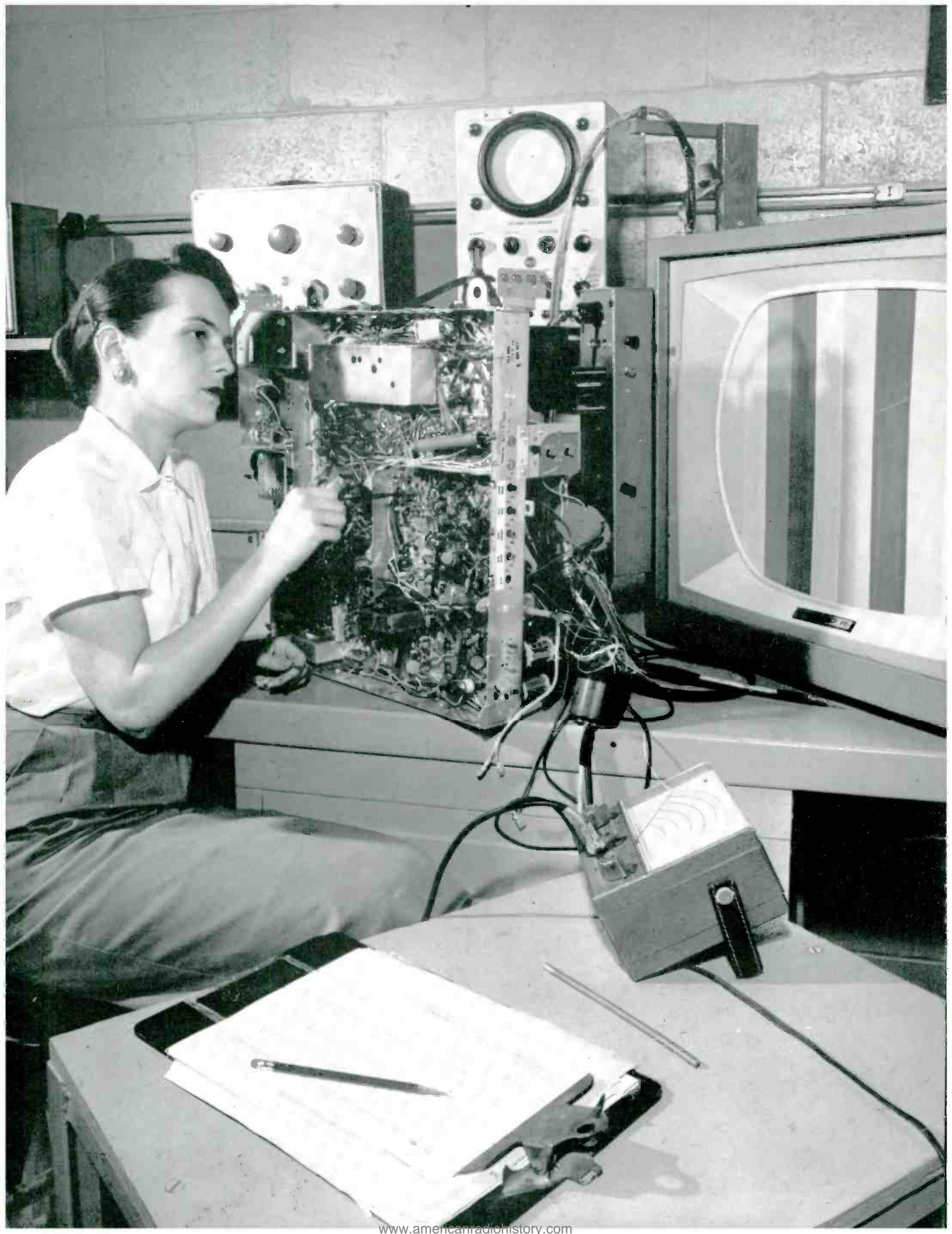
# electronic age



**OPERATION  
BALLOT:**  
Push-button Results

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**THE EXCITING  
CONSUMER MARKET**



Library  
Southern State Teachers College  
Springfield, South Dakota



# electronic age

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**COVER:** Heading the NBC News coverage of events on Election Night this November will be the team of Chet Huntley and David Brinkley, whose wit, candor, and refreshing style have won them critical acclaim and a huge audience. For a report on how electronic data processing will aid them, see story beginning on Page 23.

LOWELL FARLEY, Editor  
BARBARA ZERRIEN, Assistant Editor  
JOHN MAXIMUS, Design Consultant

## RADIO CORPORATION OF AMERICA

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

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A color TV set undergoes quality control testing at Bloomington, Ind. See page 2

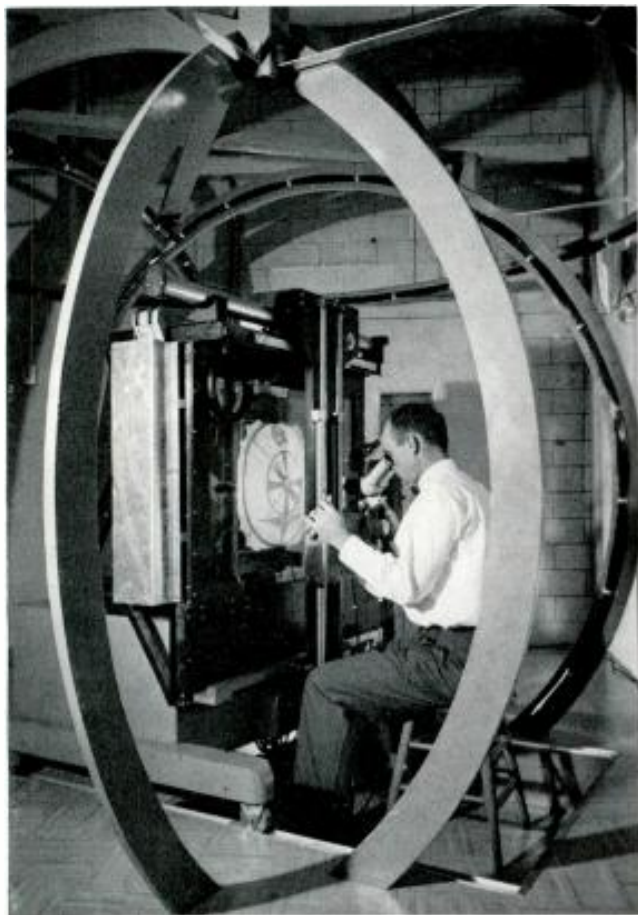
limits of endurance and beyond that new and better materials are found, new and better methods of building them are developed, new and better products are made available.

As M. M. Tall, Manager BMEWS Quality Assurance, said recently: "Reliability assurance in a major defense project is not merely the difference between a superior or inferior product, but rather an integral part of the job to safeguard the security of our country. Our nation's security cannot afford the possibility of failures within its defense systems."

The Product Assurance Program of RCA Defense Electronic Products extends into all operations of each DEP division from early contract negotiations to final field follow-up and includes all the product characteristics: reliability, quality, maintainability, producibility, operability, application suitability, system integration, value and others.

The importance of quality in all products bearing the RCA trademarks is perhaps best illustrated by the strenuous ordeals to which RCA Victor television receivers are submitted before they are approved for shipment to dealers.

*A color picture tube undergoes electromagnetic tests.*



At RCA's plant, at Bloomington, Indiana, for instance, one out of every five employees devotes his time to the inspection, testing and checking of the work of the other four people who actually build the TV receivers.

This "fifth man," the inspector or tester, is perhaps the most hard-to-please viewer who will ever tune in an RCA Victor television set — for unless the set operates perfectly, he will reject it.

RCA testers are always looking for trouble and they have devised diabolic methods to find it. For example, they subject all wire-wrap connections in every set to 32-pound "pull" tests; then they expose these connections to a highly corrosive gas which discolors metal, and unless the wire contact points remain clean and bright, the set is rejected. Each RCA Victor TV chassis is given a rapid vibration treatment at the end of the production line to shake out loose solder drips or other foreign matter and expose possible weakness of components; inspectors pound every chassis with a rubber mallet during its alignment test to expose possible loose connections or near-shorts, and repeat this treatment in the final assembly.

Not even the glass used in an RCA Victor TV set can escape the inspectors' torture chamber. They delight in dropping a two-pound steel ball from a height of six feet to test the safety glass faceplate which guards the picture tube, but so far they have been unable to break any.

Once the set is finally assembled, it is air-tested by RCA's own plant transmitter which feeds VHF, UHF, color, black-and-white and FM signals to various parts of the plant. Each TV tuner is individually checked and tested against a total of 24 signals on 12 different channels. One of these, a check of TV speakers, has kept Arthur Catellier of the Bloomington plant "over a barrel" for 14 years. One of Catellier's jobs is to play "The Beer Barrel Polka" eight hours a day, five days a week.

"The recording incorporates a wide range of high and low frequencies," Catellier explained, "and our inspectors use this signal to test the tone and response of various instruments. Hearing the same tune all the time, they know what to listen for."

Even after the set is packed for shipping, it is still subjected to further inspection. At Bloomington, one inspector does nothing but look for dents in the packing carton, no matter how small. Cartons not meeting with his approval are unpacked and the set is given a thorough inspection before being re-packed.

At Bloomington, pre-production model sets are put through extended peak voltage or "life" tests for 1500 hours before a new line goes into mass production.

The 1500-hour peak voltage test is equivalent to

one-and-a-half years of normal viewing in the home!

M. B. Still, Bloomington plant manager, said, "we can pretty well tell after 200 hours of this sort of testing whether or not there is something basically wrong with a new model. By thoroughly testing each model in a new line 30 days before it goes into production, we eliminate the possibility of serious production line trouble."

Once a new line goes into mass-production, each sub-assembly, such as security-sealed circuits — circuits printed in copper which are then coated with solder and a spray coat of wax to seal the circuits from moisture — tuners and chassis are inspected and tested 100 per cent, according to Mr. Still.

"As if that weren't enough testing and checking," the plant manager added, "last year we unpacked at random 75,000 crated sets which were ready for shipment in our Bloomington and Indianapolis warehouses. These sets were tested an additional 100 per cent."

RCA quality control tests are designed to duplicate — and in many cases exceed — the extreme trials a television set may encounter in shipping or in actual home use.

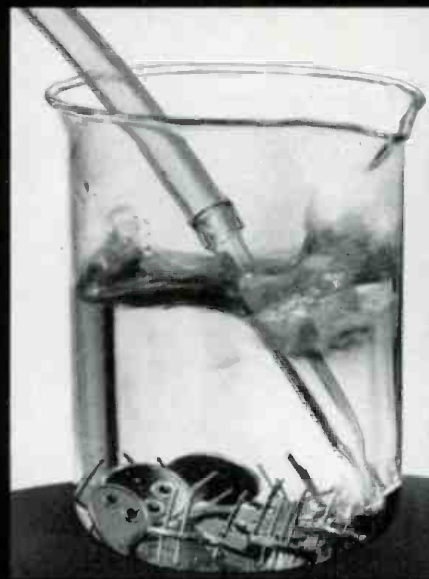
For example, several units of each new model are put through a jarring "drop test" to check their ability to withstand rough handling treatment. In the test, crated sets are dropped from a height of two feet to a hardwood floor no fewer than five times. After the test the sets are unpacked and the packing material and the instrument are given a thorough inspection which includes air-checking the receiver.

Quality control begins in the research laboratory and extends through production stages, but doesn't end there. Even after a product is marketed, the search for ways and means to improve it continues. The near-perfection of the tint-controls and the ease of tuning in the 1961 color television line is a striking example of the striving for perfection.

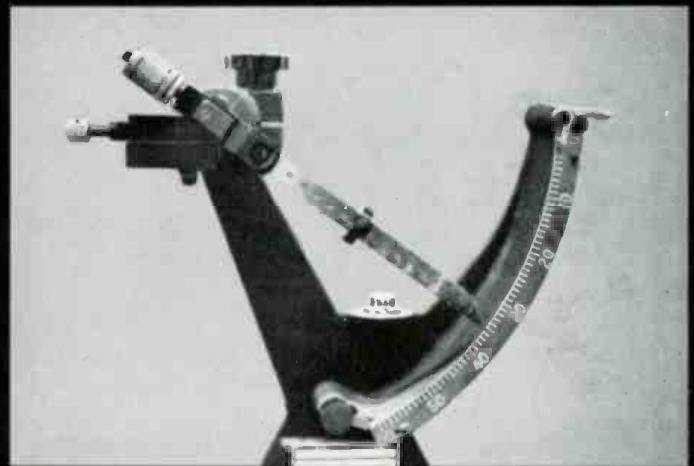
A woman whose RCA set had been transported in an automobile which was declared a total loss after an accident, recently related this story in a letter:

"... the car was demolished... they found my TV in the back seat... I called the local TV man but didn't tell him what had happened because I felt he'd make it a \$75 job... He checked it and finally looked at me and said: 'Lady, were you fooling around with this set?' I said, 'No, why?'... He answered: 'Well, there is a tube laying at the bottom of the case.' He put it back in place and it heated up immediately and has worked perfectly ever since."

This letter and thousands of others like it received by RCA in the past year graphically illustrate how quality pays off. They are the dividends of a multi-million dollar investment. ■



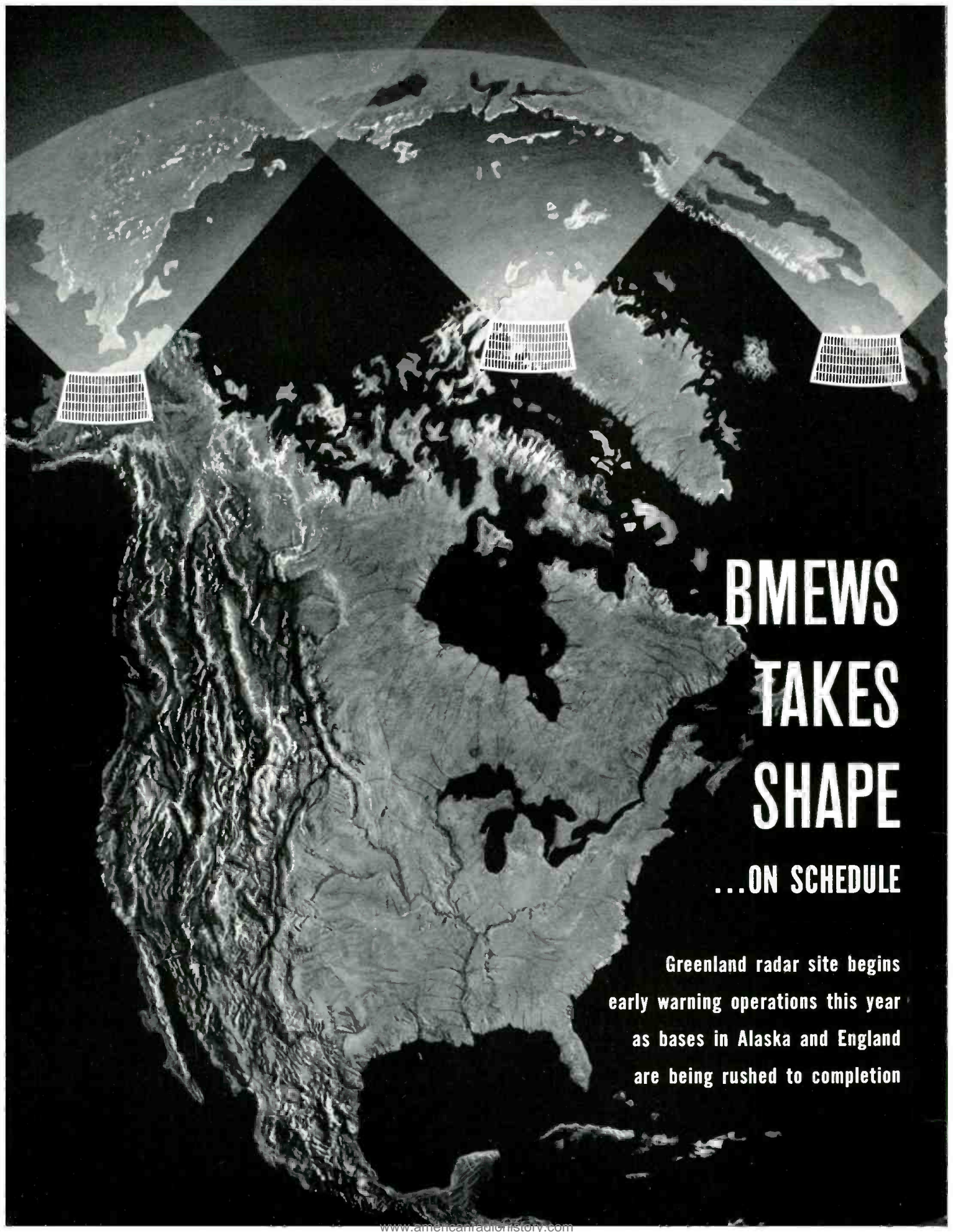
Among the several "tortures" which transistors and their parts are subjected to is a corrosion resistance test.



A transistor lead sustains a right-angle load to test its resistance to bending in another test. Failure of as few as 25 transistors will cause rejection of a lot of 100,000.



A transistor lead, subjected to a one-pound weight, is bent over and back to ascertain its breaking point.



# **BMEWS TAKES SHAPE**

**...ON SCHEDULE**

**Greenland radar site begins  
early warning operations this year  
as bases in Alaska and England  
are being rushed to completion**

By ROBERT L. MOORA

**B**EGINNING THIS FALL those people directly responsible for the Free World's defenses will be breathing a bit more easily.

It's not that the danger of Communist aggression is any less real, but rather that the Free World will have a powerful new tool at its disposal — BMEWS, the Ballistic Missile Early Warning System.

Begun a bare two years ago, BMEWS Site No. 1, at Thule, Greenland, is now completed. As early as Spring it was sending radar beams across the polar wastes on a limited test basis. The tests having proved successful, the Thule site is ready to go "operational."

In anticipation of this event, the U. S. Air Force and Radio Corporation of America — the prime system contractor for BMEWS — recently flew representatives of the United States, Canadian and Danish press to Thule, to visit and to report to the world on the progress of the huge system being built to guard the Free World against surprise attack by ballistic missiles.

In addition, Air Force and RCA personnel at Thule played host in July to King Frederik and Queen Ingrid of Denmark, whose government made available the site for the base.

What they saw — and what they were told by officials of the Air Force and the contractors building the system — was reassuring. Gist of the report: BMEWS, with its three bases strategically located close to the top of the world, was fast taking shape as part of the world's most likely deterrent to war.

The progress they reported was this:

Site No. 1, at Thule, was completed and would go into full operation this Fall.

Site No. 2, at Clear, Alaska, was "well along" in construction and should become operational sometime in 1961.

Site No. 3, at Fylingdales Moor, in Yorkshire, England, is now in its initial stage of construction.

"By 1963," said General Thomas D. White, Air Force Chief of Staff, "we hope to have the Ballistic Missile Early Warning System in full operation at Greenland, in Alaska, and then in the United Kingdom.

BMEWS will not be fully effective until all three sites are completed. Nevertheless, a large measure of protection will be in force when the No. 1 site at Thule goes into service.

As military experts view it, should an enemy nation launch a ballistic missile attack on the United States, it would not hurl one missile, or two, or even a dozen, but a vast arsenal of missiles in order to guarantee a knockout blow. In all probability, some of these would penetrate the huge area covered by the sweeping radar beams of the Thule site. Thus, the needed warning would be sounded — along with the death knell of the attacking country itself.

Should a sneak missile attack be hurled suddenly at the United States, southern Canada or Britain, BMEWS radar beams would detect the missiles and feed information about them to computing systems which would instantly determine the key facts needed: the location, speed, trajectory, possible impact areas and launch points.

In split-second time, this information would be flashed to headquarters of the North American Air Defense Command (NORAD) at Colorado Springs, and with equal swiftness relayed to the headquarters of the Strategic Air Command (SAC) at Omaha.

The data transmitted from all forward sites are received at Colorado Springs and Omaha and combined and processed in a central Display Information Processor (DIP). Missile threat information and threat summary data indicating detailed raid information are projected on a large screen. Site equipment status is shown on a small console in a monitoring room.

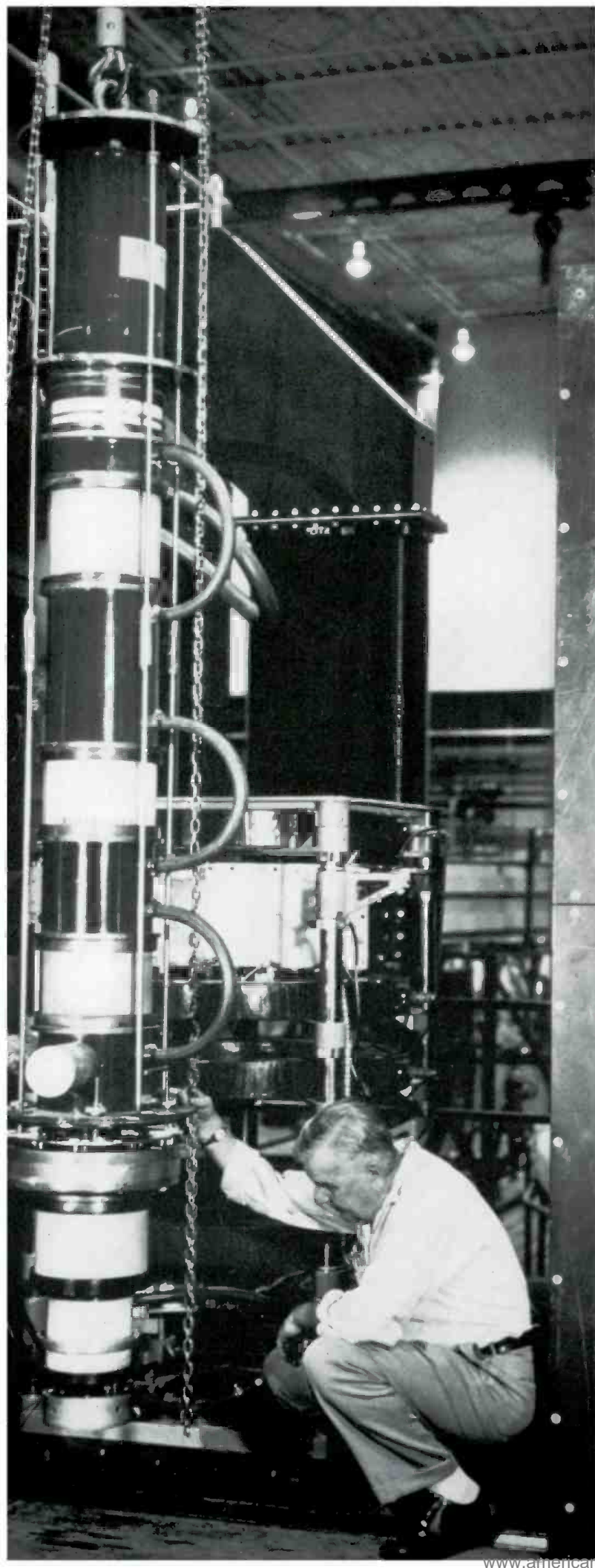
Automatic processing of a missile attack from the moment of recognition of a mass raid by the site computers to the display of the threat information at NORAD and SAC requires an average time of eight seconds. Data on individual missiles will be displayed at NORAD within three seconds after missile discrimination. On the basis of the information in these displays, the NORAD and SAC commanders will decide on the appropriate air defense and retaliation.

SAC, with the bulk of its force on instant alert basis and many of its bombers constantly aloft, would have 15 to 30 minutes in which to mount a retaliatory assault. Thus the combination of BMEWS and SAC might well be the world's greatest deterrent against war — and guarantee of peace.

However, the price of this protection comes high — all told nearly a billion dollars. But, as Air Force Officers have pointed out, this is "the premium we must pay for survival insurance."

BMEWS is one of the biggest single electronic complexes ever put together, for military purposes or otherwise. A glimpse of the mile-square site on the cliff at Thule is ample evidence. Here, RCA engineers will tell you, the overall installation requires 290 cabinets of electronic equipment, 10 monitoring consoles, eight high-speed scanning switches, 440 miles of connecting cable and waveguides, 315,000 transistors, 33,000 vacuum tubes, 270,000 capacitors and 1,000,000 resistors. And standby replacements for everything are on hand.

The BMEWS installations at Thule and at Clear, Alaska, will depend, at least at the start, on the giant detection radars, designated the AN/FPS-50 and supplied by General Electric Company under subcontract to RCA. These massive antennas have been



especially designed to withstand winds of up to 185 miles an hour, even when coated with six inches of ice.

The third site, in England, will use three tracking radars, designated as AN/FPS-49 and developed by RCA. Each radar is 84 feet in diameter and enclosed in a honeycombed plastic dome 140 feet in diameter. These radars perform space surveillance and tracking functions. They will be atop two-story buildings housing electronic equipment and, all told, will tower to the approximate height of a 15-story building. A test model of the tracker is now undergoing integration and operation tests at the RCA Missile and Surface Radar Division at Moorestown, N. J., and is visible from the New Jersey Turnpike about a dozen miles northeast of the Camden-Philadelphia area. The pedestals and antennas, as well as the radomes, are being fabricated by Goodyear Aircraft for RCA.

The U. K. base is being constructed under the joint supervision of the U. S. Air Force and Britain's Royal Air Force with RCA Great Britain, Ltd., as weapons system contractor and RCA as the corporation's agent in the United Kingdom.

Eventually the Air Force envisions the use of both types of radars at all three sites.

This is how the detection radars at Thule will work: The transmitter buildings, receiving power from a generator ship stationed in North Star Bay, send radio pulses of tremendous power to the scanner buildings, where they are sent through two rows of feed horns in each scanner building, and bounced against the 400-by-165 foot screen. The signals then go out through space in two sets of fans, one above the other. Should an object rise through these two fans, one after the other, the signals would in turn be bounced back to the radar, and the BMEWS computing system would go to work to determine what the object is and where it is going.

This process represents something of a technological miracle — for the signal returning from space has shrunk to around one-thousandth of one-millionth of one-millionth of a watt, or in numbers, 0.000,000,000,000,001 of a watt. For contrast, a home electric light bulb usually uses 75 or 100 watts. Yet, with rectifiers using more than 100,000 volts, this minuscule pulse can be “read” by BMEWS's computing system.

When such a signal is detected, a “data takeoff” computer translates the visual image into digital form, calculating distance, range, angle of flight, speed and direction. In split seconds, this data is on its way to a high-speed “missile impact predictor” computer. Through data already fed into the system's “memory,” this computer can identify the object — whether it is a space satellite, meteor trail, the deceptive flickering of the aurora borealis, or a hostile missile.

*A nine-foot high Klystron super-power tube is lowered into position at the Thule BMEWS base.*



The tracking radars to be installed in the Yorkshire base will operate in a similar way. Like the detection radars, they will also scan the skies, passing on to their computers any returning signals. Further, the trackers, unlike the detection radars, after spotting an object can then "lock on" to it and follow its flight as long as is necessary.

An important factor in the successful operation of BMEWS is its built-in automatic checkout and monitoring equipment. In each building is a console that keeps constant check on all sections of its system, and warns, by colored lights and bells, if there is a stoppage or even a gradual degradation in any part. In addition, punched cards and magnetic tape bearing simulated targets are used to guarantee reliability of the system's information.

Similarly, the data being relayed to Colorado Springs is subjected constantly to accuracy tests. Two separate channels of information flow rearwards. At 1,000-mile intervals along the way – and again when they reach NORAD – they are compared, and if there is any discrepancy NORAD's equipment automatically asks BMEWS to repeat. The whole operation takes a split second.

During the periods when no official messages are being sent, test messages are transmitted at the rate of eight a second. Should the number drop to six, an



*These giant antennas will withstand winds of 185 m.p.h.*

amber light gives warning; if to four, a red light goes on. Each message has 63 bits of information, yet its eighth-of-a-second sound at the receiving end is something like that on an abbreviated hiccup.

Construction of the Thule base has been accomplished despite extreme hardships. The site is 600 miles north of the Arctic Circle and only 900 miles short of the North Pole – farther north, in fact, than the Magnetic Pole. Even so, the ground had to be artificially refrigerated. Because warmth from a building might

melt the permafrost and permit the structures to sag, RCA engineers installed refrigeration coils beneath the building foundations to keep the ground frozen.

Life and work there can be rugged – as some 300 RCA men on duty can attest.

Temperatures, which rise to a moderate 60° during the midnight-sun Summer, can plunge just as far below zero in Winter. And while there is surprisingly little snowfall at Thule – 15 to 30 inches a year compared with New York City's annual average of 30.1 inches – an incalculable amount of snow is blown off the Greenland icecap a few miles to the north, much of it before gale-force winds and of a sand-like texture that rips any face uncovered by a parka. Even without snow, with a sudden dip in temperature and increased wind velocity (the Arctic weather is unpredictable) human flesh will freeze in less than one minute.

Storm conditions are measured in three "phases" – ranging from Phase I, with 30-mile-an-hour winds, when all hands are restricted to their immediate work areas, to Phase III, with winds of 80 miles or more, when all personnel must take shelter. On the 12-mile road from the air base to the radar site, there are twelve small shacks, each weighted down with four rock-filled gasoline drums and equipped with food, kerosene stove, telephone and bunks, where men caught in the open during a Phase III can take shelter.



*This automatic equipment monitors BMEWS constantly.*

Working hours also are rugged at Thule . . . and that applies to everyone, from Dick Shaffer, RCA's project manager at the site, down through the ranks. But the pay is good, food and lodging are "on the house," and aside from the Air Force's base exchange – to which civilian personnel have access – and the officers' club, there is virtually no place to spend money. Hence, many a man completing a tour with BMEWS at Thule returns to the States with a good-sized "poke" to pay off the mortgage, buy a new car

or two, or deposit in the bank for future comforts.

Signs common to the American scene help to relieve the monotony at the bleak Arctic base.

At the entrance to a road leading onto the desolate polar ice cap just north of Thule is this warning:

"Put out your butts and help keep Greenland green."

In the dining room for RCA personnel, a sign admonishes: "Children under 12 not admitted unless accompanied by parents."

There is, of course, not a single child in the rugged community of several thousand workers.

On a bus transporting Army personnel is a sign

which reads: "Belvoir Express," probably inspired by a motor pool sergeant nostalgic for Fort Belvoir, Virginia, headquarters of the Army Corps of Engineers.

On the door of a communications worker's room in an RCA dormitory: "Iceberg Telephone Company."

And on a stretch of bare tundra alongside Piktufik Boulevard, Thule's Main Street: "Keep off the grass."

To every newcomer reaching the all-male colony at Thule, this wistful word of advice is given:

"Women are no problem; there's one hiding behind every tree."

For at least 500 miles, in any direction, there is not a single tree.

## Teamwork Is Building BMEWS

**T**HE U. S. AIR FORCE Ballistic Missile Early Warning System, in addition to being a vital element in the defense of the free world, will also be a monument to the capability of American military services and industrial organizations to work together on a project of crucial importance to keeping peace in the world. Indeed, it has been suggested that BMEWS may well be the biggest demonstration of teamwork on a single project ever shown by the services and industry.

On the military side, all three services are co-operating in the construction of the system. Primarily it is an Air Force project, being carried out under the direction of Air Materiel Command's Electronic Systems Center, with headquarters at Laurence G. Hanscom Field, Bedford, Mass., and commanded by Maj. General Clyde H. Mitchell. But both the Army and the Navy have pitched in, as well. And so has Britain's Royal Air Force and the Royal Canadian Air Force.

The Army's Corps of Engineers assumed the responsibility for construction of the buildings at Thule, Greenland, and Clear, Alaska. Britain's RAF is supervising the construction work on the third site at Fylingdales Moor, in Yorkshire.

The Navy's Military Sea Transport Service shipped vast tonnages of equipment, material and supplies to Thule during the brief periods that North Star Bay is open to shipping—usually about ten weeks in midsummer. From the start of the project early in 1958 to its near-completion this spring, more than 150,000 measurement tons of all kinds of cargo had been transported to Thule by sea—some of it preceded by Arctic ice-breakers and "floating harbors" carrying their own tug-boats, landing craft, and other equipment.

In addition to the sea shipments, well over 3,000 tons of material have been flown in by the Air Force's giant cargo planes.

The Navy has also supplied a generator ship—an old West Coast freighter converted some years ago for use in

emergencies—to supply the power for the BMEWS site at Thule. Now diked in on all four sides on the edge of North Star Bay, it not only can supply millions of watts of electrical energy to the radar base—enough to light a city of 30,000 people—but also steam sufficient to heat the vast complex of buildings at Thule Air Force Base.

On the industrial side, as many as 2,900 different companies in twenty-nine states are contributing to the BMEWS project—about 2,400 of them in the "small business" category, sharing 36.1 per cent of the total dollars spent in development of the system.

In the key role of prime system contractor is the Radio Corporation of America, with headquarters at the Missile and Surface Radar Division, Moorestown, and with D. Brainerd Holmes—who directed the Talos missile land-base project for RCA a few years ago—as project manager.

RCA has the responsibility to the Air Force for overall management of the BMEWS project, including development and design of the system, both its electronic equipment and its building criteria, direction of major subcontractors, development of the tracking radars to be used, and the installation of the equipment both at the three forward sites and at NORAD headquarters at Colorado Springs. In addition, personnel of the RCA Service Company will operate and maintain the sites for the first two years—700 of them at the Thule site alone.

Principal subcontractors to RCA include General Electric Company, to furnish the giant detection radars such as those at Thule; Goodyear Aircraft Corporation, to fabricate the tracking radar antennas, pedestals and radomes; Sylvania Electric Products, to furnish a portion of the data processing phases of the system. Western Electric Company has a separate prime contract to provide the all-important rearward communication system from the BMEWS bases to NORAD at Colorado Springs—a system of advanced design, reliability and quality. ■

# THE EXCITING CONSUMER MARKET...

*TV, RADIO,  
STEREOPHONIC  
SOUND*

Color television, now more than a \$100 million-a-year business, promises to provide the thrust that will lift the entire consumer product line to new heights of popularity. Innovations in styling, quality and technology are stimulating consumer appetites for more and better goods and services. Developments in defense and space electronics serve to strengthen consumer products through the interchange of ideas and innovations, thus assuring their continued growth.



# \$100 MILLION-A-YEAR

**SPURRED BY TECHNICAL IMPROVEMENTS AND INCREASED NETWORK  
COLOR TV HAS ATTAINED THE STATUS OF A MAJOR INDUSTRY**

IN BOSTON'S FENWAY PARK, Ted Williams slammed a curve ball deep into the right field bleachers for a home run. Under the blazing arc lights, a wildly partisan Red Sox crowd roared its approval.

Across the nation, bedtime retreated another hour as Jack Paar and a varied assortment of guests went on the air.

To New England TV baseball fans and the legion of Paar admirers, it was another evening of exciting entertainment. But for many of the viewers, the programs had a heightened element of drama. Both the Red Sox game and the Jack Paar show flashed before their eyes in vivid living color.

TV viewers who saw the colorcasts enjoyed a thrilling new dimension in home entertainment. For the television industry, they heralded a major breakthrough in color programming. Reason for the excitement was a new color camera tube, recently developed

by RCA engineers, requiring no greater lighting for color pick-up than for black-and-white.

The new tube is typical of developments that have led color TV into the ranks of more than \$100,000,000-a-year businesses, and which have injected new vigor into the entire television industry.

The more than \$100,000,000-a-year figure represents the current annual retail volume for color television receivers, tubes and other equipment, servicing and for local independent broadcasting.

"You can get some perspective on the massive scope of these activities," says RCA President John L. Burns, "when you reflect that if a single company were handling the whole business, it would rank in size among the top one per cent of the nation's industrial corporations. It would easily qualify for membership in corporate society's elite '400' set — the 400 largest corporations in sales volume.

"A remarkable feature of color's growth is that it achieved the status of more than a \$100,000,000 enterprise in just six years. By comparison, it took the American automobile industry 12 years to hit the \$100,000,000 mark, the aircraft industry 25 years, the petroleum industry 40 years."

The new RCA color camera tube is spectacularly more effective than those now in use. It makes it possible to colorcast, without special lighting, the exciting gamut of night sports events — baseball, bowling, football, trotting races and others. Because it requires substantially lower power for lighting and air conditioning, the new tube also makes it possible to broadcast color from the same studios now transmitting programs in black-and-white. And it provides a powerful stimulus for more local TV stations to originate color programs of their own.

One engineer who worked on the new tube project observed: "We've opened the way to a whole new spectrum of electronic entertainment."

Color this season will brighten virtually every type



*Colorcasts of major league baseball games have proved to be a powerful stimulus for color television set sales.*

# RAINBOW

## AND LOCAL PROGRAMMING

### IN JUST SIX YEARS

of TV program, from musical and variety shows to news and children's dramatizations. In the final quarter of 1960, the National Broadcasting Company will broadcast twice as much color as Hollywood puts on the screen in a full year. For the full year, more than 1,000 hours of color programming, virtually 50 per cent greater than 1959, will bring over thirty-two hours of color a week to the television screen, almost five hours a day.

In addition to the "Jack Paar Show," which turns to color four and later five nights a week, new color programs will include "The Shirley Temple Show," music-variety specials, the award-winning "Meet the Press" series, and a Saturday morning cartoon series for youngsters.

Later in the season, NBC also will broadcast a two-hour presentation of "Macbeth," filmed in Scotland, as well as on-stage presentations of the world famous Radio City Music Hall pre-Christmas and Easter programs. Together with such regular favorites as Dinah Shore, Perry Como and Tennessee Ernie Ford, color for 1960 on the NBC network will offer America its most exciting source of home entertainment. When added to the mounting local color programming in cities across the nation, viewers in many areas may be able to see up to fifty hours of color a week on their TV screens.

Parallel with the new program developments, other significant advances are carrying color to the forefront of popular appeal, to the point where 98 of every 100 homes are now within the coverage area of the nation's 367 color stations.

Increased programming is proving a powerful stimulant in accelerating color TV set sales. For example, in Boston and Chicago, where home games of their major league baseball teams were broadcast in color, early summer sales of receivers respectively shot up 528 per cent and 493 per cent over 1959.

Across the nation in one recent month, orders for



*This revolutionary new RCA color camera tube requires no greater lighting for color pick-ups than for black-and-white telecasting.*

the new model RCA color TV sets ran 300 per cent higher than 1959's levels, and this pace is expected to continue. Inventories of color sets across the nation are at a low point as dealers have reported sell-outs on many models.

RCA's Electron Tube Division is producing more



*A color picture tube nears completion at Lancaster, Pa.*

than twice as many color picture tubes as it did a year ago, and further increases have been scheduled.

One of the most meaningful indications of color's mounting popularity is the survey recently conducted in Cincinnati by Burke Marketing Research, an independent research organization.

The survey showed that twice as many color homes tune to color shows, as compared with black-and-white homes viewing the same program in monochrome. In terms of television commercial effectiveness, color commercials outscore black-and-white three-and-one-half times to one.

Color's increasing popularity as one of the nation's leading sources of home entertainment is reflected in TV receivers as well as in increased programming.

The new RCA Victor color TV line, for example, combines the latest technological advances with the public demand for quality styling.

Highlight of the 1960-1961 array is the first complete home entertainment center, a one-piece unit

combining color TV, stereophonic "Victrola" phonograph and AM-FM radio.

In appearance, the new line reflects the widest decorative tastes; from Danish modern and early American to French provincial and oriental. Typical of the emphasis on quality styling is RCA's association with America's master furniture craftsmen, Henredon.

In technical improvement, the new RCA Victor color line features what has been called "television's clearest, steadiest picture, even in difficult reception areas." The new sets also include circuit arrangements for improved picture tube life, and still-simpler service installation. To meet increased demand for remote control, six of the color models feature the new, improved RCA "Wireless Wizard," remote control unit.

Just as black-and-white television provided the exciting product thrusts of the Fifties," says RCA President Burns, "so color will furnish the great surge of the Sixties."

While color maintains its forward march, black-and-white TV continues to stimulate interest.

The new RCA Victor black-and-white television line, for example, offers new features that, according to W. Walter Watts, Chairman of the Board and President, RCA Sales Corporation, give performance "substantially beyond anything ever offered before, including unequalled fringe reception."

Most dramatic of these, which also appears in a number of the RCA Victor color models, is the "New Vista" tuner, based on the recently developed thimble-size nuvistor tube.

"Laboratory and field demonstrations of the new tuner have shown us that in these extreme fringe and difficult reception areas it is now possible to provide the viewer with a usable television picture where before reception by any receiver was unacceptable," Mr. Watts said.

Describing the new television line to RCA distributors and dealers, Mr. Watts also said that tests of its Security Sealed Circuit Boards, in which the circuit connections are etched on plastic boards "have proven that this modern method of manufacturing circuits for home instruments is so reliable that an extended warranty can be offered." For RCA Victor TV receiver owners, the warranty will extend for five years.

Whether designed for table use, outdoors, as home consoles or in combination with radio and phonograph, the new RCA Victor black-and-white and color lines highlight the demand of the buying public — quality reception and appearance.

With these two arms of progress — technology and styling — television promises an even more exciting future of entertainment and information than its previous fourteen spectacular years. ■

# EVOLUTION OF A TV SET:

## *from drawing board to living room*



EIGHTEEN MONTHS OF RESEARCH, DESIGNING, PLANNING AND TESTING  
GO INTO ITS DEVELOPMENT FOR THE HOME MARKET



MARCH 1959 . . . planning begins at Consumer Products headquarters in Cherry Hill, New Jersey, for 1961 television cabinets. Each final model is the result of screening at least eight preliminary design sketches, with attention to minute detail.



JULY 1959 . . . skilled craftsmen produce hand-made cabinets from approved designs. A top-level committee chooses from these models; then engineers, having worked closely with designers, fit the television chassis to final cabinet specifications.



MARCH 1960 . . . after engineering plans are completed, components go into production at seven RCA plants across the country. Here, the face of a tube is coated with phosphor in the production of color picture tubes at Lancaster, Pa.



JUNE 1960 . . . TV chassis are assembled at RCA's Bloomington, Ind. plant. Also at Bloomington, components gathered from distant production points are installed in the finished cabinets, completing sets at the rate of 80 to 100 per hour.



JULY 1960 . . . a final quality control check is made before units are released for shipment to distributors and dealers. Such tests are made constantly at the plants and at special control centers throughout production and in the field.



SEPTEMBER 1960 . . . the finished product is installed in a home. The set in this series is "The Cunningham," the first home entertainment center on the market to include color television, AM-FM radio and a 4-speed stereo "Victrola" phono.

# STEREO...THE SOUND FOR THE 60's

*Increasing sales of stereo phonographs and records reflect public's eager acceptance of new recording systems*



A MIDDLE-AGED WOMAN, shopping for gifts, recently walked into a record store and asked for a demonstration of stereophonic sound. After listening, she commented:

"It sounds like music from Heaven!"

The woman's opinion obviously is shared by the vast majority of America's music lovers. For in the scant two years since their introduction, stereophonic phonographs and records have firmly established themselves as a commercial success, say industry leaders.

For example, industry-wide figures show that since the Fall of 1958, nearly five million stereophonic phonographs have been sold at retail!

More telling are the industry-wide figures for the sale of all types of phonographs during the first half of 1960. Total phonograph sales were up 21.5 per cent over the like 1959 period. The figure included an 86.5 per cent rise in sales of stereo units, while sales of monaural units had declined nearly 44 per cent.

Sales of stereophonic records, meanwhile, have increased until today they represent 28 per cent of total LP sales dollars. For the first six months of 1960, LP sales, both monophonic and stereo, totaled \$112 million, up one-third over the same period last year.

Moreover, the advent of stereo records has not hurt the sales of monophonic LP records as might be expected. Rather, stereo records have been a 100 per cent plus for record manufacturers since sales of monophonic LP's have continued to increase each year, and currently are up more than 15 per cent over last year.

The upward spiral is expected to continue for both phonographs and records, making 1960 a banner year for each. Typical of the confidence of stereo manufacturers in the sales picture for the rest of 1960 is that expressed by Radio Corporation of America. It projects a year-end sales increase of 35 per cent over last year for its instruments. Record industry experts, meanwhile, say they expect a total sales volume exceeding \$600 million for the year — triple the figure of five years ago!

One of the main reasons for RCA's optimism is its new "Total Sound" stereo systems, described by W. Walter Watts, Chairman of the Board and President of the RCA Sales Corp., as "every bit as big an advance as high fidelity itself was in its day."

"It is the finest system ever produced by the company that has led the world in the reproduction of sound for over half a century. 'Total Sound' stereo adds new dimension, new magic to music, and the optional reverberation system gives you fantastic concert hall realism," he said.

The reason behind stereo's wide acceptance by the public in so short a time is understandable. It begins with the human hearing mechanism. Everyone with normal hearing perceives sound three dimensionally: he can perceive depth, direction and fidelity.

Stereo is simply the attempt to present recorded sound that comes as close as possible to the illusion of the original sound. With stereo, the sound seems to be three-dimensional, just as it is in everyday life.





With stereo, one can hear exactly where every sound is coming from, just as in everyday life. The living room becomes a duplicate of a stage in which a violinist who sits on the left of the concert hall is heard playing on the left of the room, while the kettledrum that bangs out the rhythm and accentuates the excitement on the right of the concert hall, is heard on the right of the living room.

By contrast, monophonic sound is only one-dimensional. In listening to a monophonic recording of a favorite work, one is excited only by its resemblance to the real thing, since it is a cramming of entire orchestras, soloists, studios, people and instruments into a single recorded and reproduced channel.

Since the technique of recording in stereo is still relatively new, much experimenting still is being done to obtain the best results.

When the sound in the recording studio control room is not the same as that created in the studio, it may be necessary to rearrange the positions of musicians relative to each other and to the microphones, and to the studio itself.

It is also important to take into consideration the amount of sound conditioning material – drapes, panels, and the like – in the studio, and to know the potentials of all, including their position, number and type for good sound reproduction in the microphones.

The importance of the recording studio and its acoustics is illustrated by Boston's Symphony Hall.

The hall is famous for its excellent acoustics – when filled. Yet when the Boston Symphony Orchestra made a recording there, sans audience, it was not equal to its live performance. After much experimenting, it was found that good results could be obtained by removing the first 12 rows of seats and placing the orchestra on the floor for recording purposes.

Conversely, it was found that Chicago's Orchestra Hall – considered by many, including world-renowned conductor Fritz Reiner, to be the single greatest recording studio in the world – had far superior acoustics for recording when no audience was present.

Recording in stereo also has forced a refinement in the physical placement of vocalists in relation to the microphones – especially in opera.

Richard Mohr, producer of RCA Victor's recently-released recording of Puccini's "Turandot," explains the need for the refinement by saying:

"Experience has shown that in stage presentation of opera, a singer only occasionally moves while singing; usually the action comes during those sections when his vis-a-vis sings, and each one is left free to concentrate naturally upon vocal production as the prime ingredient of the production. For recording, and particularly in stereophonic opera, singing and action must literally go hand-in-hand.

"When the singer achieves this twin identification of the vocal and dramatic standpoints, another problem can arise. Singing is not a cold-blooded mental



Few opera performances can boast a cast of the calibre of that in the new RCA Victor recording of "Turandot." At the recording session in Rome are (left) the late Jussi Bjoerling and Birgit Nilsson, and (right) Renata Tebaldi.

process, and with the best will in the world, no singer who is also an artist can invariably repeat the same stage action in the same way. For this reason, one must have a stage director, an invaluable ally who, with marked score of his own in hand, guides the artists at exactly the same pace in the same direction on the checkerboard floor for each 'take' of the scene in progress.

"Otherwise, should cutting between two 'takes' become necessary later, one might find a voice ricocheting and vaulting from one speaker to another, much like the vaudeville lady of another era who ended her turn with Ardit's *Il Bacio* as she careened madly about the stage on roller skates."

As might be expected, the most successful records in stereo are those which can take best advantage of stereo's three-dimensional effect — symphony orchestras, choral groups, and operas.

Technical improvements in both recordings and instruments then, have played an important role in raising stereo out of the novelty class and making it an accepted household necessity.

In explaining the rosy outlook for stereo, Mr. Watts said:

"People are over the amazement and wonder of stereo, and now want it to be a part of the household. This is showing itself in demand."

Mr. Watts referred to the fact that while there still is a great demand for lower-priced stereo phono-

graph units, more and more consumers are buying the middle and higher priced consoles, which are styled as "fine furniture."

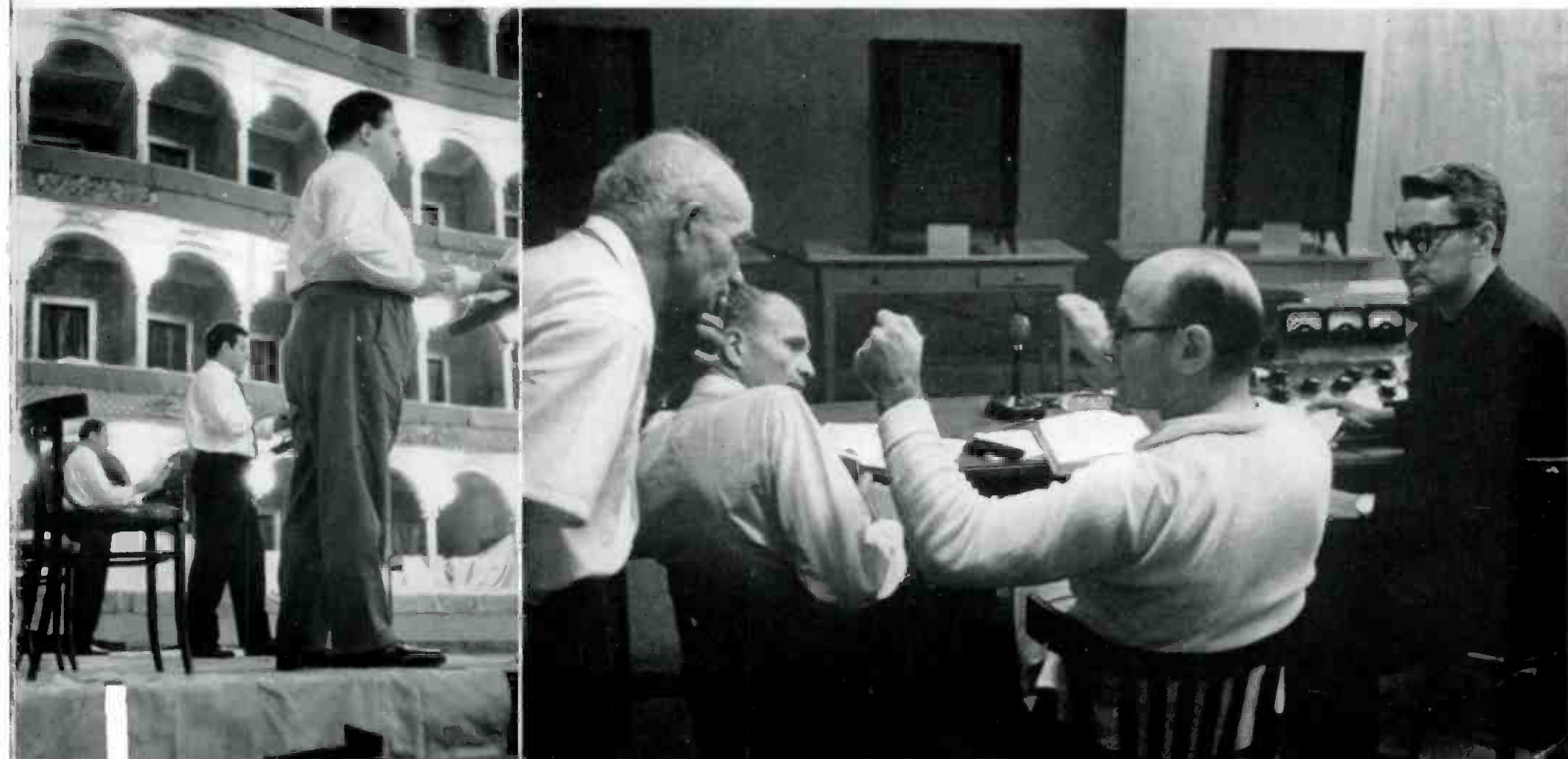
The new RCA Victor line of "Total Sound" stereophonic "Victrola" consoles for 1961 reflect this current trend toward "fine furniture."

Two of the 18 new models in the line are in the distinguished cabinet styling of Henredon fine furniture. Consoles in the medium and high-price ranges feature a recently-developed triple amplifier — a combination of three amplifiers on a single chassis to provide room-filling "Total Sound."

The non-directional bass or low-frequency portion of the music is separated and fed through a large speaker into the center of the cabinet under the "Total Sound" stereo system. Meanwhile, the directional mid-range and high-range frequencies are channeled through their own speaker systems. Adding the optional twin matching speaker systems extends the stereo effect to all parts of the room.

The optional "Total Sound" speaker units are small enough to be placed on end tables, in bookcases, or hung on the wall without disrupting a room's decor.

Thus, with the air of confusion which marked its debut clearing, with tastefully designed and good quality players, and with thousands of LP records to choose from, music critics as well as industry experts say there is little doubt that the sound for the 60's is Stereo! ■



*Pong, Ping and Pang — Tommaso Frascati, Mario Sereni and Piero De Palma (left) — recording the opening of Act II. Conductor Erich Leinsdorf (right) makes a point with RCA Victor Records officials at one of the playback sessions.*

THE INDUSTRY'S FIRST ADVANCED STYLING  
AND ENGINEERING CENTERS WILL CONCENTRATE  
ON DEVELOPING NEW CONCEPTS FOR HOME INSTRUMENTS  
AS FAR AHEAD AS 1970

# HIGH STYLE IN HI-FI...



*Today's portable radios are a far cry from those of 1925.*

THE HOME OF 1970 — will it be glass or brick, round or square? Will it have sliding partitions, or firm walls? Where will the family spend most of its time? What form and shape should the home entertainment instruments of 1970 — particularly television — take in order to blend advantageously with the mode of living?

Although these questions may seem somewhat too far removed for the average person to spend much time pondering over, they do pose a problem, and a challenge, to the manufacturer determined to maintain a position of leadership in his field.

Among those manufacturers which have recognized the challenge and are organizing now to meet it is Radio Corporation of America, which has announced the establishment of both the industry's first Advanced Design and Styling Center and its first Consumer Products Advanced Engineering Center.

As explained by RCA President Burns, the purpose of the Design and Styling Center will be "radical experimentation with advanced styling concepts which can eventually be incorporated into the whole range of home instruments." By so doing, RCA hopes to give new and tangible meaning to the concept of home entertainment instruments as pieces of fine furniture which can enhance the decor of a living room, a den, a bedroom or any room interior.

To oversee and evaluate developments in the world of art, interior decorating, fashion and architecture, and to advise the staff of the Center, will be an Advisory Board composed of recognized authorities in their field.

The Center will operate under the direction of Tucker P. Madawick, who as Manager of Industrial Design for RCA Victor Television Products, is responsible for the design and styling of RCA Victor's color and black-and-white TV sets.



*Lady Malcom Douglas-Hamilton presents RCA the American Institute of Approval's award for "good taste" in cabinet design.*

RCA is the lone major manufacturer offering a built-in, or mural, TV line.



Portable sets continue to be a popular style with the public.

## and TV, too

The Consumer Products Advanced Engineering Center, established at Princeton, N.J., will keep abreast of new technical developments in order to incorporate them as rapidly as possible into RCA Victor home entertainment products.

Despite its interest in instruments of the future, RCA stylists and designers still are very much aware of market trends and demands of today's consumers, or more precisely, today's housewives. For, as Mr. Madawick explains:

"Whether her husband plows the field or runs a stock brokerage house, the style-conscious housewife literally controls the trend in TV design."

Mr. Madawick pointed out that women's "capacity for change" and "keen interest in home decor" have proved most important influences in creating today's consumer products.

"We must create for a variety of women who are more style-conscious than ever before and, at the same time, for a variety of markets that reach from Maine to California," he said.

The diversity of markets, according to Mr. Madawick, demands constant and diligent research. For example, it is known that limed oak — the blond finish that captured the eye of the nation a few years back — has definitely become a slow seller. However, in a few areas like Chicago, Milwaukee and Detroit, it is as popular as ever. This is due mainly to the population make-up of those cities. But regional variances also make themselves felt. In the Far West, for example, Colonial, Scandinavian and Oriental are the most sought-after styles. French Provincial styling is not enthusiastically received in the West although it is a demand item in other parts of the country.

Through market research and other media, these



The new style trend is to fine furniture cabinets.



This table model has five-function remote control.

This Henredon-styled color TV cabinet features hand-rubbed veneers.



variances can be isolated. Trends and motivating factors can be charted, such as the rising demand that TV, radio and stereo cabinetry complement fine pieces of furniture.

This trend, influenced by the concept of more gracious living, has been given full play in RCA's new line of consumer products. In outlining RCA's objective in styling, President John L. Burns said: "In styling, under the umbrella of the RCA 'custom concept,' we are giving fresh meaning in our line to the idea of fine furniture — the television console or stereo phonograph that will enhance, and not intrude upon, the decor of a living room, a den or a bedroom."

Heading for this goal, RCA designers created a line of products for 1961 that can fit into any room and any decor: authentic Early American, Danish Modern, Oriental, French or Italian Provincial and a houseful of other. One model, the "Bordeaux," already has received the Award for Good Taste of the American Institute of Approval.

Adding further emphasis to the idea of fine furniture, RCA entered into an agreement with Henredon, recognized as one of the nation's finest furniture manufacturers. RCA is combining its electronics with Henredon's furniture, selecting individual products from Henredon's very successful "Provincial Gallery" and "Circa 60" groupings. A specialist in the craftsmanship of exclusive furnishing, Henredon has fashioned a custom line for RCA which many design experts regard as the finest offering in the history of television.

The four deluxe Henredon television models — three black-and-white and one color — feature "Wireless Wizard" remote control and the revolutionary RCA "New Vista" tuner, and all have fold-back doors which completely cover the front of the cabinet when the receiver is turned off. The cabinets themselves are of the finest veneers, solids and hand-rubbed finishes.

To plan successfully for such consumer demands, the designer must thoroughly understand the big market of the United States and recognize shifts in the preferences of that market. To do this, the RCA design staff travels regularly to furniture centers such as Chicago, Grand Rapids and New York; they never miss a large furniture show, and at their home base in Cherry Hill, New Jersey, they study closely every "shelter" magazine published in order to keep current on home decorating fashions.

Close contact also is maintained with the engineers throughout the styling procedure since rapid technical innovations force stylists to make constant improvements in their design. Such developments as the change in the length of the TV picture tube, and consequently the possibility of thinner sets, open new horizons for the designer.

"In the early days of television," Mr. Madavick pointed out, "the electronics were large and the kinescope small. Today we have the reverse — small electronics, large picture. Ten years ago the cabinet suggested a housing for the TV. Today, with correlated design emphasizing fine furniture, we now share the same space with Louis XIV, Early American, Italian Provincial, Traditional, Contemporary Modern, and other styles."

Once the picture of the general market is known, it is necessary to study the individual consumer in relation to that market. In this phase, it's one thing to design a line for use in motels, hotels or hospitals. But when the designer starts matching wits with the housewife, complications can set in. In this field, more than any other, the designer has learned that he must know the habits and tastes that make up the demand for his product. He must convey a "furniture feeling," the RCA designer stated.

Not too long ago, these experts were trying to out-guess the housewife . . . a practice that met its end with the short-lived triangular TV set. It seemed very logical, at the time, that four areas in a room should be used more efficiently — the corners. The answer was the creation of a triangular set that would fit nicely into the unused space. The sales reaction was poor. No one had considered the compulsion of many housewives to "redecorate" their homes every few months, and that to do this they don't buy, they just rearrange. Being limited to four corners, triangular sets didn't fit into the scheme and designers learned the hard way that they can't tell the customer how to place her furniture in her home!

An illustration of market research proving invaluable is the growing popularity of RCA's line of built-in TV, radio and stereo sets. When studies revealed that housewives wanted more flexibility in room arrangement, RCA designed mural TV sets that are built into the wall of any room in the house and can be made to match the decor by a series of attractive louvered frames. Not only are these sets compatible with the decorating scheme of the room, but their wider viewing area gives freedom in furniture placement unknown since the introduction of electronic home entertainment. So far, RCA is the lone major manufacturer answering the homebuilders' need for built-in entertainment to fit into their plans for producing the more spacious and completely equipped home.

As a British sage recently quipped, "It's a fast age — the impossibility of yesterday has become the luxury of today and the necessity of tomorrow." With this in mind, RCA engineers and stylists are keeping their fingers firmly on the pulse of today's market, while setting their sights on the designs for 1970. ■

By JACK O'BRINE

Electronic data processing will help correlate Presidential Election returns faster and more accurately than ever before

## OPERATION BALLOT: *Push-button results*

**A** NEVER-TO-BE-FORGOTTEN election night is the one on which Charles Evans Hughes' butler told inquiring newspaper reporters: "The President is sleeping and cannot be disturbed." To which the reporters replied: "Well, when he wakes up, tell him he's not the President."

California, in a late swing to the Democrats, had given the 1916 election to Woodrow Wilson.

In more recent years, Harry S. Truman took great glee in exhibiting in the White House a Chicago newspaper with first-edition banner headlines proclaiming: "Dewey Defeats Truman." The victory of President Truman in 1948 came as a big surprise to many Republicans, including editors and some news commentators, whom Mr. Truman loved to mimic, and did so frequently throughout his administration.

Thus pointed up is the fact that men have tried for years — and not always successfully — to project election trends and come up with the winner early. There have been formidable obstacles in the past — such as tardiness of Western returns, lack of means for evaluating early scattered returns in the East, and lack of applied know-how and devices for swift comparison of voting patterns.

Now, at last, great strides are being made in overcoming these obstacles through the use of electronic data processing, and it is believed that the coming election will be accurately projected far in advance of the final tally.

The project — known as "Operation Ballot" — is a combined effort of the Radio Corporation of America and the National Broadcasting Company.

How can an electronic data processing system project election results?

The operation involves three main requirements:

1. To feed into the system background data of such comprehension and discernment as to establish comparative voting patterns.
2. To supply as speedily as possible the developing returns of the November 8 election itself.
3. To apply to these known factors a mathematical formula or "model" of high predictive power.

Thus one of the first steps is to select, accumulate and store in the "memory" of the system a vast quantity of facts on the electorate and its voting habits.

These facts include a careful breakdown of trends in previous Presidential elections. For instance, it is found that the swing to the Republicans from 1948 to 1952 occurred as the percentage of the labor force in manufacturing decreased. The same is found to be true in the 1952-56 period.

So, according to these findings, the data system might project a decline in Republican votes should the percentage of labor in manufacturing show an increase in the 1956-60 period.

The economic well-being of the electorate also is taken into consideration. It has been ascertained that the swing to the Republicans in the last two elections coincided with the increase of per capita income in the election year, as compared with the previous year.

Another important factor taken into account by electronic calculation pertains to the voting of the non-white population. Political analysts think for example, that as this population increases the Democrats

## The Great Debate: Kennedy vs Nixon



The first of four historic face-to-face appearances on nation-wide network television and radio by Vice President Richard M. Nixon and Senator John F. Kennedy in "The Great Debate" series, will occur Monday, Sept. 26, from 9:30 to 10:30 p.m. EDT, when the two Presidential candidates discuss domestic issues from Chicago. On Oct. 21, they will discuss foreign policy from New York from 10 to 11 p.m. EDT. The remaining programs, on Oct. 7 and Oct. 13, will be in a news-panel discussion format. The appearances, made possible by suspension of the Federal Communications Commission's "equal time" regulation, will be carried by all three TV and four radio networks. The proposal for the series originated with Robert W. Sarnoff, Board Chairman of NBC. The programs will not be sponsored. They will originate in network studios with no studio audiences present.

benefit in the industrial North as well as in the South.

The all-important first phase of feeding pertinent information into the electronic data processing system has covered not only the "hard facts" of political life of the past but has included vital statistics on the population, its growth, education, employment, incomes and religion, among others – for every state in the union.

Here the full weight of political and technical know-how is aimed at creating a set of mathematical equations capable of fast and accurate prediction.

These equations – known to data experts as a "mathematical model" – emerge to form the operating basis for the Election Night projections.

An exciting challenge is the translation of facts, techniques and requirements into terms used in the mathematical model. This involves the application of a wide array of statistical and mathematical techniques and formulas in sifting through information, evaluating it, and combining it with early election returns for projections.

The early returns, in fact, represent the ingredient needed to begin forecasting the results. For already in the processing system's "memory" are facts on voting behavior and other essential data with which to project what can be expected to happen in the Middle West

and Far West on the basis of how the Eastern urban and rural sections are voting.

To the uninitiated, this may seem "a long way around" – but the proof of its efficacy will be forthcoming on Election Night when correct projections are expected to be given to the public earlier than ever before in political history.

The 1960 Presidential Election promises to usher in a new area in political reporting – "electronic reporting."

More than a year ago – in the early summer of 1959 – RCA and NBC began laying the groundwork for this unique development.

"Operation Ballot" has as its prime objective providing, by scientific means, a scope, depth and speed in reporting heretofore unattainable.

The key is RCA's electronic data processing system. Viewers tuned on Election Night to stations of the NBC-TV and radio networks will see and/or hear this exciting new product of American enterprise in action.

Heart of the project is RCA's New York Electronics Service Center at 45 Wall Street. It will be linked by special communications channels with NBC's New York Election Central in Studio 8H, Rockefeller Center, and with other important sources of information.



Each time television coverage switches to the data center NBC commentator Richard Harkness will report trends projected by the electronic system. This system — the RCA 501 — provides service to New York's financial district. It is capable of prodigious feats of speed and accuracy.

RCA has assembled a team of nearly 100 technical experts, specialists and technicians to set the stage for "Operation Ballot." In the group are researchers, political analysts, sociologists, statisticians, data programmers, computer authorities, communications specialists, and mathematicians.

Managed and coordinated by RCA's own data processing executives, the team has the services of creative technicians of CEIR, Inc., leading consultants in the field; Richard Scammon, noted political analyst and author of "America Votes," and Dr. John Mauchly, a pioneer in digital computers. RCA executives on the project are Arthur A. Katz, Manager and three Coordinators, Sidney I. Neuwirth, Philip B. Jordain, and Jordan B. Rabin.

Vital to the success of "Operation Ballot" will be the speed and accuracy of communications on Election Night. Undergoing exhaustive tests for this purpose is RCA's DaSpan — the first digital communications system designed to integrate electronic data processing with remote operations.

DaSpan lines of communication capable of handling as many as 1,200 messages per hour will feed Election Night returns into the 501 system.

Chief source for these returns will be NBC Studio 8H, into which will come reports from wire services and special correspondents across the country. These returns will travel by DaSpan directly to the RCA Center. Additional returns from specially chosen voting areas will be transmitted to the Center by direct telephone linkage.

At the NBC Central and at the Center, items will be screened, selected, coded, verified and transmitted to the 501 computer. To insure that information has not been garbled in some manner, each item will be given "validity checks" through a feedback circuit.

It is estimated that it will take less than forty seconds for any specific piece of information to reach the 501 in code from the time of its receipt in the form of "hard copy" at NBC.

The first prediction of "Operation Ballot" can be expected about 7 o'clock (E.S.T.) on Election Night. Subsequent predictions will be made as desired.

The RCA 501 can be depended upon to perform many highly involved calculations at split-second speed. Therefore, if the problem has been correctly analyzed by the mathematicians, sociologists, statisticians, political experts and programmers, then the

computer will come up with the correct projection.

When election night is over and the Presidential Election is decided beyond doubt, the 501 will go back to its regular chore — data processing for New York's financial community.

But something new will have been added. Many of the techniques and programs worked out for the job of "electronic reporting" on Election Night will find valuable use in solving business and scientific problems. One of the data processing experts puts it this way: "If our methods and system can call the turns on an election, it can be equally successful in telling us what products will sell in what quantities — when and where!" ■



*Many Americans stayed up until the early hours of the morning to get election returns over their crystal sets in the early 1920's.*



*In the election of 1948, thousands of Americans watched election returns for the first time on small screened sets like that at right.*



*By using computers, such as the RCA 501, broadcasters hope to project the election result earlier than ever before.*

# TOMORROW'S THRUWAY

An electronic highway system,  
with many immediate applications  
as well as completely automatic vehicle control,  
is now operating at RCA Laboratories



By KENYON KILBON

**A** WHITE CONVERTIBLE, speeding along a macadam roadway at Princeton, New Jersey, has carried its passengers into the electronic future – with no one at the wheel.

Starting, accelerating, steering around curves, and stopping at a safe distance behind a car parked ahead, the driverless car has brought into dramatic focus the ultimate prospect of fully automatic travel on super-highways of tomorrow. With no one at the controls, it has performed all of the routine functions of safe driving, guided by mechanical devices responding to electronic signals from the road itself.

This venture into the future provided a climax to the recent demonstration of the world's first full-scale electronic highway installation at RCA's David Sarnoff Research Center at Princeton. Shown to an audience of federal, state, and municipal traffic officials and representatives of the nation's press, the developmental system combined for the first time the electronic vehicle detection and guidance techniques developed over the past seven years by RCA Laboratories, and the automobile control equipment developed by the General Motors Research Laboratories to respond to signals from the RCA roadway circuits.

While the system carried the audience years into the future with its preview of fully automatic driving, it demonstrated at the same time a number of important applications that are immediately practical for



*Dr. Vladimir K. Zworykin (left) explains the operation of the electronic vehicle controls to a newsmen at a demonstration.*

# IS HERE TODAY!



the performance of numerous traffic control and safety functions. Within a few weeks after the demonstration, in fact, RCA announced the commercial availability of the compact, all-transistor detector equipment which lies at the heart of the system. Known as the RCA Ve-Det (Vehicle Detector), the equipment is applicable to a range of uses including vehicle counting, operation of traffic lights, and speed measurement.

Both the immediate applications and the ultimate potential of the system were described at the Princeton demonstration by Dr. James Hillier, Vice President, RCA Laboratories, in these words:

“This pioneering approach uses advanced concepts of both electronics and automotive engineering to achieve a practical system that can vastly increase convenience and safety in driving, and multiply the traffic handling of our highways.

“A feature of particular importance is the ability of the electronic circuits to perform a wide variety of specific functions within the *present* traffic environment — the conditions that prevail on our roads right now. These include operation of lights at intersections or along hazardous stretches of road; the measurement of car speed and automatic display of warning to drivers who exceed any of the wide range of limits for which the circuits may be set, and the counting of vehicles and adjustment of signals to ensure the maximum flow of traffic.

“Beginning with such immediately practical applications, the system can be gradually expanded by linking the various segments over longer stretches of highway and by introducing simplified controls to aid the driver in his operation of the car. Thus we could proceed by gradual steps to an eventual system of fully automatic driving as demonstrated in this pilot system. When this day arrives, we shall have achieved in a sense the highway equivalent of aviation’s automatic pilot, opening a new era of convenient, efficient, and safe travel for vehicle drivers and passengers.”

To demonstrate the complete system, RCA and GM project engineers employed a combination of vehicles, including a standard automobile with no special equipment, and two General Motors cars fitted with simple electronic circuits linked to the GM system of automatic controls for steering, braking and acceleration.

One of the special cars, a 1958 Chevrolet sedan, was the same vehicle used at the General Motors Technical Center two years ago in a demonstration of automatic guidance by means of signals buried in the pavement, based upon one phase of the RCA system.

The other special car, an Impala convertible, was equipped not only with automatic controls to respond to the highway signals, but also with the Unicontrol system combining steering, acceleration, and braking into a “single stick” control.

The highway officials watched the conventional car

travel around the test track, setting off a flying tail of warning lights that extended for 200 feet behind it.

They watched as the specially equipped convertible was driven onto the track and proceeded to follow the conventional car, accelerating, braking, and maintaining a center-of-the-lane course, without assistance from the engineer in the driver's seat.

Then the second specially equipped car joined the parade, and it too proceeded to perform as if a well-mannered expert driver were at the wheel.

In addition to the automatic driving, the highway experts saw demonstrations of the system's ability to perform a variety of other control and safety functions.

In one demonstration, for example, a speed warning circuit in the road measured car speed and provided an automatic warning both within the car and at the roadside whenever the drive exceeded any speed limit for which the road circuit was set.

The test track, a single-lane asphalt oval, contained a full-scale installation of the RCA electronic highway system. The elements included:

- (1) A series of car-length rectangular wire loops,
- (2) a continuous guidance cable buried just beneath the pavement, and
- (3) a chain of transistorized detector circuits along the roadside, each linked to one of the buried loops.

This is how the system works:

Both the buried loops and the guidance cable carry a small current. When a car passes over a loop, the metal in the vehicle causes a change in the magnetic field around the charged wire. This change is detected by the transistorized unit and translated into an electrical signal that can be used to perform any desired operation, from switching on a light to generating a warning signal in the road circuits behind the car. The

guidance cable generates a steady signal at a different frequency to guide the car along the center of its traffic lane.

In the demonstration all three of the cars activated the detector circuits as they moved around the track. The resulting signals were used both to illuminate roadside lights for a distance of about 200 feet behind each car, and to generate pulses in the buried loops for a similar distance to the rear. Thus, each car was followed around the track by a "flying tail" of lights and radio pulses.

The visible trail of moving lights, intended for use in conditions of poor visibility, provided the driver of the unequipped car with a visual warning of the car ahead, and with an indication of its distance and speed. The invisible trail of radio pulses from the road, picked up by receivers in the two specially-equipped cars, provided automatic control signals for the brakes and accelerator in order to maintain a safe distance from the preceding car without any need for action by the driver.

In addition, the two equipped cars were steered automatically around the track by the steady signal from the guidance cable, picked up by circuits which controlled the power steering mechanism. The guidance cable also was used to carry voice communications to a radio in one of the equipped cars, simulating emergency instructions and information to drivers on cross-country highways equipped with the electronic system.

The electronic highway concept originated in 1953 with Dr. Vladimir K. Zworykin, Honorary Vice President of RCA, who demonstrated the principles at that time by means of a miniature working model built at the David Sarnoff Research Center.

A full-scale installation of roadway circuits, representing an earlier stage in the development of the system, was demonstrated in late 1957 at Lincoln, Nebraska, in a cooperative experiment by RCA and the Nebraska State Highway Department. At that time, simulated equipment was used to show possible automatic control of automobiles.

Discussing the system, Dr. Zworykin pointed out that several limited practical applications already are under test. One of these is an installation of two loops and detector units in the roadway at the entrance to the David Sarnoff Research Center. During the past two years, the units have been used to count vehicles, measure their speed, and flash a visual roadside warning to drivers who exceed the posted speed limit.

Portions of the system also are currently being used to count and space traffic flow at the tunnels linking New Jersey and Manhattan. Nebraska highway officials also are using the system to count cars. In addition,

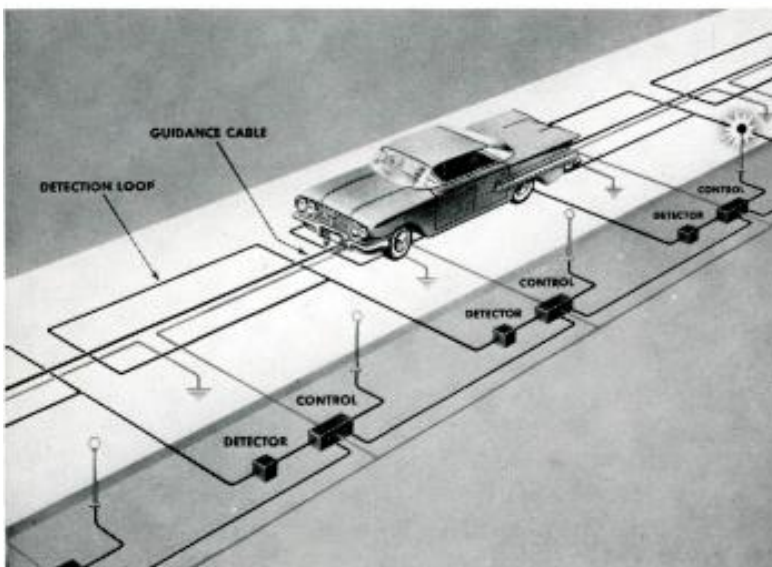


Diagram shows a section of the RCA Electronic Highway, in which the circuits are buried beneath the pavement.



*A segment of the electronic highway system in use at RCA Laboratories warns speeders to go "Slower Please."*

Leland M. Hancock, an engineer for the Nebraska State Highway Department, said that an installation is planned for the near future at an intersection on U.S. 30 between Omaha and Boys' Town, to determine the timing of a traffic light.

New Jersey highway officials also have installed a portion of the system at an intersection on U.S. 1 near the RCA Laboratories to "trip" a traffic signal. RCA officials said the system might find early widespread application for similar use elsewhere, replacing metal "treadles" which require considerable maintenance.

The ability of the system to detect the passage of vehicles is being put to a different and promising use by the Federal Aviation Authority in an experimental installation at the National Aviation Facilities Experimental Center at Atlantic City, N.J. The buried loops and their associated detector circuits are being employed in runways and taxiways of the FAA airport to detect the position and movement of planes on the ground. The information is used in the traffic control center to route aircraft.

The question of cost for a fully equipped electronic highway was a subject of speculation among the visitors at the Princeton demonstration. RCA officials pointed out that estimates are difficult to make at this

stage of development, and that costs would be substantially affected by type and location of the road itself. They explained that the complete equipment of a highway passing through an urban area requiring many access roads and overpasses would be more costly than similar equipment of a highway passing over open country. They hazarded a guess, however, that a complete installation for the length of a modern highway traversing both urban and rural areas might add an over-all average of about 10 percent to the cost of building the road itself — or roughly \$100,000 per mile over the complete course.

The price of automatic controls in automobiles using the electronic highway also was a subject of speculation, with estimates ranging from \$100 to \$1,000 per automobile.

At a question-and-answer period following the demonstration, Dr. Hillier emphasized that while there are still many "bugs" to be worked out, the electronic highway system has been carried to the point of "showing its technical feasibility."

"It is now ready for study and evaluation by highway and traffic authorities," he said. "These are the people who will have to make the decisions on the future of our public roads." ■

# THE ARMY'S BRAINIEST "BRAIN"

**The giant Bizmac system has saved  
the Ordnance Tank-Automotive Command  
millions of dollars and wiped out  
a critical supply bottleneck**

**O**NE MORNING recently an official of the U.S. Army's Ordnance Tank-Automotive Command in Detroit walked into his office to find a pile of 12 × 18-inch envelopes nearly a foot high on his desk.

The stack represented orders for \$70 million worth of supplies — 10,000 line items — for an overseas depot. They had to be processed for the availability of the items, the dollar volume in each category and whether some already were listed in back orders; then the orders had to be written for shipment.

The entire stack went through OTAC's giant Bizmac electronic data processing system in two weeks — in spare time, without interfering with the system's regular program.

"Three years ago," said Charles S. Diehl, Executive Assistant in the Command's Data Processing Division, "this would have overwhelmed us. It would have taken clerks 60 days just to find out the dollar volume alone — and on overtime with top priority. Using Bizmac, there was little if any overtime."

The example is just one of many which underscores the vital role the world's biggest electronic "brain" has assumed in the four years it has helped OTAC to control the world-wide vehicular needs of all U.S. armed forces as well as those of many allied nations. Bizmac also provides the most detailed information yet available on what data processing systems actually can do for government, for commerce and industry, and for the individual taxpayer.

Since its installation by RCA late in 1956, the Bizmac system has had as its two primary achievements the establishment of a swift and efficient management of inventory and supply, and the savings of tax dollars. Installed at a cost of \$4,100,000, the system has saved the Army many times its original cost.

For example, 1957 — five years after the United States began the Military Assistance Program to allied nations — OTAC was faced with a colossal problem. There were on hand about 400,000 individual papers, most of them requisitions, from 44 MAP nations that for sheer lack of manpower had not been processed.

Putting their information on punched cards and paper tape, OTAC personnel began to feed them into Bizmac. In three months, without interfering with other regular work, the machines had disposed of the 400,000 papers. During this period, a time study was made on one increment of 35,000 requisition lines. The timing of this portion of the task required a total of 128 machine hours; OTAC officials estimated that it would have taken 17,000 man-hours to do that increment alone by conventional paper work. Of far greater importance, however, was this by-product of the project:

Bizmac showed that many MAP countries had ordered far greater quantities of material than they could possibly use. OTAC officers examined the orders and found hundreds of duplicates or repetitions. The explanation was simple: a MAP country, impatient when a requisition was not filled, merely made out another one — a process repeated ad infinitum.

Totaling up the MAP nations' orders, OTAC found they had asked for \$311,200,000 worth of material — against \$30,000,000 available for the purpose. Army Ordnance promptly sent officers to the nations involved to determine just how much of what items they really needed. Within weeks, they were back with cancelled orders totaling \$157,300,000.

Another accomplishment of Bizmac has been to speed up overseas shipments of supplies to both MAP countries and U.S. foreign bases. Up to last October, the lead time allowed for delivery of material to its destination was 55 days; even so, only about 60 per cent of it arrived within that time. Last October, Army Ordnance eliminated most requisitions on paper and instituted a punch-card system. Today, 90 per cent of





## ELECTRONICALLY SPEAKING

### EN GARDE

A member of the RCA Family, Albert Axelrod of Scarsdale, N. Y., helped the United States' cause at the 1960 Olympic Games in Rome by winning a bronze medal, for third place, in fencing.

Mr. Axelrod, a senior project member of the technical staff of RCA Surface Communications Laboratories in New York, is rated as one of the world's top foilsmen. He won the national foils championship in 1958, placed second in 1959, and recaptured his title this year. He placed fifth in the World Fencing Championships in 1958, in which he administered the only defeat sustained by the champion, Giancarlo Bergamini of Italy.

In the 1959 Pan American Games, Mr. Axelrod placed second, losing out to teammate Harold Goldsmith. He also was a member of the U.S. Olympic Fencing Teams at Helsinki in 1952 and at Melbourne in 1956.

### MOVE OVER, NIPPER

Nipper, the famous RCA Victor trademark, may have become famous listening to "His Master's Voice," but "Poocher" Kauffman of Haddonleigh, N. J., doesn't need to take a back seat to any canine.

The seven year-old pet of Wilbur W. Kauffman, Product Assurance Manager, RCA Defense Electronic Products, Camden, "kneels" on his front legs and nods his head every time he hears a mention of "RCA."

Even the mention of "RCA" in an ordinary conversation is enough

to send Kauffman's pet into his act.

"He scares me," says Kauffman of his pet. "He can learn to do just about anything in three lessons."

Poocher's latest gimmick is to start howling whenever any of the Kauffmans call the family cat, "Pusser," in a high-pitched voice.

### SOUND BOATING

The Western Long Island Sound area is a safer, more convenient place to cruise these days for 1,500 small craft owners, thanks to an ingenious communications plan employing lowcost, compact RCA Citizens' Band two-way radios.

The plan was devised jointly by RCA and six participating yacht clubs, a marina, and the boat owners. Participation is on a voluntary basis.

The plan provides an inexpensive and flexible means of communication between small craft skippers and their home bases, other yachtsmen and shore stations operating on the Citizens' Band of radio frequencies.

Value of the two-day radio system was demonstrated dramatically during a recent Larchmont Yacht Club Race Week. A dozen small sailing craft capsized when northerly squalls moved into the race area without previous warning. The young skippers, trained to remain with their disabled boats, were picked up unharmed in a matter of moments, thanks to the RCA Citizens' Band hookup which directed radio-equipped patrol boats in carrying out the rescue operation.

### EGGS ANYONE?

According to the President of the American Poultry and Hatchery Federation, Jack Paar and his NBC-TV late-night show are causing people to eat fewer eggs.

Viewers who watch TV shows into the early morning are failing to eat breakfast and therefore have cut the U. S. egg consumption by 3.6 billion, "eggspert" Ray E. Parmenter claimed in an interview with Richard Connelly of the Memphis Commercial Appeal.

Parmenter says "The Jack Paar Show" and other late-night TV fare are causing many people to sleep late, therefore missing breakfast — and eggs.

### PLAIN ENGLISH

John Griffin (right), a message programmer at the RCA Electronic Systems Center in New York, N. Y., coaches Miss Ruth Bie in the use of the new English-language system of instructing a computer. Known as COBOL (for Common Business Oriented Language), the new programming system substitutes simple English words for the complicated numerical jargon now employed in computer use — as witness the two equivalent sets of instructions on the blackboard. Basis for COBOL was worked out by a committee of manufacturers at the Defense Department's behest to provide a single interchangeable language applicable to computers of different makes. RCA is the first computer manufacturer to implement the language. ■

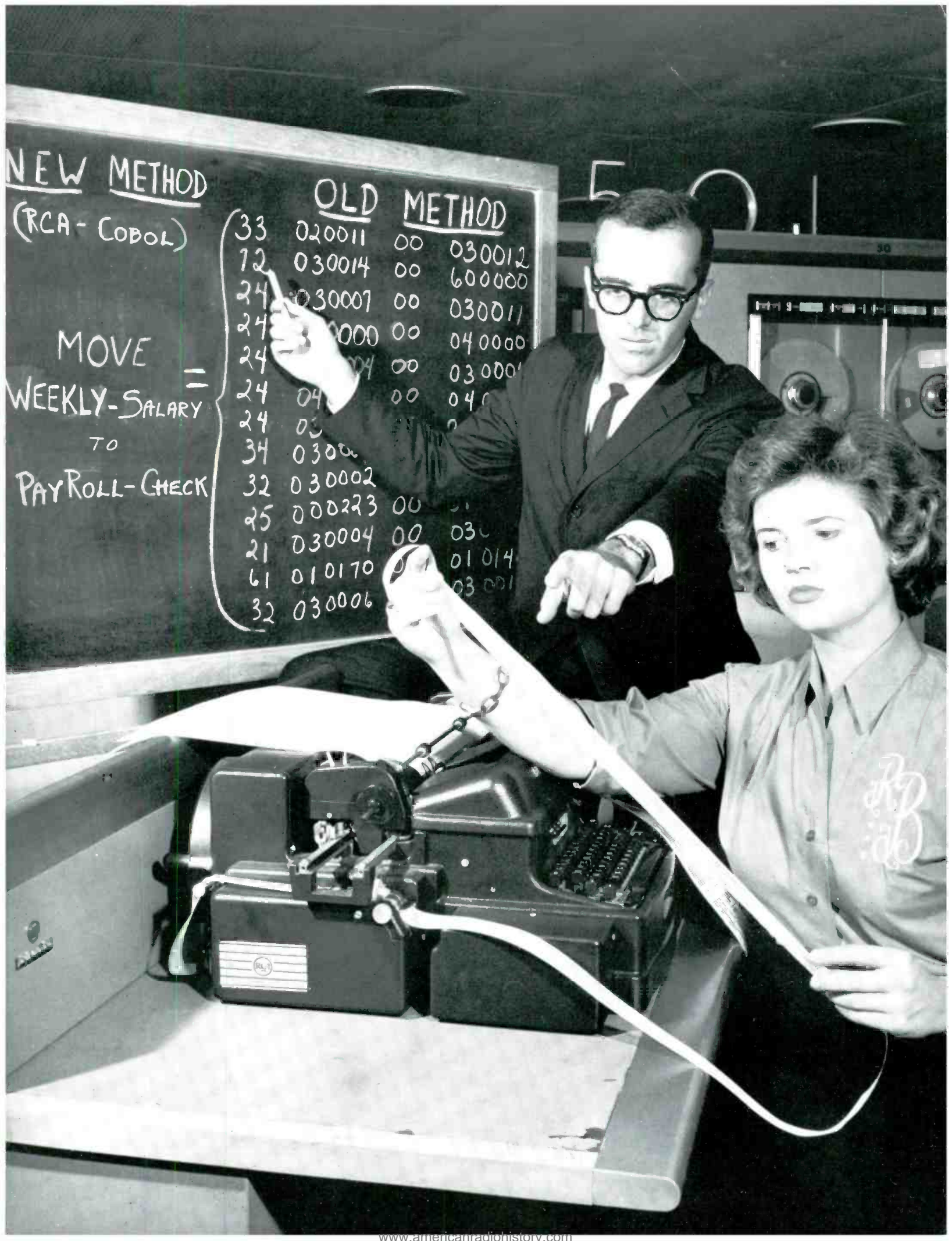


NEW METHOD  
(RCA-COBOL)

OLD METHOD

MOVE  
WEEKLY-SALARY  
TO  
PAYROLL-CHECK

33	020011	00	030012
72	030014	00	600000
24	030007	00	030011
24	000000	00	040000
24	000004	00	030000
24	040000	00	040000
24	000000	00	000000
34	030000	00	000000
32	030002	00	000000
25	000223	00	000000
21	030004	00	030000
61	010170	00	010140
32	030006	00	030000



# You don't know what you're missing 'til you see the Series on RCA VICTOR **COLOR TV!**



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tainment—at its best! The picture is amazingly sharp and clear. Colors are beautiful and so easy to control. And the sets have never been so dependable, or so favorably priced! See your RCA Victor dealer —now! See what you've been missing!



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