

DECEMBER 20, 1957

electronics

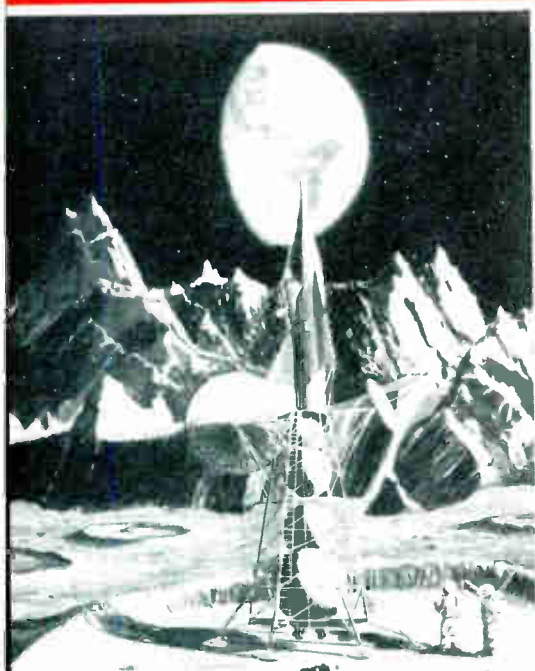
business edition

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ELECTRONICS
ARTICLES
for '57**

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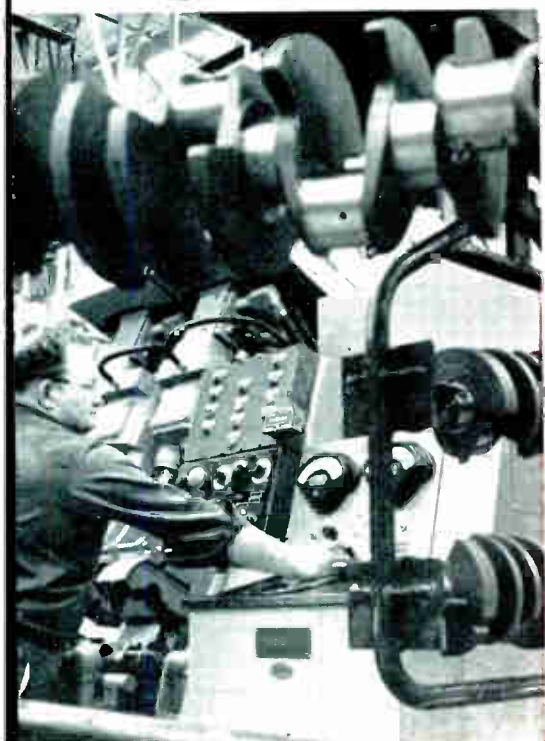
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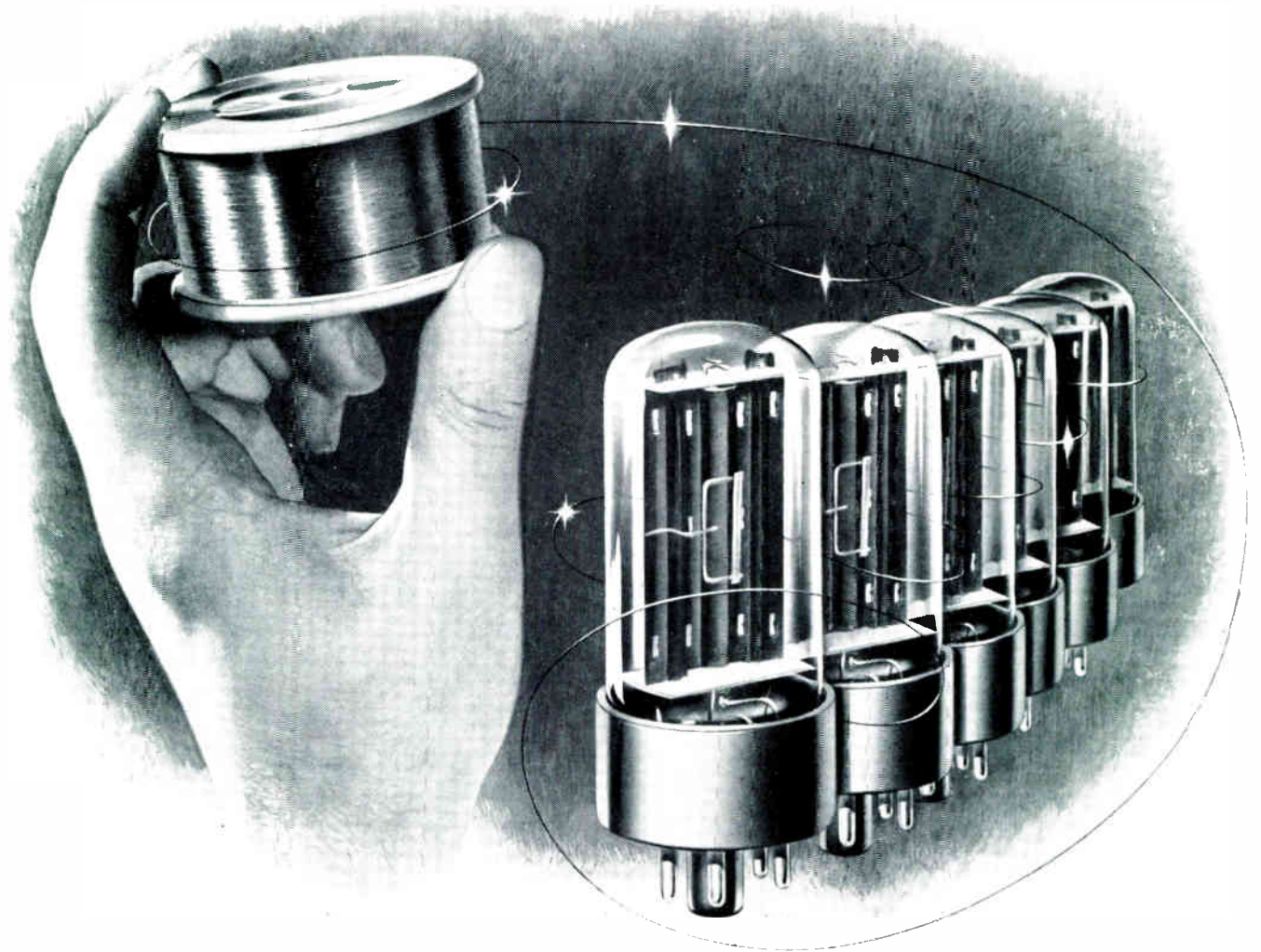
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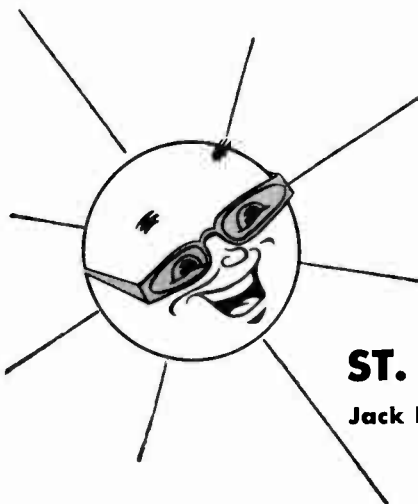
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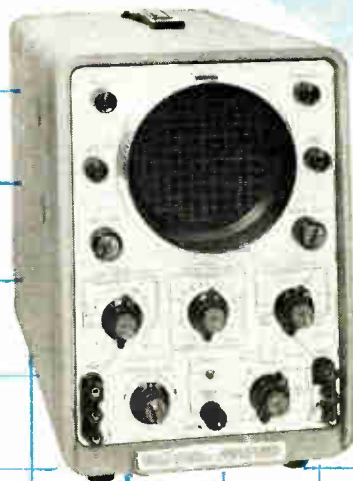
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Easier Money Due

Federal Reserve's discount rate cut, falling bank loans point to easier bank credit in future

TIGHT MONEY, bugaboo of our cash-short industry, now is beginning to lose its grip. This is important since raising money is the industry's number one problem, electronic firm executives say.

Bank loans should be easier to get in the coming year. Sooner or later bank interest rates will recede from their present high-water mark, money experts say. Present rates range upwards from the prime rate of 4½ percent for top-risk borrowers.

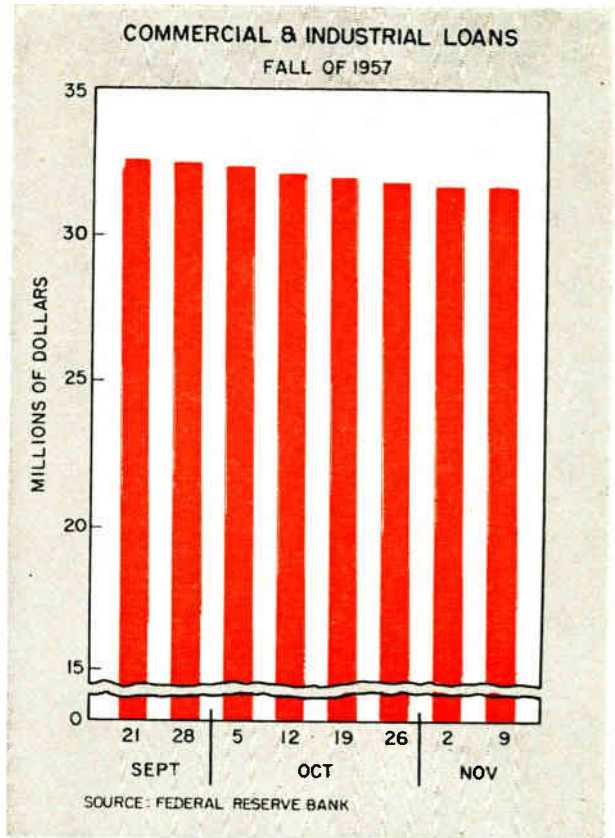
The Federal Reserve Bank pulled the rug on tight money on Nov. 14th when it reduced the discount rate from 4 to 3½ percent. (This is the rate banks pay when they borrow money from the FRB. Normally bank interest rates move in close sympathy with the FRB discount rate.)

Immediate effect of the rate drop was neither an easing of the loan money supply nor a drop in bank interest rates. However, other rates fell—commercial paper, bankers' acceptances, and treasury bills.

The prime rate remained at 4½ percent because the lower discount rate did not increase the supply of money, said banking industry leaders.

More important than the immediate effect of the cut in discount rate is the intention of Federal Reserve policy makers. The FRB can stoke up the money supply whenever it wants to.

Moreover, many experts claim the FRB won't have to go that far. They say that banks will soon be fighting for loans. They point to the declining vol-



ume of commercial bank loans that has accompanied the softening of business conditions.

Since the last week in September commercial and industrial loans of the nation's banks have declined consistently. The steady weekly fall has reduced commercial and industrial loan totals by \$852 million, from \$32,603 million at Sept. 21 to \$31,751 million at Nov. 9. Over approximately the same period last year C&I loans increased \$745 million, from \$29,694 million to \$30,439 million.

SHARES and PRICES

ANTI-MISSILE contracts appear to be destined for a big chunk of military procurement budgets in future years. Recent request by the Army

for \$6-\$7 billion to spend on anti-missiles over three years spot-lights the huge sums involved. Although the request was unsuccessful at the time, it indicates the size of spending to come. Firms like those listed

below, already participating in anti-missile development through Army Nike Zeus and Air Force Wizard contracts, have gotten in on anti-missile's ground floor. The experience they are gaining could pay off.

	Recent Price	Dividend Rate	Percent Yield	Earned Per Common Share 1957	Per Common Share Period	1956	Traded	1957 Price Range
Avco.....	57½	0.10	1.7	0.92	(9 mos)	d-2.17	NYSE	4½-7¼
Douglas Aircraft.....	69½	4.00	5.8	6.67	(9 mos)	5.56	NYSE	50½-91
General Dynamics.....	59	2.00	3.4	3.50	(9 mos)	2.51	NYSE	46¼-68½
General Electric.....	60¾	2.00	2.9	2.10	(9 mos)	1.85	NYSE	52¾-72¾
R.C.A.....	28¾	1.50	5.2	1.87	(9 mos)	1.82	NYSE	27-40
Sanders Associates.....	12¹	0.57	(1 yr)²	0.40	OTC
Sylvania.....	33¾	2.00	6.0	2.37	(9 mos)	3.20	NYSE	30½-46¼

¹ bid

² Fiscal ended July 31

Heaters to Missiles

Acquisitions turn heater company into major electronics firm

FROM SPACE heaters for the home to space missiles for the military in three years is the standout fact in the recent history of Siegler Corp.

Until 1955 Siegler's business was 100 percent space heaters. Today, 63 percent of its business is in electronics. The remainder is divided between heating equipment, 28 percent, and tools and machinery, nine percent.

In military electronics the firm is concentrating on electronic ICBM equipment. In commercial electronics it is concentrating on closed circuit television.

Siegler is one of the 10 largest suppliers in the nation of missile electronic equipment, president John G. Brooks told the New York Society of Security Analysts recently. The California firm aims to become a designer and developer of missile sub-systems for major missile weapons system producers.

The big jump from space heaters to electronics got started in November, 1954, when present management acquired the firm. At that time the new management established the policy of building a diversified firm that would be primarily in electronics.

Principal instrument used for making this plan a reality was a program of acquisitions.

The program began in June, 1955, with the acquisition of Hallamore Electronics. It was completed (at least for the time being) last September with the acquisition of the Unitronics and Hufford corporations. Between these dates Siegler also acquired five firms unrelated to electronics.

Hallamore makes electronic control and test equipment, aircraft and missile avionics equipment, closed-circuit television systems and telephone electronic equipment. Unitronics makes tv and radio receivers, phonograph combinations and hi-fi equipment, and sound systems for the civilian market. It also makes airborne radar, direction finding equipment, and other products for the Armed Forces. Hufford makes machine tools for stretch-wrap forming of metals and ground-handling equipment for aircraft and guided missiles.

MERGERS, ACQUISITIONS and FINANCE

• **Consolidated Diesel Electric** of Stamford, Conn. completes negotiations for acquisition of **Aircraft Products**, division of **Manning, Maxwell & Moore**. **Consolidated Controls**, subsidiary of Con Diesel, has agreed with MM&M to purchase Aircraft Product's business and certain assets, not including its plant. New plant space will be leased shortly in Danbury, Conn. The transaction was primarily for cash with part payment on time. But the amount paid was not disclosed. The closing is scheduled to be held Dec. 31. Major activities of Aircraft Products are in aircraft and missile propulsion control systems. Joseph F. Engelberger, currently general manager of the division, has been elected president of Consolidated Controls.

• **Varo Manufacturing**, Garland, Tex., privately places \$1 million of notes due in 1967. The interest rate to be paid was not disclosed. Five hundred thousand dollars has already been borrowed and the

balance will be taken up later. Varo is a manufacturer of high-precision systems and components for the missiles, communications and aviation industry.

• **P. R. Mallory** acquires plant, facilities and majority interest in **Milli-Switch Corp.** of Santa Monica, Calif. Milli-Switch will operate under its own name as a Mallory subsidiary. Its production equipment is to be moved to the Frankfort, Ind., plant of Mallory's electronics division. Milli-Switch products include precision switches and auxiliary actuating devices for military and industrial use.

• **North American Aviation** plans increased diversification. It expects to develop additional non-military business based on its technical developments in missiles, electronics, control equipment, atomic energy and rocket propulsion. In future years, North American will consider acquisition of commercial companies in related fields.

• **AMI**, juke box and hi-fi phonograph producer of Grand Rapids, Mich., cancels proposed stock offering to stockholders. The plan was canceled because of financial market conditions. The proposed stock offering would have given shareholders the right to buy one share for each four shares held, plus an option to acquire additional shares.

• **Columbus Electronics**, Yonkers, N. Y., plans to issue 110,000 shares of common stock at \$2.50 per share, without underwriting. Proceeds are to be used for working capital.

• **Hycan Manufacturing**, Pasadena, Calif., publicly offers 400,000 shares of common stock at \$3 per share. **Dempsey-Tegeler & Co.** of St. Louis, Mo., headed the underwriting group. Proceeds will be used as follows: 1) to repay a bank note, \$500,000; 2) for research and development, about \$80,000; 3) for capital improvements, about \$120,000; 4) balance for working capital.

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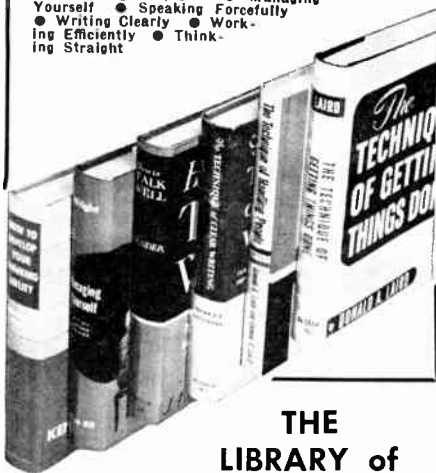
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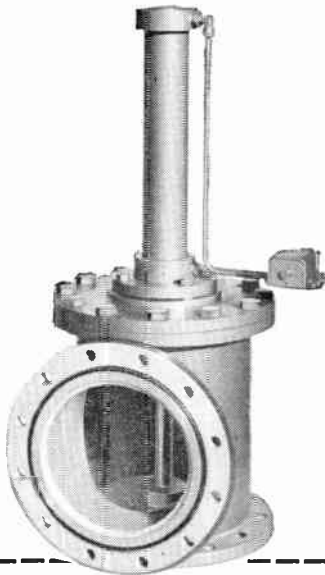
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8

WASHINGTON REPORT

THE EISENHOWER Administration is taking its first step toward centralized civilian-controlled development—and possibly production—of new military weapons. In its wake may come a revamping of contracting procedures for electronics companies in defense work—dealing with supervision of contracts, profit allowances, allowable costs, contract awards and the like.

The first step is Defense Secretary McElroy's plan to set up a "single manager", independent of the military services, to run development of the infant antimissile-missile systems reconnaissance satellites, space vehicles and platforms and other newfangled projects outside the traditional realms of the three military services.

This is the closest the U.S. has come to the British weapon development system—a system which many experts, critical of U.S. defense policy, say should be emulated here. In Britain, the military services originated requirements for new weapons. Then the independent Ministry of Supply determines the technical feasibility of such projects and follows through on development—setting up a budget, selecting contractors and so forth. Only after a new weapon is fully proved operational is it turned over to one of the services.

The Defense Department has been frequently urged to create such a system to curb duplication of research effort between the services, stimulate new weapon schemes and strengthen general control over weapon development.

Up to now, the Pentagon has shied away from centralized operations of this type except for the most common off-the-shelf items—like fuel, food, conventional ammunition, medical supplies and photographic goods. But the speedy advent of a new generation of military weapons—and the growing evidence of Russian advances in this field—has now forced Washington to take the radical step of taking space vehicle and new rocket development out of the direct control of the military services.

- As *ELECTRONICS* went to press, McElroy was still seeking a man to head the new single agency, tentatively called the Advance Research Projects Agency. McElroy believes the ballistic missile programs and other established missile development projects are too far advanced to put under the control of the new single manager.

So the services are continuing to run these development operations. But even here, McElroy has tried to bolster coordination of the established missile projects by broadening the authority of his Special Assistant for Guided Missiles, William M. Holaday.

Holaday is now called Director of Guided Missiles and has new responsibilities over missile procurement policy and jurisdiction over all guided missiles except antimissile missiles and other upcoming projects run by the single manager. In the past, Holaday was limited to strategic missiles and had no say in procurement policy.

Still, it's clear that Holaday will remain essentially a coordinator rather than an operating executive directing individual missile projects. Holaday is not the "missile czar" for whom defense critics have clamored. McElroy makes it clear the defense secretary himself will run the show, knock heads and take responsibility for what is or isn't accomplished.

"George is great . . . right where he is!"



If ever a compliment could cut the ground out from under a man — you just read it. Just make sure your management never says it about you.

Once upon a time, business moved at a slower pace, and people and things were sort of tidily pigeonholed. So many companies were wedded to a single product, a modest plant, simple processing, comfortable competition, family ownership and one-man rule.

Once upon a time, you could be a specialist in a particular part of a particular business, live within narrow walls, and everything was just dandy. No longer! Today, job isolation is stagna-

tion. Companies, products, industries, have cross-bred like crazy. Anybody's business is everybody's business. Being "an expert" is always essential in depth, lacks much in breadth.

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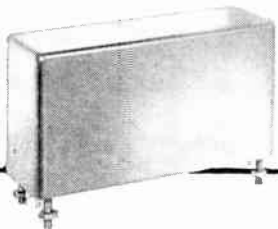
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EXECUTIVES IN THE NEWS



Vicary: tests, not noise . . .

IN THE last couple of months, James McDonald Vicary has been in the center of much controversy. The storm rages around his development of electronic gear to project tv commercials subliminally—at intensity levels below conscious perception. Idea is for the message to register on the viewer's subconscious.

Vicary, 42, owns his own market research firm, besides being an officer of Subliminal Projections Inc. Motivation has always intrigued him—"I like people," he'll tell you; "I like to know why they do what they do." While a student at the University of Michigan (AB in sociology, 1940), he formed the Bureau of Student Opinion to find out how students spent their leisure and what their ethical attitudes were. After college, he did operations research for Detroit's giant department store J. L. Hudson Co., later worked with Benson & Benson and Crowell-Collier on marketing research and opinion sampling.

After the war he started his own company specializing in motivation studies. Names, words, and how people react to them are his particular business. One study showed him (and client Socony-Vacuum) that a proposed brand name Sovac made people think of Soviet and communism. Result: the firm changed its name to Socony-Mobil.

Vicary's tired of the loud noises about subliminal projection and grateful to FCC for putting a moratorium on its use. "We need more tests," he says, "and less noise." He's acutely conscious of its ethical significance, says "if it's a dangerous device—and we'll only find out by testing it—I'd be among the first to say 'don't use it.'"

His job is his hobby, and he spends most of his time doing it. He reads a lot, but "very little of it's fiction. I used to like murder mysteries but don't take the time any more." He also likes the theater and "fair amounts" of tv, which first gave him the idea for subliminal ads.

COMMENT

Gremlins

We would like to call your attention to a fairly obvious proof-reader's error. In the story "Acro-

nutronics Will Build Lab" (Nov. 10, p 54), you report that our west coast subsidiary will build a new R&D center.

Unfortunately, except for the headline, the name of Acronutronics Inc. appears elsewhere in the story as Aeronautics Inc. To

avoid any possible misunderstanding, we thought this correction should be brought to your readers' attention.

JOHN CAMERON

FORD MOTOR CO.
NEW YORK, N. Y.

Gremlins—probably left over from Hallowe'en—were at work in our Nov. 10 edition.

Here's more evidence of their work: A line dropped out of the story "Hi-fi to Pass \$250 Million" (p 53), changing the last sentence in column 1 to a garble. (The sentence originally read "Hi-fi pioneer Norman Pickering figured hysteresis motors might be the answer to the problem, asked Rek-O-Kut to build a playback turntable using the motor.") Then one of our editors made sure that the firm's name read Rek-O-Cut (instead of Rek-O-Kut) throughout the story.

Programmers

In (Crosstalk, Sept. 1, p 137) is the question "What is the best name for 'computer programmer.'"

Hearing that a learned Frenchman is recommending *ordinateur* to mean a data-processing machine, I would in turn suggest a word *pre-ordinator* (or even *priordinator*) for computer programmer.

L. F. BIRDSEYE

HESTON, MIDDLESEX
ENGLAND

Tarheel Plants

As an interested reader of *ELECTRONICS* I was pleased to see your report on the plans for a research park in eastern North Carolina ("North Carolina's Top Card," Oct. 20, p 39).

Our growing company recently initiated construction of a new plant near Asheville, N.C., so we were disappointed not to be listed among the electronic manufacturers. International Resistance, Hammarlund Manufacturing, Kearfott and General Electric are all neighbors of ours in the Asheville area.

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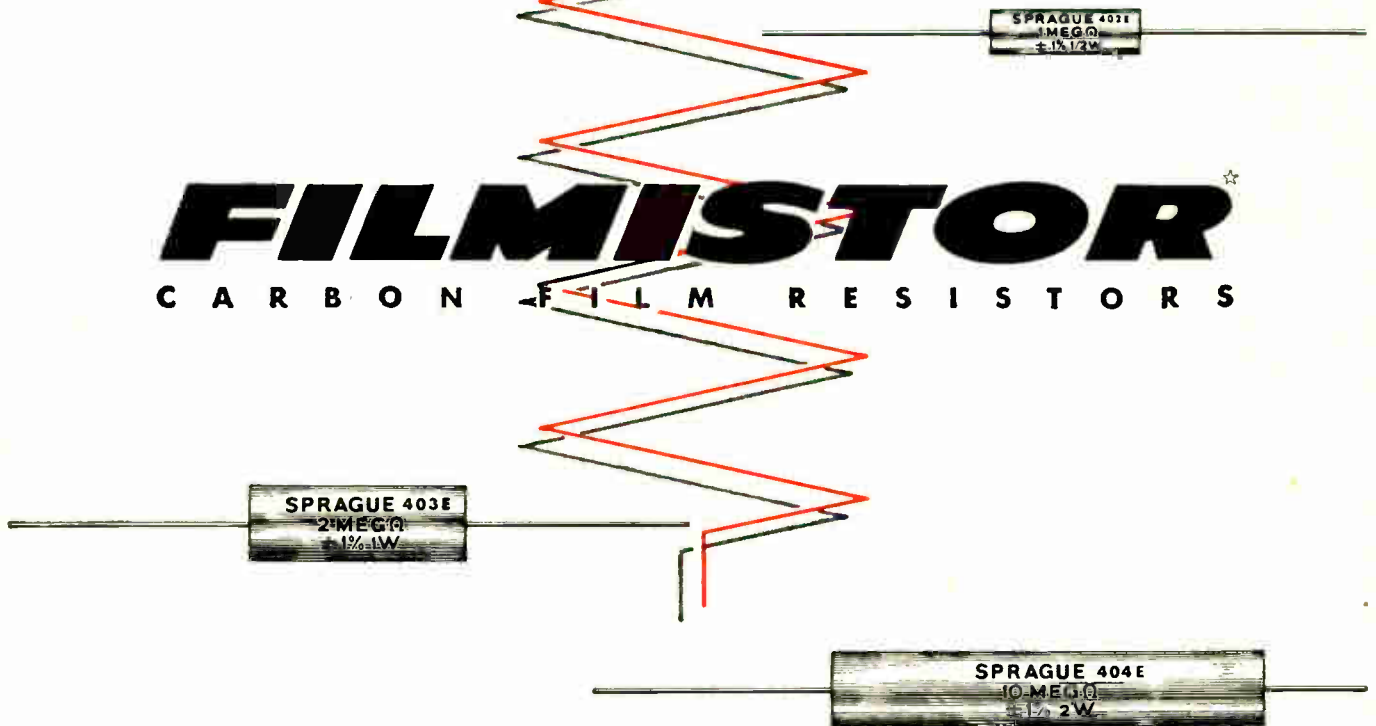
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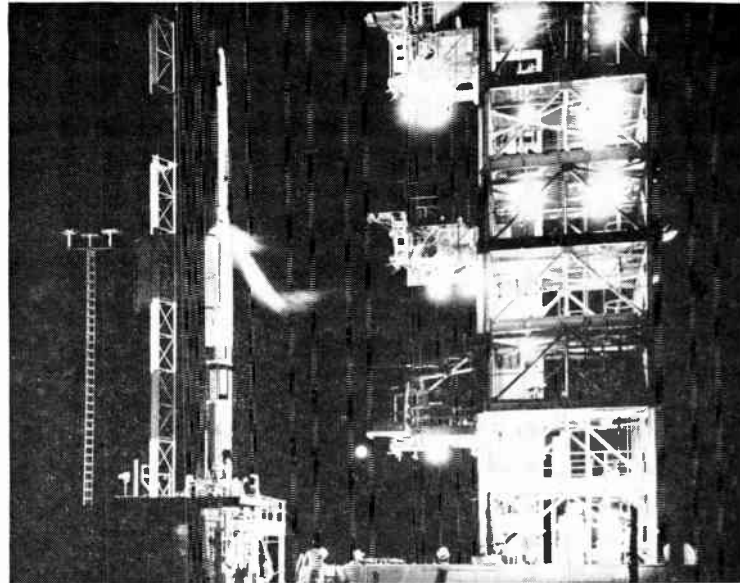
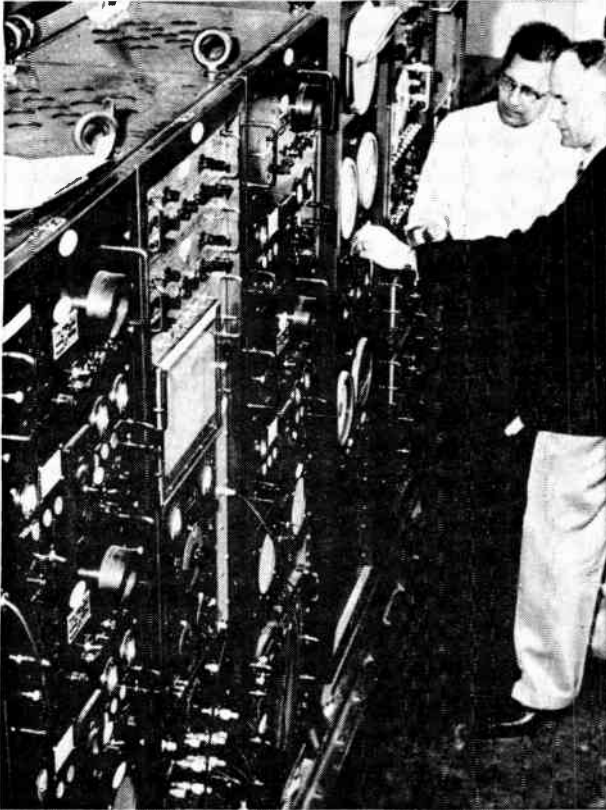


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Instruments at Patrick Airbase (left) will record Vanguard's flight. But what comes after?

Moon Rocket by 1962?

● **Hard look at missile and rocket plans provides peep at astronautic technology now in planning stage. Man may be probing deep space in earnest within next decade. And electronics will have to lend a hand**

QUESTION is naturally arising today: What are the U.S. satellites the vanguard of?

There are other things planned, by the defense establishment and by scientists working outside of government. *ELECTRONICS* looked into some of the projects, found a startling breadth and depth of research. Some programs antedate Vanguard, which was spun off from a then-secret project when the International Geophysical Year first got a government okay.

The new technology will call upon electronics

heavily and often. National Science Foundation director Alan T. Waterman feels that rocketry and space technology can only grow as fast as electronics lets them. Rocketeer Willy Ley thinks of electronics as the limiting factor.

Principal responsibilities for the industry are familiar ones:

Controls: servomechanisms for flight control; fuel controls; electromagnetic controls for ion propulsion and thermonuclear power plants.

Navigation (astrogation) and location: inertial sys-

tems, radar, and doppler systems, attitude controls, celestial navigation.

Instruments and computers: flights into space are going to need fast sensing of environment, probes into space ahead, fast processing of sensed data.

Communications and telemetry.

For the immediate future, rocket experts see a general reevaluation of all missile and rocket plans. Vanguard will undoubtedly better its own schedule, using either the Martin vehicle originally planned or Army's Jupiter C. Despite the Dec. 6 launching-pad mishap—to be expected in an experimental system—officials remain optimistic.

Air Force hasn't said yet whether the four-stage Farside rockets—one of which went up 1,400 miles, the other over 4,000—came down or not. Experts are betting they did, and without burning up. The reentry problem has apparently responded to the research poured into it during the last few years.

Vanguard and Farside provide two paths that will ultimately converge. One will put satellites up either to stay or to return. The other will send vehicles on one-way journeys. There're hot projects in both.

Willy Ley sees rocket shots to the moon as the next step, adds "it looks like something the Russians can do now." Air Force experts assert the Atlas engine could launch a payload in excess of 1,000 lb. clear of earth gravity. Army's Werner von Braun thinks an unmanned rocket to the moon will fly before 1962.

Goodyear Aircraft has a complete set of plans for large and medium-sized ferry rockets capable of orbiting, probing, or flying to the moon (cover).

Did USSR Shoot Moon?

THERE'S a chance that the Russians actually did try to launch a rocket to the moon on their fortieth anniversary date a month ago, and that it either fizzled or missed the target.

Russian scientist D. A. Chebotar, chief of the Soviet Academy of Science's moonflight project, released a statement in Leningrad on Nov. 7 which said that such flights are now possible. Stating that the necessary initial speed of 11 km (about 6½ miles) per second could "definitely be achieved," Chebotar added "the launching of the first Soviet *razvedchik* proves that a flight to the moon has ceased to be a phantasy."

Razvedchik is the Russian word for scout in the military sense: an advance party sent out to test the ground ahead. It would be the logical name to apply to an instrumented probe fired at the moon

The craft, dubbed Meteor, would fly with known fuels, could place a 1-ton payload in orbit 500 miles up, run ferry trips from earth to an orbit and back, or become the hub of a space platform.

The METEOR vehicle would contain about 1,200 lb of instrumentation and scientific equipment, carry either 3,400 lb of cargo or 15 passengers. Guidance systems would continuously sense position and velocity, select optimal path to destination. Radar, integrating accelerometers and doppler systems would be linked with earthbased tracking and computing machinery for three-way fix.

Pied Piper, the USAF reconnaissance satellite about which the Defense Department is still saying nothing, is one of many plans for little moons.

Pied Piper would map the globe from between 300 and 1,000 miles up (between one and two hours orbit time). Reports that Defense officials will neither confirm nor deny say that Eastman Kodak and CBS Laboratories are in on the project with prime contractor Lockheed Aircraft.

For mapping purposes, Pied Piper will probably not use direct tv transmission because of inadequate resolving power. Its camera will take pictures on extremely fine-grain film or on extra-high-resolution videotape. Film, if used, will be developed aloft, scanned, and the data relayed to earth.

For surveillance or for mapping cloud cover, a 1,000-line-or-better tv camera will go aloft. Infrared spotters and radio detection systems are also planned.

For communications purposes, the thing that makes a satellite attractive is its height. Communications engineers compare a relay satellite to a radio station with an enormously high antenna mast. At 22,500 miles up, it would move at the same speed as the earth's surface, thus remaining "tied" to one spot. This would eliminate doppler shift, obviate the necessity of tracking the satellite.

Manned satellites, with instruments controlled and augmented by the on-the-spot observer, will come later. At first, they will remain aloft for only a week or a month at a time. Permanent platforms for the launching of long-distance craft will follow.

With the art in its present state and interest mounting, it is safe to predict manned satellites by the early sixties, construction of a space platform during the sixties. Before then we should be seeing:

- a telescope satellite orbiting at upwards of 2,000 miles, peering at the moon, sun and stars without the masking haze of atmosphere.
- a tv-relay satellite orbiting at 22,500 miles, covering as much as a third of earth's surface. In the battle for men's minds, this may be a critical step.
- unmanned lab rockets to and around the moon, the latter either returning to land or orbiting around both earth and moon.

\$5 Million For Postal R&E

- Today 40% of annual research budget goes for electronic aids as Post Office seeks to update mail-handling process
- Prototype devices for automatic stamp-canceling, letter-sorting will be ready within one year

THE U. S. POST OFFICE DEPARTMENT, periodically scolded for 19th century mail-handling techniques in the pre-automation age, today is spending \$5 million a year for research and engineering—and 40 percent of the research budget goes for creating electronic aids.

Within 6 months, an automatic facing and stamp-canceling device will be ready—in prototype.

Within a year, the prototype of a machine for letter-sorting will be ready for testing. This is being developed by the Bureau of Standards in conjunction with private firms. Research companies are also deep in character-recognition studies, under

contracts with the Post Office Department.

“Within two years, automatic sorting machines will be in production,” predicts Clyde Gray, director of research and engineering for the PO department.

Basic, long-range goal is to get information on envelopes that electronic machines can “read.”

“The human noodle is hard to beat—and to duplicate,” says Gray.

The main requisite of automation is standardization.

Someday, letters will fit through sorting machines,



Transistorized Digital Computer Flies New Jets

Airborne digital computer that can fly USAF jet interceptors automatically from take-off to touchdown is shown at left installed in a F-102A interceptor. Built by Hughes, and already in production, the

Digitair, shown close up at right, makes 100 decisions a second, can be installed in a space normally taking no more room than a 21-in. table model television set

in and out of trucks and planes and into the carrier's bag—but not on a system-wide scale until envelope size and shape, addressing and stamp location are standardized, and a code pinpoints geographical area.

Stamp color systems are also being studied, along with other symbols that can feed data into the memory systems of electronic machines.

Confident that the U. S. public can be "sold" on standardization of mail when they realize it can make delivery 30 to 50 percent faster, the PO department is distributing to TV stations a film on latest equipment and plans for the future.

Two electronic devices are now in operation. A keyboard letter-sorting machine at the Silver Springs, Md., post office can accomplish 300 sortations.

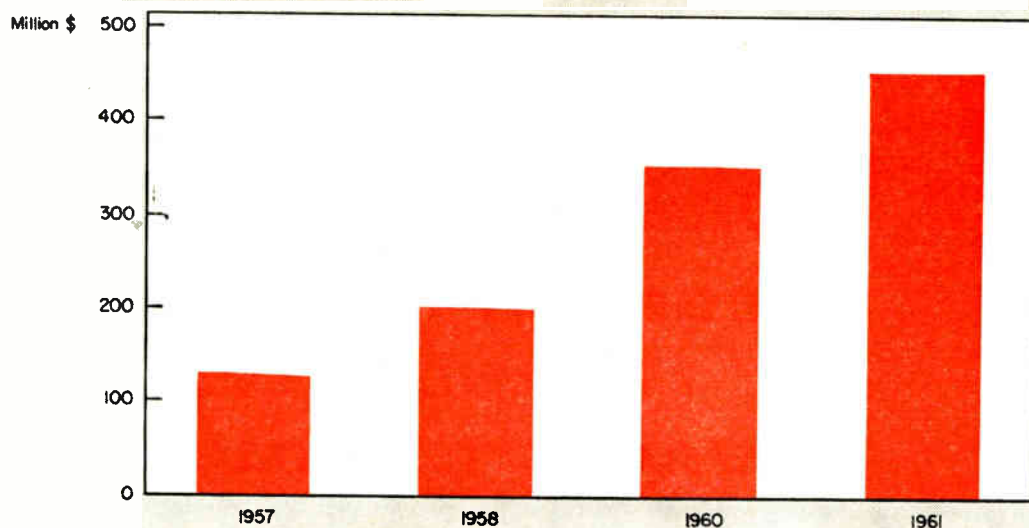
At the Parcel Post Annex in Baltimore, a sorting machine starts packages on their way. Like any other device in use or in prospect, it cannot read script. An operator reads the address and writes a code number on the parcel. Another clerk reads the code number and works a keyboard, which actuates an electronic "memory."

At the right spot on the conveyor line, the machine "remembers" and pushes the package down the proper chute.

One-third of the man-hours in postal work is consumed by sorting—a field which is a "natural" for electronics.

When electronics takes over, and clerks no longer have to pop letters into pigeonholes two or three times in the mail-handling process, it will mean faster service at less cost.

PRODUCTION and SALES



Semiconductor Sales Up 44%

SEMICONDUCTOR sales for 1957 will total more than \$125 million, predicts Joseph S. O'Flaherty, manager, semiconductor division, at Hughes Aircraft. Value of semiconductors sold last year was \$70 million, 56 percent of the sales estimate for this year.

O'Flaherty also sees semiconductor sales of \$200 million in 1958, about \$350 million in 1960 and \$450 million by 1961.

These predictions do not include the effect of any expansion of missile manufacture that may follow the Russian satellite launchings.

Chief factors spurring the rapid growth of semiconductor business, says O'Flaherty, are: new and improved products, production efficiencies, new applications, and price reductions.

Sales of transistors account for the biggest share of semiconductor revenue. Checking 1957 transistor sales and comparable 1956 sales supports the above statements.

For the first nine months of 1957 transistor sales totaled \$49.1 million, more than twice sales of \$23.2 million in the like period of 1956, reports the Electronics In-

dustries Association. Last September transistor sales were \$7.0 million, compared to sales of \$3.5 million in September 1956.

Transistor sales during the first nine months of the year totaled 18,843,300 units, compared with 8,113,000 units sold in 1956 through September. For September alone, 3,231,000 transistors were sold this year, compared with 1,115,000 transistors sold in 1956.

In one year the average price of transistors has declined almost one-third. It was \$3.00 in September 1956, \$2.02 this past September.

What's Ahead In Research?

Thanks to the Sputniks, U. S. research labs are getting a large shot of adrenalin. What areas will be explored in the field of electronics? In an exclusive survey by Electronics, leading scientists and research engineers reveal . . .

With government and industry digging deeper into research, the electronics industry now stands to gain in at least two ways: computers and instrumentation are needed for almost all research endeavors; also, advances in electronics per se will result.

Where will new electronics research begin?

Answers to this question from leading scientists and research engineers asked by *ELECTRONICS* indicate a wide variety of interests, more activity:

Lynn C. Holmes, Director of Research and Advanced Development, Stromberg-Carlson division of General Dynamics says: "Solid state physics. Research into the physics, chemistry and metallurgy of the solid state will certainly lead to important advances in such fields as cryogenics, magnetics, superconductivity, photo-conductivity, and others."

"Frequency spectrum. Through basic research we can obtain at least a 10-fold increase in the efficiency of our use of the spectrum, as well as a very significant extension of the spectrum beyond the frequencies presently used."

W. W. Bender, Vice President, Research Institute for Advanced Study, subsidiary of Glenn L. Martin: "Properties of materials. This will lead to whole new physical concepts and electronic systems which have not yet been imagined.

"Storage and readout methods used by the human brain. Basic work in this area in the past might already have made the most elaborate digital computers of today seem clumsy.

"Pure mathematics and nonlinear differential equations. Nature uses nonlinear systems far more effectively than do many electronic devices.

E. R. Piore, Director of Research, IBM: "Classical physics. There is limited interest and instruction in this field. Contemporary physics is focused on quantum phenomena. There is still much profitable speculation in the tradition of Rayleigh and Love. The Russians, on the other hand, are making progress in the classical physics field. Nonlinear oscillations and underwater sound should be studied.

"Contemporary electronics relies on mathematics, a hard science, and on some soft sciences: information theory, systems, and psychophysiology. These latter examples require more work to harden them

so they may have an impact on electronics as have the hard sciences."

Winston E. Kock, Chief Scientist, Bendix Aviation: "Far too little support is being given to basic applied research. Government-sponsored research is now top-heavy in the abstract theoretical fields."

This condition, according to Kock, is responsible for "the attitude of the average graduate physics student that he must do cosmic ray or related research instead of applied. Idea men are needed in industry as never before. If our young potential applied-science inventors continue to be forced into too highly theoretical research fields during their formative years, our technological supremacy will continue to be threatened."

Solution proposed: Sponsoring agencies should encourage and support more applied research.

Frederick E. Terman, Provost of the University and Dean of the School of Engineering, Stanford University: "Control systems and solid state electronics."

Robert M. Ashby, Chief Engineer, Autonetics division of North American: "Single Crystals."

A. V. Haeff, Vice President & Director, Research Laboratories, Hughes Aircraft cites a report made by a group of scientists under the leadership of William Everitt, Dean of Engineering, University of Illinois: "Electromagnetic radiation: coupling of energy to space, antennas; wave propagation; generation of electromagnetic energy; solid state; information theory; plasma, electron and ion dynamics; atomic and molecular resonance; surface phenomena; data processing; prime power sources; nuclear radiation effects on electronics; acoustics in air."

Elmer W. Engstrom, Senior Executive Vice President, RCA: "Improved thermionic emitters, luminescent phosphors and magnetic materials.

James R. Day, Vice President in charge of engineering, Radio Engineering Laboratories, subsidiary of Dynamics Corp. of America: "Coherent e-w radar and communications systems. Reluctance to relinquish non-coherent systems in long-range radar transmitters in favor of e-w, coherent systems has held back progress in radar range extension."



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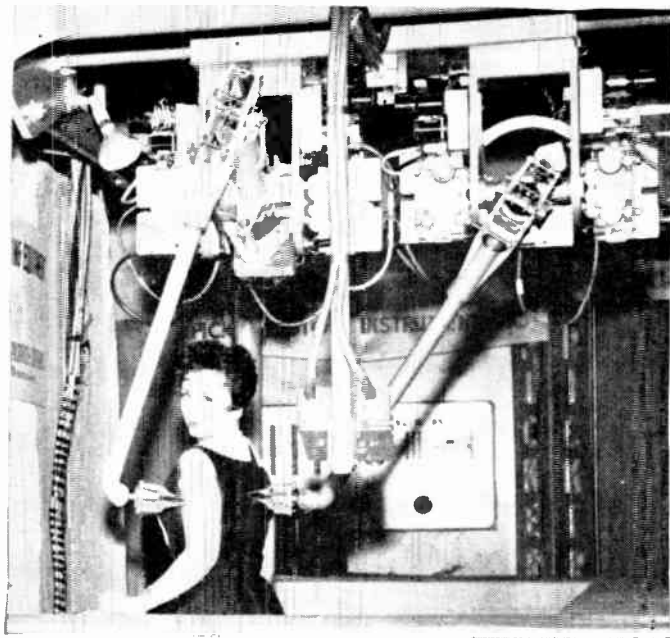


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One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS



Closing a zipper is easy with 3-D tv, and . . .

We're Gaining In Atomics

- But it will be a hard, long haul. Don't expect a miraculous buying spree, even though more money is on the way
- Atomfair and nuclear conferences attract 15,000 in New York. Twenty-five firms display electronic equipment at trade show

AS OF THIS week, electronics' future in atomics shapes up this way: it'll get brighter steadily, but don't expect spending of new millions overnight. The A-industry faces a long pull. An estimated 15,000 nuclear engineers, executives, salesmen and buyers attended the Atomic Industrial Forum's Atomfair '57 and a series of nuclear conferences in New York City last month.

The atmosphere wasn't carnival, but it wasn't gloomy either. Conference speakers emphasized the difficulty of making a dollar in atomic energy today while citing the advantages of providing diversified industrial services.

A speaker from H. K. Ferguson Company estimated the potential market for process steam reactors is 50 to 100 units a year. The reactors would have to provide steam at a cost of 65 cents per million Btu and have a capital cost of no more than \$2 million.

A reactor has been designed by Bell Aircraft with an estimated price of \$1,990,000 including \$180,000 for instrumentation and auxiliary equipment. This has been about the percentage for small research reactors and indicates electronics' stake in the success of the atomic industry.

The Forum, in its annual report, commented on the "sobering magnitude" of problems faced by atomics but said that these "should not discourage a struggling industry which has such favorable long-range prospects."

A new survey of future atomic spending was previewed. It is more favorable than a 1955 survey (ELECTRONICS, February 20, 1957), thanks to an atomic-minded Navy and prospects of a big foreign market (ELECTRONICS, October 20, 1957). The full survey will be published early next year by the Forum.

One of the more serious problems facing reactor makers is the lack of standardization. It is too early to freeze designs and each power reactor is a new experience, a gamble on construction costs. Almost invariably costs run far higher than expected and the contractor is caught short.

Several international organizations have started to tackle standardization problems. The first goals are mutually agreed-upon terminologies, safety provisions, instrumentation and control patterns.

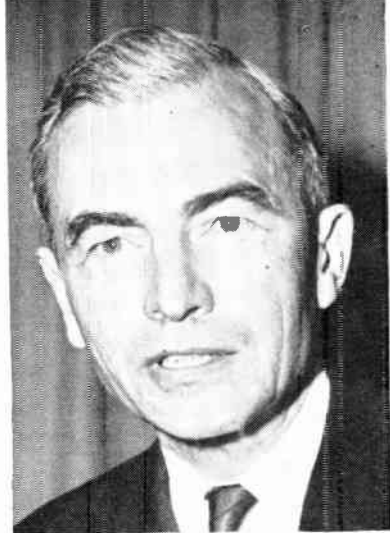
Not counting reactor makers, 25 firms displayed electronic equipment at the trade show.



HOLADAY: Minor Role?



KILLIAN: Ike's Advisor



QUARLES: 'Top Engineer'

. . . Engineers-in-government take key perches at technical summit talks in Paris this week. What it all means for electronics isn't yet clear. So our industry joins officials in wondering . . .

NATO: Sharing Electronics?

NATO TALKS this week in Paris are expected to spell more Allied scientific cooperation. Eventually, this might mean wider technical information exchanges between U.S. and European electronics firms.

But right now the political, legal and commercial problems to be solved in order to achieve the fullest technical cooperation are mountainous.

What form U.S. scientific cooperation will take will probably not be known until the ideas of our NATO friends have been heard and studied in Washington.

Meanwhile . . . in Bonn . . .

A PROGRAM quietly undertaken more than a year ago in West Germany has reached the point where scientists with leading electronic firms could be mobilized for a NATO military effort in 90 days, *ELECTRONICS* learned.

The United States Military Assistance Advisory Group (MAAG) has been working with West German officials. American authorities reportedly are now satisfied that the Germans could erect an adequate military security program within a few months.

Deputy Defense Secretary Donald A. Quarles was expected to spearhead "brass tacks" discussions relating to technical cooperation, *ELECTRONICS* learned before the summit conference got underway.

Quarles, former Western Electric and Bell Telephone Laboratories vice president, is believed to be facing European conferees as "America's No. 1 engineer." A group of engineers from the Defense Department was slated to act as Quarles' staff in Paris.

It was also likely at press time that James R. Killian, Jr., would go to Paris in his advisory role as Special Assistant to the President for Science and Technology.

About two weeks ago a classified report covering NATO scientific cooperation was circulated to NATO members. It was authored by Joseph B. Koepfli, who headed a special task force last summer for the North Atlantic Council in Paris.

Koepfli's report is expected to be part of the basis for summit talks on the technical level. He is a former science adviser to the State Department, now a special assistant to the president of the California Institute of Technology.

Preparatory policy talks relating to NATO technical cooperation went on largely without President Eisenhower's participation. They involved Secretary of State Dulles, Secretary of Defense McElroy and

the Atomic Energy Commission.

Guided Missiles Director William M. Holaday is believed so far to have played a "minor role" in the broad discussions about scientific cooperation. However, if a working plan develops, it is anticipated that Holaday may be drawn in more. This will probably depend on how rapidly basic agreements are reached, and how far they go in committing the U.S. in the weapons field.

One likely result of this week's talks at NATO's technical summit could be creation of a scientific committee to determine joint objectives and how to achieve them.

One probable objective which should not be too difficult to agree on: Systematic procurement by NATO of nations' technical journals, including those in electronics. Then a centralized translating service may make important papers available to Western scientists in the scientist's own language. This would counter the fast, thorough translating service Russia provides to her scientists.

First step for the U.S. to take at home, many observers agree, is to amend the Atomic Energy Law. This would open the door to exchanges of some information.

How much more than a "symbolic gesture of cooperation" this might be is a moot question. Administration officials do not say so publicly, but

the extent to which the U.S. will go, particularly in involving industry, may depend somewhat on what we learn at Paris about the thinking of cartel-minded European electronics industry.

Some basis for exchanges already exists, of course, under the Mutual Weapons Development Program, which provides for the rendering of technical assistance to NATO countries by either government or industry experts.

More important, perhaps, to industry are the two-way Presidential Agreements signed in the last two years with our allies. Commerce, State, Justice and Defense departments were all involved in drafting these agreements. So were industry trade associations, including the Electronics Industries Association (then RETMA).

The fundamental policy embodied in the agreements is this: Wherever possible information and rights should pass from manufacturer to manufacturer under a contract freely negotiated between the U.S. and foreign firms.

Big advantage of these Presidential Agreements is that they create an atmosphere of direct dealing favorable to both U.S. and foreign firms. Conceivably, the U.S. could strengthen NATO somewhat by encouraging more international commercial arrangements under these agreements.

TECHNICAL DIGEST

- **Powdered lead** is used by IBM for making superconducting connections to thin films of metal evaporated onto wires. One method involves inserting coated wire in end of AMP taper plug, filling cavity with lead, then crimping. Another uses 5,000 psi to compress lead powder in cavities of plastic block that serve as terminals for film-coated wire. Resulting contacts have remained superconducting at 3.67 deg K.

- **Nondestructive** sonic and ultrasonic testing of engineering materials is replacing conventional static destructive tests, particularly in British and other European laboratories. One instrument measures velocity of 100-ke vibrations in specimen between 3 in. and 10 ft. thick. Another uses 100 cps-10-ke xfo to vibrate specimen at its resonant frequency for check on quality control; pickup, ampli-

fier and meter detect resonance. Third method measures logarithmic decrement of vibrations by pulsing transducer at various frequencies until resonant mode is detected, then counting decaying vibration cycles with Dekatrons.

- **Undesirable magnetostriction** in transformer laminations is checked with GF setup using barium titanate phonograph pickup, in quality control procedure for reducing power transformer noise. Stylus was modified slightly to give signal of 1 millivolt per microinch, responding only to movement in one plane. Lamination sample up to 6 ft. long is placed in end-to-end array of 16 series-connected coils. Sample rests on oil film and is covered with brass weights to prevent spurious motion.

- **Flying-spot scanner** using single cathode-ray source with half-silvered mirrors to give two optical systems provides automatic detection of variable stars at University

of Groningen. Photographs of same region of sky, taken at different times, are similarly positioned in the two scanning beams and difference signal from two phototubes serves as picture signal for television display tube. Only stars which have changed in brightness are thus seen on screen.

- **One-transistor master clock** developed in Germany draws 0.85 watt-hour per year from single dry cell, so that battery life is shelf life and can be up to 5 years. Permanent-magnet gravity pendulum moves into coil at each end of swing, generating voltage in one of coils which is amplified by inter-connected transistor to increase swing of pendulum.

- **New aluminum-iron alloy** created at Ford Scientific Lab becomes less magnetic as temperature is lowered. This phenomenon, called antiferromagnetism, may provide clue to relationship between magnetism and rust.



MILITARY BUSINESS

Limited War Needs Cited

Here's latest advice to our industry: examine limited war tactics, then design weapons accordingly

"LIMITED WAR is the more normal and the more likely type of war I believe we will have to cope with."

Although the particular phrasology is that of Army's Chief of R&D, Lt. Gen. James M. Gavin, the statement expresses the theme of the American Ordnance Association's 39th Annual Meeting in New York a short while ago.

Initial premise that limited war is a likely prospect includes the factor that a total war capability must be sitting back home to back it up. Such a threat is the only assurance that a limited war will remain limited.

General requirements for limited war plus specific advice to the electronics industry were set forth at the all-day session by military, industry, and science leaders.

In general, the industry was urged to examine limited war tactics and design weapons accordingly.

Specific recommendations for tailoring our guided missile arsenal for limited war were made by C. C.

Furnas, Chancellor, University of Buffalo:

1) Reduce versatility of missile types, since each type requires special crews, components and test gear.

2) Spread the range of one missile type for more flexible operation.

3) Design for simplicity. GI's must operate under battle conditions.

4) Make realistic tests of guidance and control systems to determine susceptibility to jamming. "Thus far our R&D program has been evading the issue in this area," says Furnas.

E. R. Piore, Director R&D, IBM, urges research in such areas as visual spectra, short range navigation, small, highly specialized data processing, and geophysical environment throughout the world.

Hall L. Hibbard, Senior Vice-President, Lockheed, cites the need for a short range battlefield attack plane carrying radio communication, inertial navigation and infrared target detection equipment.

Robert Shatz, Head, Systems Research Dept., Cornell Aeronautical Lab, stressed the need for effective sensory devices for reconnaissance systems; new family of mobile, reliable and compact data-processing equipments; and new missile guidance and communication techniques.

MILITARY ELECTRONICS

• **Missile Master**, electronic air defense control system, went into action Dec. 5 at Fort Meade, Md. Next site will be New York City.

• **Three out of every four dollars** being spent by the DOD for hardware this year are going for aircraft and guided missiles, according to Aircraft Industries Assoc. Percentage Army spends for aircraft and missiles: 55.9; Navy, 51.9; and USAF, 87.1.

• **Two-way dial system for aircraft signaling**, communications, identification and traffic control is being developed by Electrical Communications, San Francisco.

• **Marines will get a new, portable, tactical early warning radar system (TEW)** that can detect enemy aircraft or missiles "at altitudes and distances in excess of any

presently existing or contemplated tactical system," according to prime contractor Sperry. The AN/MPS-21, unit will use an inflatable, dual wall, air-mattress-like radome designed by Birdair Structures.

Signals picked up by a rotating V-beam antenna are passed down to the radar control console in the radome. Signals are then fed to the combat interceptor control shelter nearby where range, azimuth and altitude information is presented on PPI's and counters. By using special molding techniques, Sperry's design engineers have superimposed search and height-finding radar paraboloidal-shaped dishes into a single antenna.

• **Bomarc launching site construction** is scheduled to begin by spring along NE coast. First 4 (30 proposed) will cost \$46 million.

CONTRACTS AWARDED

GE will sell preproduction models of AN/APS-81 radar for B-52's under \$250,000 AMC contract.

Hughes gets \$380,139 AMC contract for MG-12 fire control systems for the F-89J.

IT&T is awarded an amendment to a letter contract providing for 100 percent obligation of funds from AMC for tropo scatter communications system for Spain-Morocco.

Hughes will provide AMC with receivers, transmitters and other instruments for F-102A's under \$1,181,560 contract.

Eclipse-Pioneer division of Bendix will sell, under \$1,532,639 AMC contract, directional controls, panel

controls, amplifier, servos and gyroscopes for F-100 series aircraft and for the KC-135.

Hoffman Laboratories gets \$255,342 contract with AMC for 23 ASN-6 computers, amplifiers and related parts.

Aerophysics Development gets \$826,963 contract with Los Angeles Ordnance District for Dart antitank guided missiles.

Litton Industries wins \$244,058 contract with U.S. Naval Gun Factory, Washington, D. C., for transistorized amplifiers, servo assemblies, gear sector assemblies and other related equipment.

Federal Telecommunication Labs will provide Army Signal Supply Agency with components for an experimental model of a digital communications system under \$339,163 contract.

Phileo will furnish 68,800 man-hours of qualified civilian instructors for use in preparing instructional courses and programs to the Ordnance Guided Missile School under a \$306,160 contract with Redstone Arsenal.

Phileo gets \$423,292 contract with Rome AF Depot for IF/MIF test set and allied equipment for French microwave system.

D. S. Kennedy sells a 60-ft dish antenna, AT-797/IRC-39 and a type R-655 to Rome AF Depot for use in Polevault. Total contract is \$192,000.

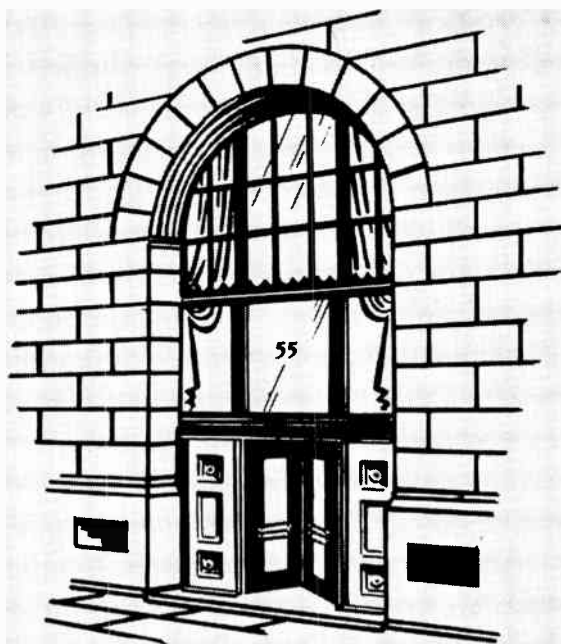
Gilfillan gets a \$1,746,829 contract with Rome AF Depot for modification of S-band radar equipment to provide for circular polarization of the antenna radiation pattern.

Lear sells to BuAer vertical gyro indicator systems under \$2,085,917 contract.

Lockheed gets two AMC contracts: \$1,000,000 for instrumentation and flight test program for F-104B, and \$222,383 for installation of controlled landing system in a T-33.

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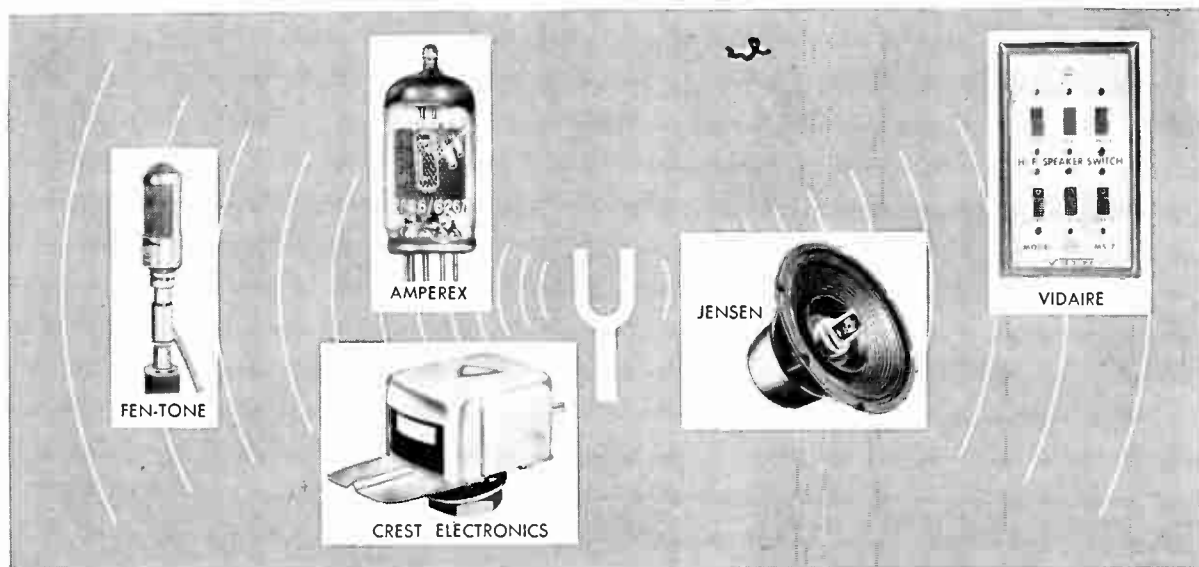
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Audio Equipment Leads List



New Hi-Fi, PA Parts Out

PICKING up, amplifying and reproducing sound accounts for a big piece of electronics business. Monaural and stereophonic tape-recording heads in record, playback, record-playback and erase models are available from **Crest Electronics** (41). Six-position speaker selectors announced by **Vidair Electronics** (42) for use with public address and intercom systems permit selection of any number or combination of six speakers while maintaining constant impedance.

Minimum hum, noise and microphonics are claimed by **Amperex** (43) for the 6F86/6267 miniature pentode for use in preamplifiers and input stages of audio equipment as a replacement for the Z729 and 5879. **Fen-tone** (44) announces the Trix Sixty Special, a miniature bidirectional ribbon velocity microphone for studio and public address system use. Nine loudspeakers added to **Jensen's** (45) line are priced substantially below existing models and have equal or better specifications.

Counters announced by **Landis & Gyr** (46) count backwards and forwards at 25 impulses per second and can be used independently as decades or as a multidigit counter. . . . Contacts developed by **H. H. Buggie, Inc.** (47) have high flexing strength said to eliminate possibility of damage to contact or printed-circuit boards during assembly or multiple insertion.

A volt-ohm-frequency meter of-

fered by **Lycoming** (48) for maintenance of aircraft electrical systems contains no tubes, is completely portable and has a frequency range from 350 to 420 cps. . . . The 6DW5 and 12DW5 miniature beam-power pentodes announced by **Sylvania** (49) are intended for application as vertical deflection amplifiers in 110-degree tv sets.

Sweep frequency generators announced by **Pacific Transducer** (50)

for testing audio equipment cover 80 to 20,000 cps 20 times per second with signal flat within 1 db over the range. . . . Neon indicator lamps are built into a series of relays offered by **Line Electric** (51) so that trouble can be spotted quickly. . . . Printed-circuit resist to cover the copper surface of a circuit board before the image is transferred from a negative to the copper is available from **Le Page's, Inc.** (52).

Shock machines by **Barry Controls** (53) are said to generate with repeated uniformity 100 g shock over the frequencies from 100 to 700 cps. . . . Double universal joints are available from **Falcon Machine** (54) for coupling synchros, resolvers, potentiometers, phase shifters. . . . Oil and dust tight console cabinets in a standard size are offered by **Hoffman Engineering** (55) for machine controls.

Associated Research (56) has redesigned their insulation tester to measure from one to 50,000 megohms. . . . Completely transistorized power supplies announced by **Power Sources** (57) furnish 250 volts at 1.5 amperes with less than 0.2 volt variation from minimum

For more information use READER SERVICE CARD

to full load or over a 10-volt line variation.

Field strength meters developed by **Blonder-Tongue** (58) cover frequencies from 54 to 216 mc and indicate signal strength from 10 microvolts to 3 volts. . . . Self-generating accelerometers announced by **Consolidated Electrodynamics** (59) to measure up to 1,000 g's operate by having acceleration force a polar liquid through a porous substance to create a potential across the substance.

Three kits, each containing six sample pulse transformers, are available from **ESC Corp.** (60) to aid the design engineer. . . . Redesigned versions of their PC-6 hermetically sealed relays in 4- and 6-pole types are announced by **Struthers-Dunn** (61) for general purpose and dry-circuit use.

Rotary switches offered by **Daven** (62) are completely hermetically sealed including around the shaft and are said to meet government specifications. . . . Amplifiers developed by **MB Mfg.** (63) for vibration systems are available in 7.5, 15 and 22.5-kva models. . . . Silicon solar cells are announced by **International Rectifier** (64) for use where conventional power sources are not available.

Wire-wound precision poten-

tiometers available from **B-II Electronics** (65) are 1/2 inch in diameter, weigh 0.1 ounce and handle 0.6 watt. . . . An expand-as-needed vidicon tv camera chain announced by **RCA** (66) as a foundation for a closed-circuit tv system or an addition to an operating system comprises a portable vidicon camera, control unit and viewing monitor.

Sundstrand-Denver (67) has developed a compact, light-weight, piston-type pump for use in aircraft to pump liquefied gases such as nitrogen and oxygen. . . . F-m broadband radio antennas are announced by **RCA** (68) for use in both standard and multiplex broadcast service. . . . Radiation monitors produced by **Nucleonic Corp. of America** (69) can be placed in doorways to check personnel for radioactivity.

Frequency meters that sweep between 3,600 and 5,600 mc and back in one second and provide a digital readout have been developed by **Narda** (70) for use in missile and aircraft radar systems. . . . Electrostatically focused travelling-wave amplifier tubes available from **RCA** (71) in sample quantities for use in airborne radar and countermeasures systems weigh 1/4 pound.

Multipurpose portable test sets offered by **Motorola** (72) for servicing two-way radios include a-c volt-

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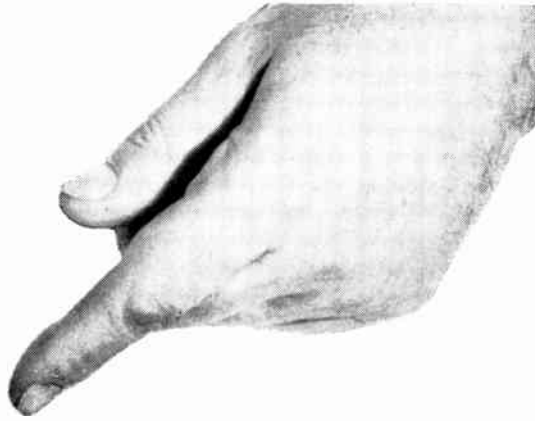
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meter, milliammeter, r-f power output indicator, signal generator and crystal checker. . . . Dissipation factor and dielectric constant of insulating materials are measured directly with the D-K Analyzer announced by Delsen (73) for laboratory or factory use.

Photoelectric controls developed by Autotron (74) can be switched to actuate in either light or dark. . . . Combined flight directors and attitude indicators by Lear (75) supply pilot with aircraft attitude and allow him to maneuver in reference to localizer, glide path, omnirange or command radio signals.

A 360-channel vhf transceiver announced by Dare (76) for any channel from 118 to 135.95 mc is said to meet the requirements of TSO C37 and C38. . . . Forces up to 20,000 lbs at frequencies to 60 cps are produced by a vibration system offered by L.A.B. Corp. (77) for making vibration tests.

Reeves Instrument (78) has designed double pinion differentials that can operate at speeds as high as 2,500 rpm with torque inputs of 32 ounce-inches. . . . Prodelin (79) extends their microwave transmission line assemblies to handle r-f energy from 1,700 to 9,000 mc. . . . Temperature measurements from — 200 to 600 F can be made with an instrument announced by Technique Associates (80) that also measures voltages from zero to 21 millivolts.

Shutter speeds as fast as 0.1 microsecond are obtained with an electronic modulator unit developed by Electro-Optical Instruments (81) for photographing electrical discharge processes, detonation phenomena, hyperballistic and acroballistic studies. . . . Choppers developed by Bristol (82) have center-tapped coils so that they can be used as a differential relay responding to a predetermined differential rather than ampereage value of either coil.

Zener diodes available from International Rectifier (83) are rated at 1 or 3.5 watts, 3.9 to 30 volts and operate in temperatures from — 55 to 150 C. . . . Ultrasonic test-

ing transducers produced by Branson Instruments (84) are said to have increased sensitivity, to be completely waterproof and to operate continuously at 250 F.

Ceramic boats and jiggling buttons for alloying indium and germanium for transistor production are available from Techion Design & Mfg. (85) in a new material said to be highly resistant to wear and to not contaminate components. . . . A subminiature afc unit announced by Lel, Inc. (86) for use in a 0.1-microsecond pulse system includes i-f amplifier, diode phantatron and internal control for manual tuning of the local oscillator.

Grid-circuit tube testers offered by Seco Mfg. (87) provide as many as eleven simultaneous checks on typical pentodes such as the 6AU6.

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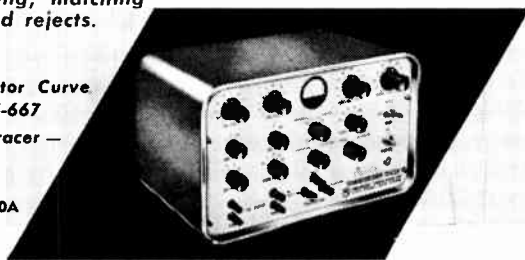
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- 45: Jensen Mfg., 6601 S. Laramie Ave., Chicago 38, Ill.
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- 62: Daven Co., Livingston, N. J.
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New Solid Rectifier

Controlled silicon rectifier is expected to find wide use as combined power relay switch and conversion device

News is now out that a controlled silicon rectifier has been made in GE's Rectifier Engineering Lab. It differs from others of its breed in that its current-passing ability can be controlled.

In converting alternating current to direct current, it not only chops off the bottom half of the sine wave, but will regulate how much of the top half of the sine wave gets through.

The new semiconductor device is still in laboratory development. Samples will not be ready for a few months and initial commercial production is not expected until the fall of 1958.

GE is playing it close to the vest on technical details at this time. It has been announced that the rectifier can switch a load of 200 volts at five amps, or one kilowatt, using only a 15 milliwatt signal on the control lead.

It is a three-terminal component, smaller in size than a typical power transistor. The rectifier will operate at a temperature of 150 C and may, in time, be able to operate at 200 C.

GE expects the silicon rectifier will be used in many circuits which now employ power transistors, thyatrons, latching relays and magnetic amplifiers.

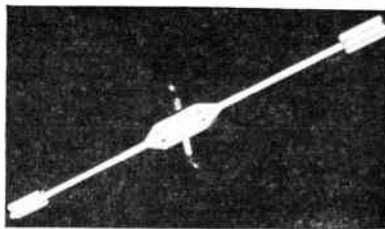
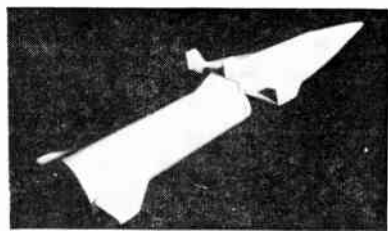
this respect than have we."

Elhricke, who is assistant to the technical director of Convair-Astronautics, told ARS members that his three-stage manned satellite supply ship (left photo) could be put into an orbit within five years. A four-man space station (right photo), built while in orbit by an unmanned 3-stage automatic supply ship, could be a reality two years after that.

Greatest fight on our hands today, Elhricke said, "is breaking the reliability barrier. A repair system must be designed into the craft to the extent that any failure can be repaired by the crew."

Next move after establishing the orbiting space platform is a manned lunar reconnaissance vehicle. It would be assembled in a satellite orbit from rocket tankage of the automatic supply ship, then launched from the orbit. The lunar vehicle would follow an elliptical path around the moon and then return to the satellite orbit around the earth.

Navigation system to be employed in interplanetary flight, according to Elhricke, is pure inertial checked by stellar orientation. Existing telemetry, he said, is adequate for a trip to Venus. Present tv, however, due to its large power requirements, will not prove usable.



Manned supply ship (left) could shuttle passengers to and from four-man space station (right)

Spacemen Reveal Plans

Now that the lid is officially off "outer space" (it stopped being a dirty word among Washington policy makers shortly after Sputnik II), the time it will take man to get there seems shorter by the day.

Import to the electronics industry of the imminent and now-sanctioned push to manned space flight is increased business, tighter reliability requirements and the need to improve, as well as design totally new, equipment.

Earlier this month at the Twelfth Annual Meeting of the American Rocket Society, the proposal was announced to set up an Astronautical Research and Development Agency (ARDA).

Objectives are to initiate a national space flight program under an agency having independent

status similar to AEC or NACA.

Although conceived before Sputnik I, the proposal was not sent to President Eisenhower until Oct. 17. Other agencies studying the program are the Defense Department, Scientific Advisory Committee, National Security Council and the Department of State.

Annual cost of such an agency, according to ARS president, Cdr. Robert C. Truax, would be about \$200 million.

Reason for the relatively low budget, ARS's Director, Krafft Elhricke, said, is that "we don't have to start from scratch. Many elements needed for space flight are already lying around the country in various arsenals. The Russians," he added, "seem to have organized their materiel more efficiently in

Electronic Toys Make Big Hit

A RADAR warning antenna rotates. Enemy targets appear on a recessed TV screen. The spotter signals positions. And the Radar Rocket Cannon hurls a winged missile at the target. Where's this? Today in Electronic Toyland 1957—five days before Christmas.

There's more: a U. S. Marine Electronic Walkie Talkie Field Set is in operation; "pom-pom," barks a Navy gun with 360-degree rotation and recoil action; and a Powerful Transistor Radio and Broadcast System is staffed by key communications personnel ready for immediate action.

Most of the devices use batteries, wires, electromagnets, although some have transistors and diodes. But it's all "electronics"—the magic name this year in Toyland.

Tv Translators On Upswing

Off-channel repeaters find growing market as tv stations in mountainous areas seek larger audiences

TV TRANSLATORS may become an important factor in the broadcast industry. ELECTRONICS made a spot survey last week of FCC activities, found thirteen applications by western broadcasters seeking audiences cut off from their stations by mountainous terrain.

Translators, which may be used in these situations, first appeared on the scene a scant six months ago. They cost about \$3,000, require one or more antennas costing \$250. Most installations receive vhf frequencies and rebroadcast in the ulf band. Translation avoids feedback interferences which would seriously impair home reception unless expensive shielding were used.

Critics deplore extra spectrum usage. Adler Electronics, which manufactures translators, counters that primary use (about 135 installations) is in areas not afflicted with spectrum crowding.

Interest in translators currently centers in mountainous regions where broadcasters seek bigger audiences. Salt Lake City stations KSL-TV, KUTV, and KTVI plan to reach viewers in Nevada and Wyoming. Power ratings given by the three applicants range from 42.4 to 107.1 watts. Other applicants include KFRE-TV, Fresno, Calif., KFDA-TV, Amarillo, Tex., KOA-TV, Denver, and KTCN-TV,

St. Paul, Minn. FCC has also received applications from stations in La Grande, Ore., Rock Springs, Wyo., Rawlins, Wyo., and Battle Mountain, Nev.

GE and RCA are keeping a "watchful eye" on translators, but have no immediate plans to enter the market.

First translator went into operation this summer for WWLP, Springfield, Mass., to extend coverage into the New England hills. Broadcasts are picked up by satellite station WRLP in Greenfield, Mass., and relayed by cable 1½ miles to Claremont, N. H. A ten-watt translator then rebroadcasts the signal on channel 79, picking up an additional 18,000 potential viewers for WWLP.

"We hit just the valley where the people are," says William Putnam, WWLP president. "In Claremont we reach 18,000 people for \$5,000." He recommends translators to other broadcasters who are in mountainous regions and want to reach population pockets in small areas. His station has one more translator grant, plans on three more.

In Pennsylvania six translators will be used in Palmerton, three in North Warren. One is slated for operation in Olean, N. Y.

Some stations have balked at permitting rebroadcasts of local programming. Station personnel have in some cases sought pay boosts where union contracts equate rebroadcasting with network operations. The networks themselves look favorably at translators. NBC gives the off-channel repeaters no-charge, no-fee affiliate contracts.

FCC ACTIONS

- Issues initial favorable decision on application of Gold Coast Broadcasting, Pompano Beach, Fla., for new a-m station to operate on 1470 kc.

- Invites comments on proposal by WKRG-TV, Mobile, Ala., to assign Channel 13 to Panama City, Fla.

- Amends report form M for class A and B telephone companies to permit use with simplified accounting apparatus.

- Grants application by Midland Asphalt Corp., Tonawanda, N. Y. for base station—30 mobile

units in industrialized service; waives rules to permit location in metropolitan Buffalo.

- Approves tv translator CP for UHF-TV-for-Gallup Association, Gallup, N. Mex., channel 70. Installation will translate KOB-TV, Albuquerque programs.

- Permits construction of new remote pickup stations by: Merchants Broadcasters Inc., Baton Rouge, La.; Valley Broadcasting Co., Pomona, Calif.; Penn Engineering Co., Bozeman, Mont.; Wichita Television Corp., Wichita, Kans.; and Palestine Broadcasting Corp., Palestine, Tex.

STATION MOVES and PLANS

KBCH, Oceanlake, Ore., seeks CP change to 1380 kc, power increase from 250 watts to one kw, unlimited daytime operation.

WOTW, Nashua, N. H., becomes property of Puritan Network for "in the neighborhood of \$250,000."

WKST, New Castle, Pa., gets extension of completion date.

WVEC-TV, Hampton, Va., plans move to Norfolk, and changes in antenna system and height.

KIN-678, Lexington, Ky., gets

11-pin plug in

Hermetically sealed

solder hook bolt down

Instrument Type Magnetic Amplifier

Output is linear from -7.5 to $+7.5$ DC volts with gain stable within ± 2 db over environmental and operating conditions. Two input windings are fully isolated from each other and the output. Null error is below 2 parts in 10,000 of full power output.

Power Requirements: 115 ± 11 volts at 400 ± 40 CPS

Applications: Guidance systems and analog controls

Temperature: -55 C to $+85$ C

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license for remote pickup station.

WCBF-TV, Rochester, N. Y., petitions for channel 13 to be allocated to Rochester.

WHLS, Port Huron, Mich., gets permission to operate main transmitter by remote control.

KAIR, Tucson, Ariz., applies for voluntary assignment of CP to Josh Higgins Radio Enterprises.

WINR-TV, Binghamton, N. Y., obtains approval for change in antenna type and minor equipment.

WAAT, Newark, N. J., requests control transfer to National Telefilm Associates Inc.

KSJO-FM, San Jose, Calif., changes from 95.3 to 92.3 mc, and from Class A to Class B.

KIV-36, 37, Bristol, Va., gets licenses for tv intercity relay stations.

KRE-FM, Berkeley, Calif., files for lower crp (9.7 kw) on pending CP.

WFEA, Manchester, N. H., control passes from F. E. Rahall to stockholders.

XFGM, Tijuana, Mexico, and KALI, Pasadena, Calif., conclude merger and schedule cross-border operations.

WHFI-FM, Newark, N. J., sells out to Du Mont, which plans to move station to New York City.

WQXT-FM, Palm Beach, Calif., asks for multiplex operation permit.

KART, Jerome, Idaho, license goes from K. L. Metzberg and H. E. Everitt to F. M. Parry.

WFOY, St. Augustine, Fla., asks permission to derive operating power figure by direct antenna measurements.

WHDI-TV, Channel 5, begins operations. Owned by Herald-Traveler newspapers, new station gives Boston 3 commercial tv outlets.

Japan Tries Infrared Tv

Image converter allows televising in darkness. Another infrared device aids ophthalmic diagnosis

JAPANESE scientists reported this week that they have perfected a system which allows televising in complete darkness under infrared illumination.

The "noctovision" system, developed by the Broadcasting Corporation of Japan (NHK) and Nippon Electric, is one of the infrared advances turned up in a check of Japanese firms by ELECTRONICS.

NHK says it tried out noctovision successfully on a recent program. Special infrared attachment consists of an image converter sensitive to the i-r spectrum. Output from the converter feeds a photomultiplier. The attachment replaces one of the objective lenses of the standard tv camera.

In noctovision scenes are illuminated by standard lighting equipment masked by infrared filters to screen out visible light.

One infrared application in the medical field

shows particular promise. This is a device for aiding ophthalmic diagnosis. The pupil of an eye usually closes according to the amount of incident light. In ophthalmic diagnosis the pupil sometimes must remain wide open.

Experiments of Nippon Electric and Keio University Hospital indicate that in complete visible darkness under infrared illumination, it is easy for the pupil to do this.

Nippon Electric has also demonstrated the use of noctovision equipment with a telephoto lens as an aeronautical or navigational safety device. Demonstration used two i-r searchlights, one 1-kw and one 420-w.

Viewers saw clearly through the device a gas tank about three-fourths of a mile from shore that could not be seen with the naked eye. The test was run by the Japanese Maritime Safety Board.

Japanese scientists are also pushing development of infrared pyrometers. They cite vacuum tube manufacture as one promising area of application. In viewing "hot bodies" below incandescence, no external illumination is required.

DEVELOPMENTS ABROAD

• Britain's Wayne Kerr Laboratories reports a new instrument to combat jet fuel icing, a moisture monitor that automatically switches on tank de-icing equipment. Monitor uses a dipping electrode and a small secret measuring device. It detects 0.0005 percent of water, or five parts of water in one million parts of fuel. Prototype will soon be demonstrated.

• Soviet Institute for Chemical Physics in Moscow, a part of the Academy of Sciences, has reportedly developed a registering camera with a capacity of 2.5 million photos per second. A movable mirror receives the picture of the process being photographed and reflects it with high speed over the film. Camera is suited for photos of explosions, spark discharges and fast-operating processes.

• In Australia the Commonwealth Scientific and Industrial

Research Organization's Division of Radiophysics is making development progress on a transistorized airborne DME (Distance Measuring Equipment). DME is a fully automatic radar transponder system which gives the pilot a continuous indication of distance to a selected ground beacon. Unit has 206 mc pulse transmitter, 224 mc receiver. Automatic ranging unit measures time delay between outgoing interrogation pulses and the incoming beacon reply pulses, which are converted to distance on the pilot's indicator. Operating temperature range is -40° to $+55^{\circ}$ C. Weight: about 14 lbs. Dimensions: 20 x 5 x 8 in. Consumption: about 50 w.

• In Munich Siemens and Halske offers gram-quantities or rods of germanium said to be purified by a new method, with specific resistance of 0.5, 5, 30 and 50 ohms.

EXPORTS and IMPORTS

In London Marconi's Wireless Telegraph Co. announces an agreement with RCA by which the U. S. company will acquire technical information on doppler navigation equipment for use in RCA-designed equipment for airlines. Marconi has been producing doppler gear for the RAF for three years and announced civil aircraft doppler gear last June. British firm says fully-engineered prototypes are now under flight test, and that airlines should get equipment for evaluation early in 1958.

British Radio Corp. has been set up jointly by Electrical & Musical Industries and Thorn Electrical Industries. Aim of the new company: to become Britain's largest radio and tv manufacturer. Thorn factories at Enfield and Spennymoor will be used. Sets reportedly will be marketed by competing companies under the trademarks of



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"His Master's Voice," "Marconiphone," and "Ferguson," but common manufacturing facilities will be used wherever practical.

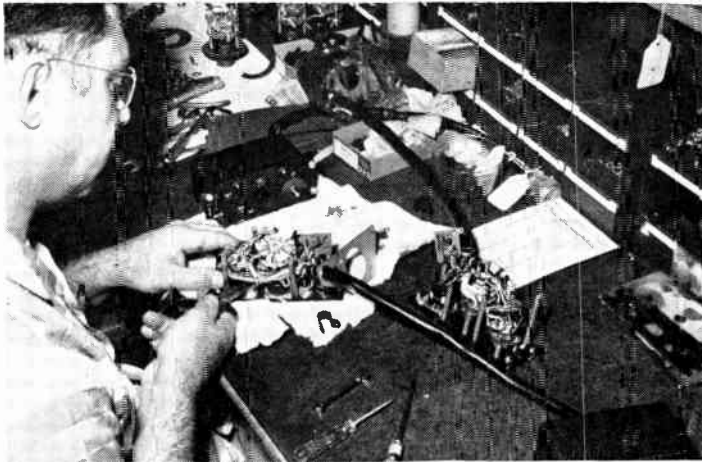
In Australia the W. A. Sheaffer Pen Co. (Australia) will manufacture electronic equipment now made in Minneapolis by Maico Inc. This follows Sheaffer's acquisition of Maico. It is understood production will begin late in 1958 or early 1959 at new facilities to be set up. It is believed this will permit marketing in countries where currency restrictions and freight differences make U. S. exports unattractive.

In London the British Tabulating Machine Co. will manufacture and sell throughout the British Commonwealth the Shepard Electronic High Speed Typer under an agreement just signed with Shepard Laboratories, Inc., of Summit, N. J. Machine can print 900 lines a minute 120 or more columns wide, and can make six or more carbon copies simultaneously.

In Mexico three leading tv stations will soon boost their power efficiency with 25 kw Standard Electronics amplifiers. They are Paso de Cortez stations Telesistema Mexicana and Television Pase de Cortez, and the Guanajuato station, Televisora de Guanajuato. Sale was negotiated for Standard Electronics, a Dynamics Corporation of America subsidiary, by CBS International.

Norwegian Telegraph Service has installed four 120-ft galvanized steel radio masts for its meteorological and coast service station at Isfjord, well inside the Arctic Circle. Masts were designed and supplied by British Insulated Callender's Construction Co.

American electronics manufacturers will exhibit in Hamburg, West Germany, Oct. 3-12, 1958, at the "1958 American Industrial Exposition of Electronics, Automation and Atomic." The all-American show will cover 200,000 sq ft and is sponsored by a group of Los Angeles businessmen in cooperation with the City of Hamburg.



Christmas Story

CHRISTMAS spirit in the electronics business is perhaps most evident in operations of the Federation of the Handicapped.

In the Federation's two-story electronics division shop on New York's 14th Street, 150 skilled assembly workers prove that a physical handicap doesn't have to be the end of the line. For some, it's a new beginning. It's a basic premise in this shop that a man in a wheelchair (picture) can be just as productive as one standing on two feet, and frequently more so.

Spirit of giving is a three-way proposition for the division. Not only does the Federation help disabled people to develop and use skills, but the people help themselves by working at industry scale wages in a useful occupation. Finally, profits from the agency's subcontracts are plowed back into the further rehabilitation work.

Chief engineer Mark Bura is the driving force behind the Federation's work. Bura carries his own handicap—the loss of a leg—so well that few people even notice it. The chief characteristic of his work is its levelheadedness—he denies sympathy and the more fuzzy-minded approaches to charity. He insists on a businessman's approach.

"Our people are skilled," he'll tell you, "before they start doing work at the benches. We can afford to keep them in training for months, where industry'd have to chalk them off after six weeks or so."

Most of the agency's electronics work is done on subcontract from Bendix Aviation's Eclipse-Pioneer division. Bendix went out of its way to help the Federation only at the beginning, five years ago.

When Bura first got started on his project, he could offer only bare floors and a source of manpower. Bendix lent equipment and raw materials, gave production knowhow and advice. It took only 60 days for the plant to go into production.

Bendix pays the Federation what it would pay any other subcontractor. The agency maintains wage rates and bonus compensation plans equivalent to industry averages. Products are subject to same tests and quality inspections as any precision work—USAF even maintains a resident inspector on the premises. "We wouldn't have it any other way," says Bura. "You can't run a business on just heart."

Bendix keeps two shifts at work producing phase detectors for automatic flight controls, stator assemblies for synchro motors, and compass levelling controls. Employment runs about 150 people, and some 75 to 100 are trained annually.

Bendix regards the agency's work as "very satisfactory," notes that rejections run a low 1.2 percent. Profits from electronics make up about two thirds of the Federation's million-dollar annual budget.

Some graduates from the division's production lines have located

successfully in outside jobs. "They're our best advertisement," says executive director Milton Cohen. "We put one man over at Kearfott, for instance. He did so well that they were happy to take several more Federation-trained men."

Schools Seeking Psych Measure

Two colleges are looking for more accurate measures for the abilities of man. The search is being conducted with the help of electronic computers given both schools by National Cash Register Corp.

One of the schools is Antioch College in Yellow Springs, O., near NCR's Akron headquarters. The other is the University of Southern California, near the firm's electronics division in Hawthorne, Calif. NCR draws on both schools for research and researchers.

The two machines were part of the inventory of computers National Cash found on its hands when it bought Computer Research Corp. They are magnetic-drum machines of the scientific type, with magnetic-tape auxiliary storage and paper-tape input and output gear.

Besides work in engineering and the physical sciences, USC will put its new acquisition to work on a project sponsored by the Office of Naval Research. This project, di-

BUSINESS MEETINGS

Jan. 6-8: Symposium on reliability and quality control, Hotel Statler, Washington, D. C.

Jan. 13-15: American Management Association Conference on product planning and R&D programs, Roosevelt Hotel, N. Y.

Jan. 22-24: National Conference on Automation Systems (EIA), Arizona State College at Tempe, Ariz.

EMPLOYMENT OPPORTUNITIES

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rected by USC's professor of psychology J. Paul Guilford, aims to evolve a full theory about "the intellectual processes of man, with special emphasis on creativity." Guilford has found 45 factors of intellect which can be measured, will use the NCR gift to find correlations, analyze test scores.

Antioch, a small liberal arts college, will use its computer "to enhance teaching and research activities." Two of its already-simmering jobs—one for Wright Field's Anthropometric Project and another for Antioch's testing office—echo the work that will be done at USC.



RCA Predicts Hi-fi Boom

PREDICTIONS that next year the sales of electronic gear for home entertainment purposes will go over the billion-dollar level were made recently at the dedication of RCA's big hi-fi manufacturing center (picture) in Cambridge, O.

James M. Toney, v-p and general manager of RCA's Victor Radio and Victrola division, said "by 1958 the fantastic growth of high fidelity will have helped boost the home-music industry's sales by 200 percent over a period of five years." He indicated that hi-fi instrument sales alone will top \$300 million this year, rack up about \$407 million next year.

Included in his billion-dollar package are records, prerecorded tapes, standard phonograph instruments and tape recorders. Toney's estimated \$1.067-billion grand total is almost three times 1953's aggregate total of \$365 million.

RCA's new plant has almost tripled in size during 1957. It now contains 355,000 sq ft of working space with 15 assembly lines. The big plant produces all the firm's hi-fi and stereophonic systems, plus

the standard phonograph lines and tape recorders. Assembly lines can turn out 12 hi-fi phonographs or 20 standard instruments a minute. Employment has grown with the expansion of the plant from 600 in 1953 to present level of 2,000.

Executive Moves

PLANT manager Russell M. Alston of Conrad, Inc., Glendora, Calif., becomes vice president for manufacturing.

Donald Hamilton Jr. moves up to become president of the Audograph Co., sales subsidiary of Gray Mfg. Co.

William A. Kerr moves from Tracerlab's nuclear division, where he was v-p and general manager, to become general sales manager of Baldwin-Lima-Hamilton's electronics division.

Barrett-Cravens Co. moves chief engineer and sales director Henry C. Fernstrom up to a vice presidency.

Reps Expand, Sink Roots

RUNNING directly counter to bearish sentiment, some manufacturers' representatives are spreading out into larger quarters. The number of reps moving into their own buildings—said to number only 5 in 1956—is also on the upswing.

In upstate New York, J. D. Ryerson Associates is settling into its own new quarters in DeWitt, near Syracuse. Ryerson will serve industrial users of instrumentation products from his 8,500-sq ft headquarters.

Albuquerque, N. M., rep Gene French opens a new branch office in Denver. Duane Frye moves in from a production manager's job at Stanley Aviation to run the shop.

Menlo Park, Calif., rep firm Nickerson & Rudat disappears from the scene, acquired by partnership Nickerson-Gray & Asso-

ciates. New partner R. M. Gray was formerly general sales manager of Rauland-Borg Corp.

New rep firm in Norristown, Pa.: S & S Associates, serving manufacturers of nuclear and scientific equipment with lab instruments and controls.

In Cleveland, O., M. P. Odell takes on the servo components of Perkin-Elmer Corp.'s Vernistat division.

San Francisco rep Jack Logan now handles intercom systems of J. M. Loge Sound Engineers.

Two new reps take on the electron tube and microwave lines of Central Electronic Mfrs., Denville, N. J. Midwest Sales, Cleveland, O., will cover Michigan, Ohio, West Virginia and Kentucky. Dallas rep William C. Aaker serves Texas and the Delta states.

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Coming in Our Jan. 3 Engineering Edition . . .

- **Cutting Costs.** The design of a transistor reflex circuit which trims receiver costs is presented by Erich Gottlieb of General Electric. Four transistors in a portable radio do the work of five as the second i-f stage doubles as an audio amplifier. Directly coupling an npn reflex stage to a pnp output amplifier obtains further savings by eliminating one transistor, five resistors and one electrolytic capacitor. Four flashlight dry cells supply the necessary power.

- **Tummy Telemetry.** A pill-sized radio sounding device which can be swallowed and passed through the gastrointestinal tract generates 400-ke signals from within the digestive tract. According to its designers, Messrs. MacKay and Jacobson of Karolinska Institute, the tiny radio transmits internal temperature and pressure information. A powdered iron-core slug is the pressure sensor, while the transistor base-collector resistance is the temperature sensor. The receiver uses non-linear capacitors to sweep the frequency band.



Engineer checks 4-transistor reflex receiver for distortion

- **Tape-Controlled Crane.** Eight preset frequencies or tones activate selector relays which operate crane motor contactor equipment. Sequence of preselected operations recorded on magnetic tape is repeated to an overhead traveling crane during playback. For a complicated sequence of movements the tapes can be prepared by a computer. Positioning accuracies of better than $\frac{1}{4}$ in. can be expected, says G. W. Sadler of Vaughan Crane in England.

- **Creating Characters.** An analog device developed at Lincoln Lab of MIT displays alphabetic or numeric characters on the face of a cathode-ray tube by deflecting the electron beam to trace out each desired character smoothly and continuously. The necessary horizontal and vertical deflection voltages for the scope are obtained by a Fourier synthesis technique that authors Perry and Aho say involves combining sine and cosine terms of the first five harmonics of a 30-ke fundamental frequency. Each character is traced in about 30 microseconds. Transistorized gated oscillators, flip-flop serial counters and emitter followers feed ten toroidal transformers having one set of secondary windings for each character desired.

- **Control Modulators.** A survey of low-frequency modulation systems used in amplification of d-c signals and equalization of a-c signals to give control system desired performance characteristics has been done by L. S. Klivans of Radioplane. Typical applications are described.

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TUBES



- **POWER TYPES** ... lightweight, compact, need no solenoid power
- **LOW-NOISE TYPES** ... increase receiver sensitivity, eliminate crystal "burnout"

POWER TYPES...Featuring *integral periodic-permanent-magnet* focusing systems, RCA's new power traveling-wave tubes eliminate the need for external solenoid power—make possible dramatic advances in physical compactness and weight reduction. Described here are three typical RCA power traveling-wave types designed as a tube complement for light-weight compact airborne systems. RCA Dev. No. A-1101...only 2½ inches in diameter and short enough to mount in a standard aircraft ATR-box, this remarkable tube weighs only 12 pounds including the permanent-magnet focusing system! Designed to operate at altitudes up to 70,000 feet, the A-1101 delivers about 100 watts at 10% duty factor over the range from 2000 to 4000 Mc. RCA Dev. No. A-1063...complete with permanent-magnet focusing system, the A-1063 weighs only 3½ pounds...is less than 1½ inches in diameter! "Plug-in" construction simplifies field maintenance. Power output is 10 watts from 2000 to 4000 Mc. RCA Dev. No. A-1113...weighing less than 1½ pounds, the A-1113 complete with permanent-magnet focusing system measures less than 14 inches long! Suitable as a low-level driver, the A-1113 delivers 100 milliwatts of cw output from 2000 to 4000 Mc.

LOW-NOISE TYPES...RCA low-noise traveling-wave tubes enable the practical design of rf-amplifier and if-amplifier stages for

microwave receivers featuring high signal-to-noise ratio and increased sensitivity. Crystal "burnouts" caused by TR-tube leakage are eliminated by the isolation afforded by the stage. These tubes find ready applications in radar receiver countermeasure systems, and wide-band microwave relay equipments. Here are some typical types:

	Frequency Range—Mc	Noise Figure—db	Gain—
RCA Dev. No. A-1056	1100 to 1400	7.0	25
RCA Dev. No. A-1105	2000 to 2500	7.0	25
RCA-6861	2700 to 3500	6.5	25
RCA Dev. No. A-1079	2500 to 4000	7.0	20
RCA Dev. No. A-1088	3500 to 4000	6.5	20
RCA Dev. No. A-1106	5900 to 7400	7.0	25

MICROWAVE DESIGNERS REFERENCE BOOKLET

"RCA Magnetrons and Traveling-Wave Tubes," MT-301... Contains information on operational theory of magnetrons and traveling-wave tubes, general operating considerations and applications, and techniques for measurement of electrical parameters. For your free copy, send request on your company letterhead to: RCA, Commercial Engineering, Sec. L-19-0-3, Harrison, N. J.

For details on RCA Traveling-Wave Tubes call your RCA Field Representative.

Equipment Sales:

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Suite 1181, Merchandise Mart Plaza, Chicago 54, Ill., WHitehall 4-2900
6355 E. Washington Boulevard, Los Angeles 22, Calif., RA 3-8361

Government Sales:

415 S. 5th St., Harrison, N. J., HU 5-3
224 N. Wilkinson Street, Dayton, Ohio, BAldwin 6-2366
1625 "K" St., N. W., Washington, D. C. District 7-1260



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Electron Tube Division Harrison, N. J.