

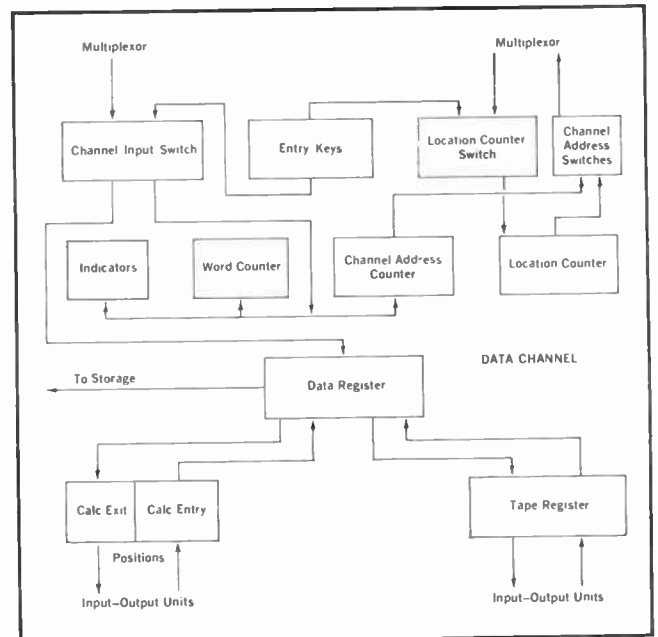
IBM asks basic questions in machine organization

How efficiently can we use computers?

```

00067 0 76000 0 00066      COM
00070 0 36100 0 02000      ACL COMMON
00071 0 76000 0 00006      COM
00072 -0 53400 4 00106      LXD WTAPE+70,4
00073 -0 10000 0 00077      TNZ WTAPF+63
00074 -0 76000 0 00012      RTT
00075 0 00000 0 00077      WTR WTAPF+63
00076 0 02000 4 00004      *RA 4,4
00077 -0 53400 4 00106      LXD WTAPE+70,4
TD 00100 3 00000 0 00105      TXH WTAPE+60
00101 0 50700 0 00100      CLS WTAPF+64
00102 0 76400 0 00302      RST *
00103 0 76200 0 00323      RTB *
00104 0 02000 0 00040      TRA WTAPE+32
00105 0 02000 4 00003      TRA 3,4
00106 0 00000 0 00001      HTR 1
00107 -0 50000 0 00100      CTAPE CAL WTAPF+64
00110 0 02000 0 00102      TRA WTAPE+66
                                02000 COMMON SYN 1024
                                00000 END
A
OSHAIRE ASSEMBLER STATISTICS
OTAPE TOTAL      1 FAIL      2 FAIL      3 FAIL      4 FAIL
INP      81      0          0          0          0
LIB       0      0          0          0          0
COL      81      0          0          0          0
NUMBER OF ON-LINE INPUT RECORDS      0
NUMBER OF OFF-LINE PRINT RECORDS      89
NUMBER OF SYMBOLS+ DEF      4+DEFOP      0+UNDEF      0
    
```

This type of written input-output program is relatively time-consuming and costly to prepare, particularly when input-output routines are used repeatedly.



Input of routine data with a unit such as this IBM 7090 data channel reduces program writing, speeds up processing, and cuts the cost per answer.

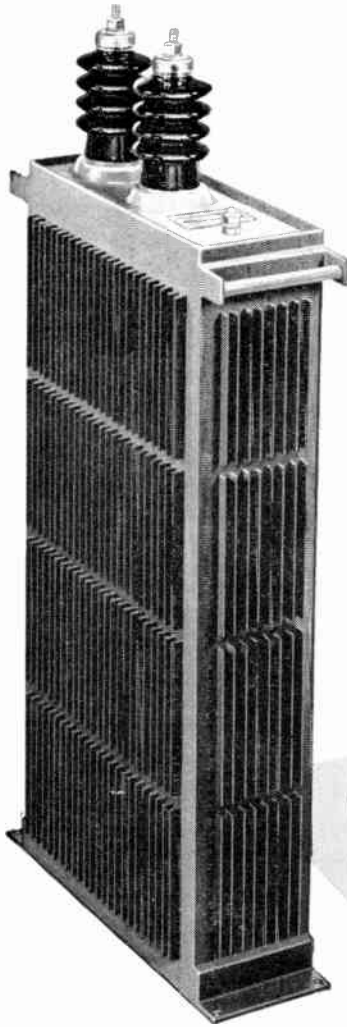
In an effort to increase efficiency, more and more instructions have been built into computers in the form of circuitry. This means fewer written programs are necessary. However, built-in computer instructions that facilitate the solution of a particular type of problem may limit the computer's capacity to handle a variety of problems. Because of this, IBM is studying new ways of organizing data processing systems. The goal is to improve the speed and proficiency of specialized problem solving without sacrificing the flexibility of general-purpose machines.

Computer architects at IBM are attempting to achieve the most efficient relationship of built-in instructions and programming systems to the range of problems to be solved. They are transferring many input-output and programming operations to built-in circuitry. One example is the IBM 7090 data channel shown above. In addition, they are developing common languages which make it possible to use the same program on different machines. At the same time, they are working to increase over-all speed by

developing time-sharing and concurrency techniques that make greater use of the entire system. For example, IBM programmers have developed a method by which a large computer can handle a number of problems at once, thus reducing the cost per answer. This involves a supervisory program that monitors the execution of the multiple tasks assigned to the central processor. In addition to these multiple problem-solving techniques, an experimental system permits the computer to handle several different programs simultaneously. From developments such as these will come the advanced architectural techniques necessary for a new generation of computers.

If you have been searching for an opportunity to make important contributions in machine organization, optics, solid-state physics, or any of the other fields in which IBM scientists and engineers are finding answers to basic questions, please contact us. IBM is an Equal Opportunity Employer. Write to: Manager of Professional Employment, IBM Corporation, Dept. 645Z, 590 Madison Ave., N. Y. 22, N. Y.

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For application engineering assistance, or additional information, write to Pulse Network Section, Sprague Electric Company, 235 Marshall Street, North Adams, Massachusetts.

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MAGNETIC COMPONENTS
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CERAMIC-BASE PRINTED NETWORKS
HIGH TEMPERATURE MAGNET WIRE

45PN-475



Professional Group Meetings

(Continued from page 64A)

Long Island—September 18

"A New Technique for Multimode Power Measurements," Jesse J. Taub, Airborne Instrument Laboratory, Deer Park, N. Y.

Orlando—September 19

"Trends in Ground Antennas for Space Applications," Laverne E. Williams, Radiation, Inc., Melbourne, Fla.

MILITARY ELECTRONICS

Long Island—May 15

"Panel Discussion on Military Proposals," R. Sellers, Moderator; John T. Kennedy, Theodore M. Everett, J. L. Leskinen, J. Vogelman, USASDL, N. Y. Ordnance District, NATDC, Capehart Corp.

Los Angeles—September 20

"Versatile Automatic Checkout Equipment," J. A. Hogg, Hughes Aircraft Company, Culver City, Calif.

"Versatile Automatic Checkout Equipment," R. Leuschner, Hughes Aircraft Company, Culver City, Calif.

NUCLEAR SCIENCE

Albuquerque-Los Alamos—August 15

Picnic and Introduction of the New Officers of the Los Alamos Chapter of the PGNS.

PRODUCT ENGINEERING AND PRODUCTION

Boston—September 18

"Space Electronics Design—Panel Discussion," Donald Sherman, Raytheon Company; Robert E. Rooney, RCA Aerospace Communications; Edward J. Duggan, M.I.T. Instrumentation Laboratory, Bedford, Mass.

Los Angeles—September 19

"Microminiaturization," Dr. Lee Steinman, Amelco, Inc., Santa Monica, Calif.

Philadelphia—September 19

"The Satellite Tiros," Glenn Corrinton, RCA, Hightstown, N. J.

RADIO FREQUENCY INTERFERENCE

Fort Worth—September 11

"Microwave RFI Measurements," Bob Friedman, Polarad Electronics Corporation, Long Island City, N. Y.

Los Angeles—July 19

"Spectrum Signature of Complex Electronic Systems," Hollice A. Favors,

(Continued on page 70A)



(Formerly the DTS 400)

Now, in full production, this amazing new silicon power transistor is available in quantity under its new number 2N2580. ■ Because of its high voltage and high temperature capabilities, the 2N2580 makes possible dramatic weight and space saving advantages to designers of missile, aircraft and commercially used equipment. Operation of 400 cps equipment from transformerless power supplies connected directly to 115v., 60 cps mains is just one practical application. Other applications include: frequency conversion and regulation, auto ignition systems, voltage regulators, electronic ripple filters, control circuitry and VLF amplifiers. ■ Contact us or your local distributor for prices and more data.

Collector diode voltage V_{CB0}	400 Volts	Base current (continuous)	1 Amp.
Emitter diode voltage V_{EB0}	5 Volts	Maximum junction temperature	150°C
Emitter current (continuous)	5 Amps.	Minimum junction temperature	-65°C

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
I_{CB0}	$V_{CB0}=400V$, $T=125^{\circ}C$	—	—	10	ma
I_{CE0}	$V_{CE0}=400V$	—	—	10	ma
I_{CEX}	$V_{CE}=400V$, $V_{EB}=1.5V$ $TEMP.=125^{\circ}C$.	—	—	5	ma
R_{Sat}	$I_C=5$ amp, $I_B=1$ amp	—	0.15	0.25	ohm
h_{FE}	$V_{CE}=5V$, $I_{CE}=5A$	10	—	50	
THERMAL RESISTANCE	—	—	0.5	0.7	°C/watt

Electrical characteristics @ $T_c=25^{\circ}C$ unless otherwise noted.
NPN silicon transistor furnished in TO-36 package.

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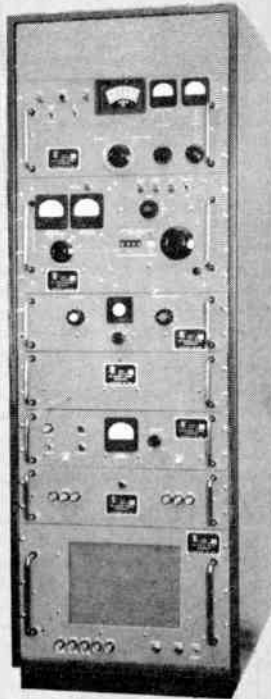
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The CPO-1 is used in laboratories and production facilities to provide precise RF frequencies. It is also used operationally as the control oscillator in a transmitter or receiver to create a highly stable transmission system.

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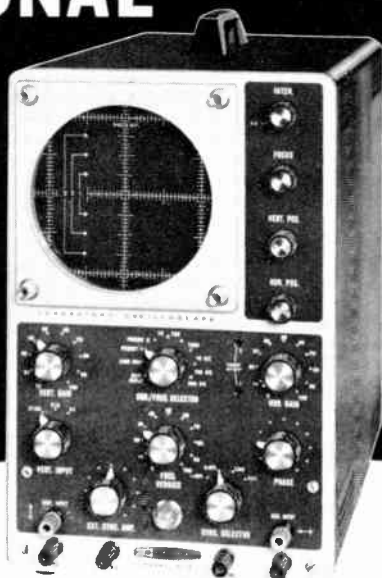
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Professional Group Meetings

(Continued from page 68A)

Hughes Aircraft, Culver City, Calif.

Film—"Aircraft Electromagnetic Compatibility," John Eekert, Norair Division, Hawthorne, Calif.

RELIABILITY AND QUALITY CONTROL

New York—May 14

"Reliability of Semiconductor Devices," Conrad Zierot, General Electric Company, Syracuse, N. Y.

"Reliability of Semiconductor Devices," Julian Hillman, General Instrument, Semiconductor Division, N. Y.

VEHICULAR COMMUNICATIONS

Los Angeles—September 17

"Shortcuts in the Identification of Interference," E. L. MacDonald, Pacific Telephone and Telegraph Company, Los Angeles, Calif.

Industrial Engineering Notes

(Continued from page 35A)

Corporation's application for three years of pay TV trials over KTVR-TV, which occupies Denver's channel 2. The approval was the FCC's second under its March 1959 order authorizing subscription television experimentation via transmissions. The first authorization went to RKO General, Inc., and Zenith Radio Corp. for three years of testing in Hartford, Conn. Franchise holder is the Teleglobe-Denver Corp., which is authorized by the Teleglobe Pay-TV System, Inc., to use its system in the Denver market. The Macfadden-Bartell Corp., which holds licenses for five radio stations, is committed to buy \$350,000 shares of stock in the corporation. The Teleglobe system transmits, unscrambled, the visual part of the program which can be received on TV sets. The aural portion, however, is transmitted by telephone lines to speakers in homes of subscribers but not connected to the TV receivers. Viewing tolls are recorded by punched tape attached to the subscribers' speaker control unit. Under the FCC provisions, subscribers to pay TV cannot be required to purchase special equipment. It will be furnished by the Denver franchise holder. Costs to the viewer will be \$10 for wire connection, then a minimum monthly charge of not over \$3.25. Per-program charges are expected to range from \$1 to \$2, but could run as low as a quarter or as high as \$3.50, depending on the type of program. The Denver backers

(Continued on page 73A)

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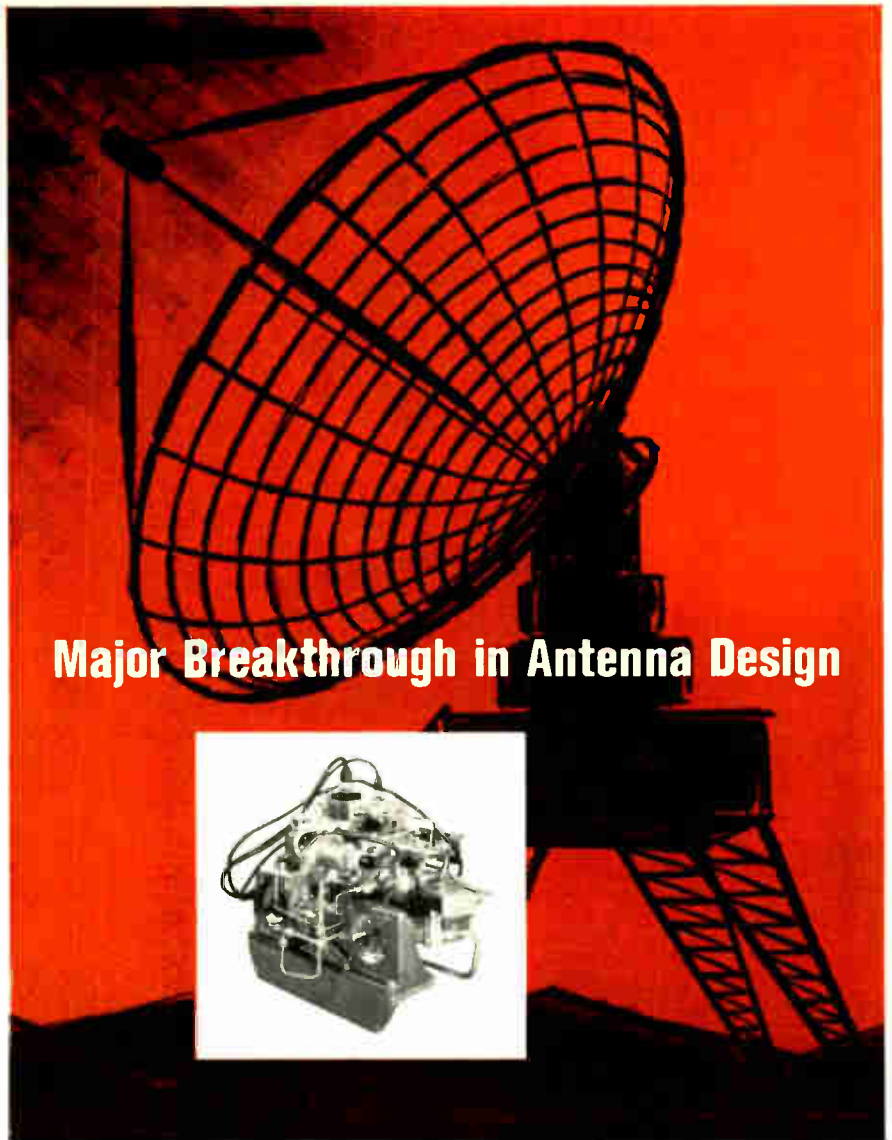
A-27
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• Q-max, an extremely low loss dielectric impregnating and coating composition, is formulated specifically for application to VHF and UHF components. It penetrates deeply, seals out moisture, provides a surface finish, imparts rigidity and promotes stability of the electrical constants of high frequency circuits. Its effect upon the "Q" of RF windings is practically negligible.

• Q-max applies easily by dipping or brushing, dries quickly, adheres well; meets most temperature requirements. Q-max is industry's standard RF lacquer. Engineers who know specify Q-max! Write for new catalog.

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Major Breakthrough in Antenna Design

... thanks to Vickers Servo Drives

Using Vickers "packaged" electro-hydraulic servo drives, radar antenna designers are achieving major breakthroughs in the state-of-the-art. In each case, these breakthroughs involve problems in moving high-inertia antenna loads in one or more planes (azimuth, elevation, traverse) precisely, smoothly, with high response and at variable speeds. Important examples include:

Rapid Accelerations (to 30°/sec.²) On one massive tracking radar, Vickers servo drives provide accelerations of 30°/sec.² for inertias up to 7,480,000 lb. in. sec.²

Creep Speeds as Low as .000005 RPM On this same application, the Vickers drives provide speeds from 2.78 RPM down to .000005 RPM (1 antenna revolution every 4.63 months!), an overall speed ratio of 556,000 to one.

High Gains — Accurate Response On another series of complex missile-tracking radars, Vickers closed-loop drives afford Velocity Constants over 100 sec.⁻¹.

Low Unit Weight-Volume/HP Ratios Weights and volumes of Vickers servo drives favor the antenna designer. For example, a 25 HP transmission has a weight to HP ratio of 8 lbs./HP and an envelope ratio of 0.24 cu. ft./HP.

Small Error Signals Move Large Masses On many antennas, error signal excitations as low as 0.10 milliwatts precisely and instantly control torques up to 4,500,000 inch pounds.

Inherent Anti-backlash Backlash is virtually eliminated by using two hydraulic motors in series. One drives the load while the second maintains a small reverse torque on the gearing.

Other Features Significant advantages afforded by the Vickers servo drives also include • infinitely variable speeds • stepless speed control and reversing • low horsepower inputs • inherent overload protection.

* * *
If you are designing radar antennas, systems or mounts, we would like to tell you more about these drives and our experience. Write for Radar Drive Bulletin No. 5306, Vickers Incorporated, Marine and Ordnance Dept., Waterbury 20, Conn.

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DIVISION OF SPERRY RAND CORPORATION

MO-236

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membership in the appropriate Professional Group at the time he places his order, he will be entitled to the rates indicated in the preceding paragraph.

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Fill in the coupon at bottom of page and mail it, with remittance, to The Institute of Radio Engineers at the address given below.

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2	10, 18, 26, 41, 48	Automatic Control Circuit Theory	1.00	1.50	4.00	5.00
3	1, 9, 17, 25, 28, 33	Electron Devices Microwave Theory & Techniques	1.00	1.50	4.00	5.00
4	4, 12, 20, 34, 49	Electronic Computers Information Theory	1.00	1.50	4.00	5.00
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7	30, 37, 43, 51	Audio Broadcasting Broadcast & Television Receivers	.80	1.20	3.20	4.00
8	7, 24, 38, 46, 53	Communications Systems Vehicular Communications	1.00	1.50	4.00	5.00
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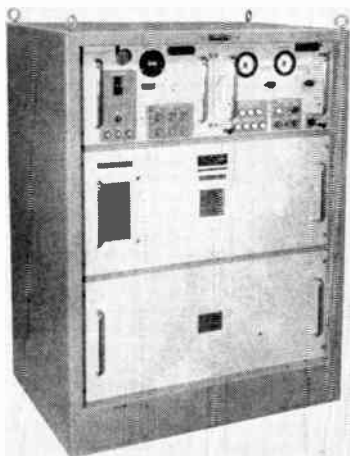
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Control features have also been included to provide local control or unattended remote operation.

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Industrial Engineering Notes

(Continued from page 70A)

expect initially to have 2,000 subscribers in one-fourth of the city under a proposed agreement between Gotham and the Mountain States Telephone & Telegraph Co. The tests are expected to begin in six months. The FCC said it had no other pay TV applications pending.

INDUSTRY MARKETING DATA

Distribution has been started of the most complete, authoritative reference to the U. S. electronics industry available—the 1962 Yearbook of EIA's Marketing Services Department. The work replaced, in a new and colorful magazine-size format and with a marked increase in factual content, the EIA Fact Book, the industry's standard general reference since 1954. To obtain all the information packed into the Yearbook's 70 pages of text, including 78 tables and charts, a single researcher would have to consult several hundred sources, according to EIA Marketing Services Director William F. E. Long. Much of the data, Mr. Long observed, reflects sales and production information collected from EIA member and non-member companies participating in the Association's 70 marketing services and programs and several dozen yearly special studies. EIA has distributed the Yearbook to the first and second EIA member-company representatives. Additional copies are available at the special membership price of \$1.00 per copy. The price to the public is \$2.00. Order from Office of Information, EIA Headquarters, 1721 DeSales Street, N.W., Washington 6, D. C. Annual sales of electronic and nonelectronic teaching machines is expected to climb from the \$5 million during 1960 to \$125 million in 1970, with dollar value of electronically operated machines climbing from 5 per cent to 50 per cent, according to a report prepared by the Marketing Services Committee of the EIA Industrial Electronics Division. The study attributes the anticipated market growth during the current decade to expected improvements in program material, expanded public awareness of the benefits of teaching machines, and increased machine sophistication and quality. The bulk of the present market is industrial and military, the report observes, but schools will be the major purchasers toward the end of the decade. Existing problems, including a lack of standardization and resistance by some educators, are expected to be solved by 1965, the report predicts. "Thereafter, accelerated growth of the teaching machine industry is expected. The market will receive added impetus at this time through the employment of computers with teaching machines." A limited number of single copies of the study, "Report on the Teaching Machine Market Through 1970," is available from the Industrial Electronics Division, EIA Headquarters, 1721 DeSales Street, N.W., Washington

(Continued on page 86A)

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40-page REFERENCE HANDBOOK aids the engineer in making full use of the versatility built into many of today's power supplies.

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3 AN ANALYSIS of COOLING METHODS:

Advantages of forced-air blowers over large-area convection systems are discussed in an effort to analyze overall equipment reliability.

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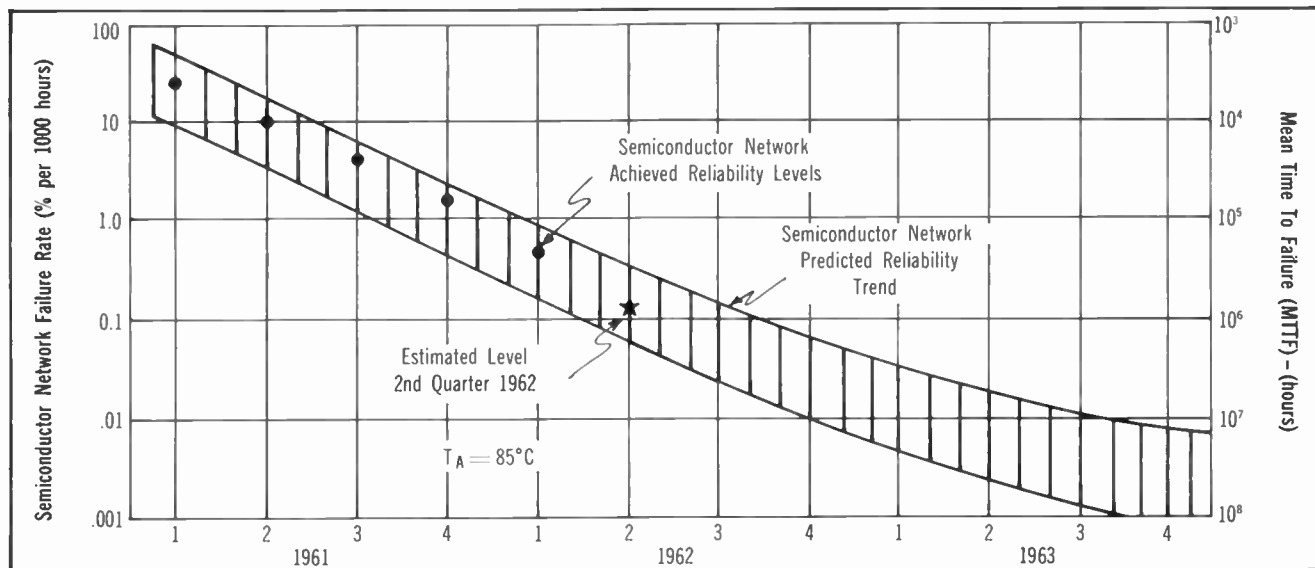
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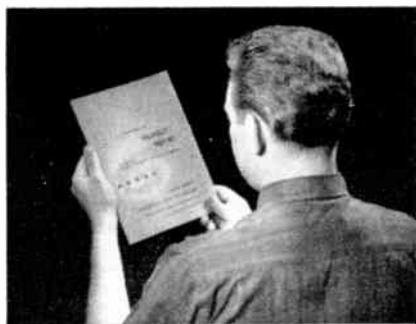
The chart above shows a circuit failure rate of about 0.13% per 1000 hours at 85° C. Use of acceleration factors determined through test data would give an approximate circuit failure rate of 0.02% per 1000 hours at room ambient.

First Report Issued on Reliability of **SOLID CIRCUIT*** Semiconductor Networks

Texas Instruments has just published a 50-page report, comprehensively covering tests on Series 51 SOLID CIRCUIT semiconductor networks. A total of

365 of these micro-electronic devices manufactured during the fourth quarter of 1961 and the first quarter of 1962 were placed on environmental tests, life tests and step-stress tests. Here is a summary of the test results:

crete components interconnected as a circuit, this is the equivalent of more than 7,000,000 component hours. The results of these tests and similar data obtained subsequent to the issuance of the report show the reliability trend indicated by the chart above.



SOLID CIRCUIT semiconductor network, actual size.

ENVIRONMENTAL TESTS: The environmental test series indicated that the 85 units tested were capable of withstanding environmental stresses in excess of those normally required of semiconductor devices used in military applications.

LIFE TESTS: A total of 255 TI semiconductor networks were placed on life test — both operating and storage — for a total of 355,000 circuit hours. Since each network contains approximately 20 dis-

STEP-STRESS TESTS: Twenty-five semiconductor networks were temperature-stressed to destruction. Defect-analysis of all failed parts were performed to determine failure modes. Process improvements and even more stringent process control have already been established as a result of the tests.

If you would like a personal copy of the complete semiconductor-network reliability report, ask for Bulletin 549-1.

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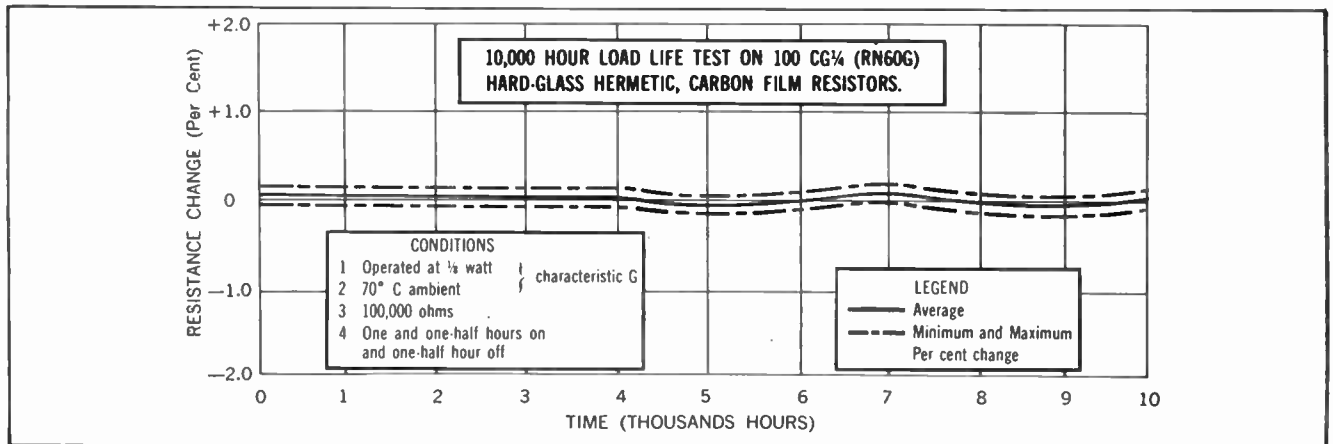
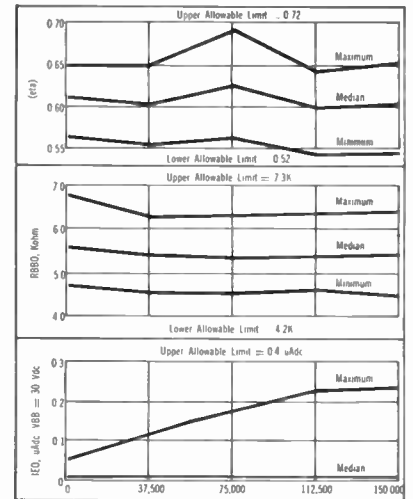
Over-all Circuit Reliability Increased With TI Unijunctions

HERE'S HOW: A single Texas Instruments unijunction transistor will do the job of several ordinary transistors and resistors in many applications. This means greater over-all reliability (and economy) for your circuits, since fewer components and fewer connections mean fewer opportunities for trouble to occur. In addition, TI unijunctions are highly reliable semiconductor devices themselves. More than a half-million unit test hours (both high-temperature storage and operating life) have already been accumulated — without a single catastrophic or degradation failure. Operating characteristics of the devices have remained well within acceptable parameters (see the charts on operating life below).

A full line of 22 unijunction transistors is now available from Texas Instruments. These units feature dissipation to 600 milliwatts, inter-base resistance from 4.0 to 12 kilohm, intrinsic standoff ratios from 0.47 to 0.8, and extremely low peak emitter current ranging from 6 to 25 microamps.

The special characteristics of TI unijunctions — particularly their highly stable negative resistance — make the devices ideal for high-reliability applications such as relaxation oscillators, sawtooth generators, trigger circuits, counters and bi-stable circuits.

Ask for bulletin 504-2, containing a number of useful circuit applications for unijunctions.



30 Million Test Hours Now Run on TI Hermetic Film Resistors

More than 30 million unit hours of extended load life have been run on Texas Instruments CG series hard-glass, hermetic film resistors. Not a single catastrophic failure has occurred during these tests, for a remarkably low failure rate of 0.003% per thousand hours (60% confidence level). In addition to this impressive evidence of built-in resistor reliability, TI has accumulated a "library" of test data on resistor stability.

TEST CONDITIONS: Over the past two years, more than 60 standard production lots of CG1/4 and CG1/8 resistors have been subjected to

long-term load life tests, up to 10,000 hours per lot. These tests include: five ambient temperatures — from 25°C to 175°C; seven wattage levels — 0, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2 w; three maximum voltages — 250, 300, 350v; and 35 ohmic values — 24.9 ohms to 1 megohm.

STABILITY PROOF: The graph above shows one test, typical of the series. Notice the exceptional stability indicated by the drift curve, even under conditions of maximum power and maximum continuous working voltage.

You may be surprised to learn how economically you can buy TI her-

metic resistors which provide all of the superior performance indicated by the test data. Ask your Texas Instruments sales engineer for more detailed information, or write for Bulletin 504-3.

If you would like to have more detailed specifications and application information on the products featured in this advertisement, call your local TI sales engineer or write to Texas Instruments Incorporated, P. D. Box 5012, Dallas 22, Texas.

Semiconductor Networks Bulletin 549-1
Unijunction Transistors Bulletin 549-2
Hermetic Film Resistors Bulletin 549-3

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The following positions of interest to IRE members have been reported as open. Apply in writing, addressing reply to company mentioned or to Box No.

The Institute reserves the right to refuse any announcement without giving a reason for the refusal.

Proceedings of the IRE
1 East 79th St., New York 21, N.Y.

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Ph.D.'s required for newly merged state university. Emphasis on graduate teaching and research. Initial opportunities in control engineering, sampled data systems, and advanced network theory. Excellent consulting and liaison with research-minded local industry. Outstanding salaries and fringe benefits. Industry-based applicants are invited. Apply Chairman of Electrical Engineering, State University of New York at Buffalo, 3135 Main Street, Buffalo 14, New York.

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Challenging opportunities in expanding independent research institute located in cultural center area adjacent to universities and one of the nation's outstanding technical and scientific libraries. Surrounded by pleasant residential districts and shopping centers. Positions for B.S., M.S., and Ph.D. engineers with backgrounds and extensive experience in antennas, electromagnetic wave propagation, microwave theory and techniques, or power distribution networks and analysis. A high degree of freedom to conduct theoretical and experimental research work in an excellent technical and scientific environment. Please send your resume to: Mr. Harold L. Stout, Director of Engineering, Midwest Research Institute, 425 Volker Boulevard, Kansas City 10, Missouri. An equal opportunity employer.

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Electrical engineer with Ph.D. and experience in either control theory, electrical circuitry, or solid state devices needed for technical direction of active program. This is a unique attempt to apply latest concepts to commercial and industrial products on a system basis. Send resume to Box 2078.

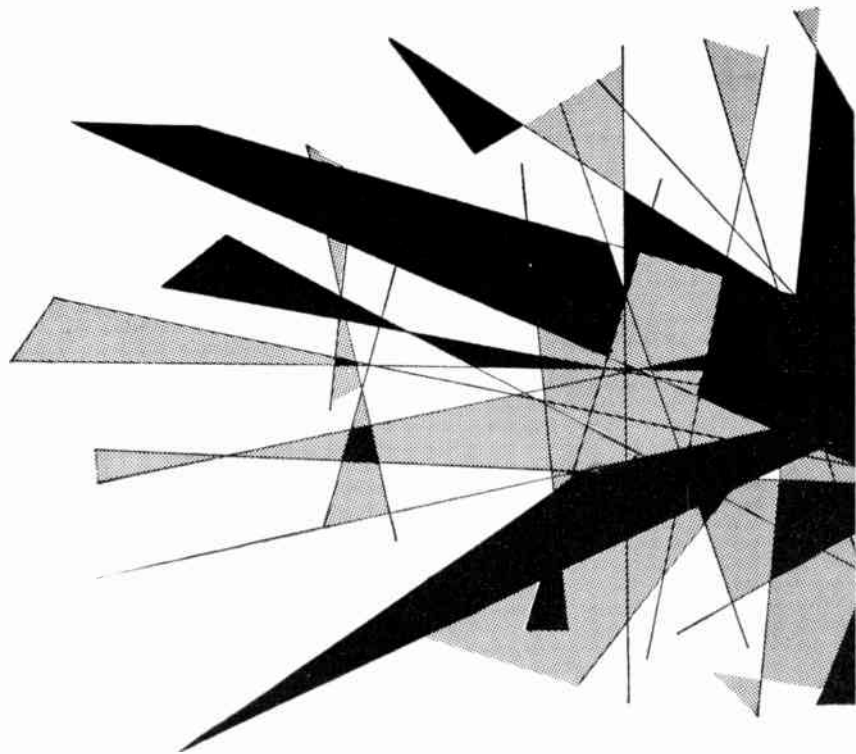
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ENRICO FERMI INSTITUTE FOR NUCLEAR STUDIES has a position available for a B.S. or M.S.E.E. with a minimum of 2 years experience in the design and development of transistorized circuitry. We offer the opportunity to work with a small group of dedicated scientists engaged in basic physics research. Salary open, send resume in complete confidence. William R. Hutchins, UNIVERSITY OF CHICAGO, 956 E. 58th Street, Chicago 37, Illinois.

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(Continued on page 78A)



*You Are Invited
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That Welcomes.....*

ASSIGNMENTS NOW OPEN ACROSS ENTIRE SYLVANIA ELECTRONIC SYSTEMS DIVISION.

	LOCATION KEY					
	A	B	C	D	E	F
RESEARCH OPPORTUNITIES IN:						
1. Secure Communications Techniques		•	•		•	•
2. Perception & Learning Theory	•				•	•
3. Character Recognition	•				•	•
4. Speech Recognition					•	•
5. Operations Research	•	•		•		
ADVANCED DEVELOPMENT OPPORTUNITIES IN:						
6. Electronic Warfare Systems		•	•			
7. Detection & Tracking Systems	•	•	•			
8. Solid State Circuitry	•	•	•			
9. Intelligence & Reconnaissance	•	•	•			
10. Data Processing Systems	•	•	•			
11. Phased Array Antennas	•	•	•			
12. Electroluminescent Displays	•	•	•			
13. Digital Control Systems	•	•	•			
14. Anti-Intrusion Anti-Missile Systems	•	•	•			
15. Communications Systems	•	•	•			
16. Logic Design	•	•	•			
17. Microelectronics	•	•	•			
18. Receiver Circuit Design	•	•	•			
19. Systems Integration	•	•	•			
20. Servomechanism and Control Systems	•	•	•			
21. Digital Computer Design	•	•	•			
22. Transmitter Circuit Design	•	•	•			
ADVANCED SYSTEMS ENGINEERING:						
23. Advanced Systems Planning		•		•	•	
24. Command & Control Systems	•	•	•	•	•	
25. Systems Analysis & Integration	•	•	•	•	•	
26. Systems Management				•		
27. Communication Theory	•	•	•		•	
28. Information Processing Systems	•	•	•			
29. RF Systems, Microwave/Antenna	•	•	•			
30. Signal Processing Systems	•	•	•			
31. Data Acquisition and Conversion	•	•	•			
32. Electro-Magnetic Wave Propagation	•	•	•		•	
PRODUCT SUPPORT (Sylvania Electronic Systems)						
33. Field Engineering & Training						•

A) EASTERN OPERATION
(Suburban Boston)
100 First Avenue, Waltham 54, Mass.

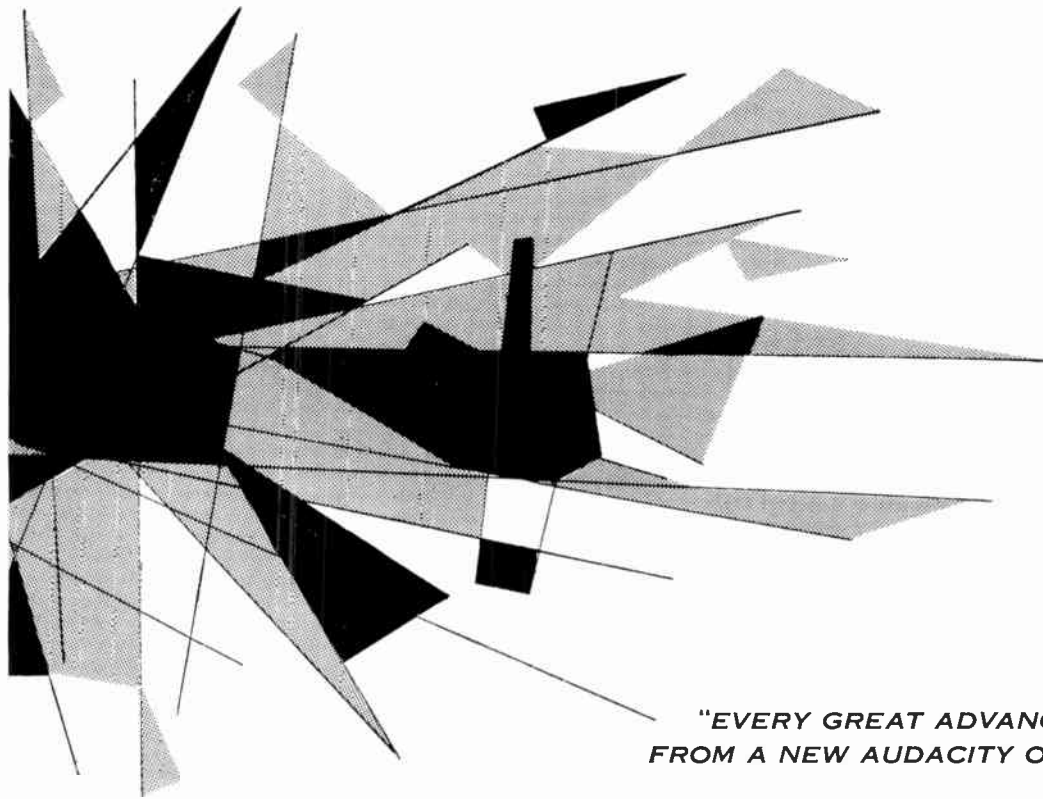
B) CENTRAL OPERATION
(Suburban Buffalo)
1100 Wehrle Drive, Williamsville 21, N. Y.

C) WESTERN OPERATION
(Suburban San Francisco)
P. O. Box 188, Mountain View, Calif.

D) SYSTEMS ENGINEERING & MANAGEMENT OPERATION
(Division HQ, Suburban Boston)
40 Sylvan Road, Waltham 54, Mass.

E) APPLIED RESEARCH LABORATORY
(Suburban Boston)
40 Sylvan Road, Waltham 54, Mass.

F) PRODUCT SUPPORT ORGANIZATION
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1210 VFW Parkway, West Roxbury, Mass.



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▲▲▲ it is based upon a laboratory concept, made up of small groups of research and development people who are backed by product design, production and field service; (there are 17 interrelated laboratories, located in suburban Boston, the San Francisco Bay Area and suburban Buffalo).

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18	19	20	21	22	23	24	25	
26	27	28	29	30	31	32	33	

Please mail coupon to Manager of Professional Staffing at the location of your choice. Attach resume if available.

Name _____

Address _____

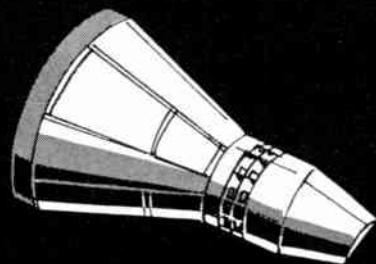
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Degree(s) _____ Yr(s) of Graduation _____



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DIVISION

ACF INDUSTRIES

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Positions Open



(Continued from page 76A)

crowave radio, plus wire line carrier, telephone and data communications. Railroad communications experience desirable. Location mid-west. Salary commensurate with experience. Send resume, recent photo and salary requirements with first letter. All replies confidential. Send resume to Box 2079.

OCCASIONAL TEACHING

Specialists in all areas are invited to communicate regarding their interests and free time available. Institute offers specialized teaching via short courses where demand exists. Consulting rates paid for teaching during vacation periods. Send resume to Wayne Tustin, President, Tustin Institute of Technology, 179 Vista del Mar Dr., Santa Barbara, Calif.

LIBRARY OF CONGRESS ELECTRONIC ENGINEERS

Positions are available for Research Specialists, grade GS-11, \$7560, grade GS-12, \$8955, and Senior Research Specialists, grade GS-13, \$10,635 per year. Some knowledge of Russian is desired. Grade commensurate with qualifications. Opportunities are available for continuing education at five local universities. Moving expenses will be paid and on site personal interviews will be arranged. Civil Service examination is not required. Interested persons please send Standard Form 57 (Application for Federal Employment) and college transcripts to the Personnel Office, Library of Congress, Washington 25, D.C.

UNIVERSITY OF CALIFORNIA SAN DIEGO

DIRECTOR—Experimental Services for School of Science and Engineering. Degree plus proven experience in areas such as semiconductor materials preparation, electro-mechanical gadgets, machining, high vacuum, optics, electronic components manufacturing, etc. Must be capable of developing a facility which will perform advanced state-of-the-art research services. Salary comparable to industry. Extra benefits. An equal opportunity employer. Please send resume to Mr. S. J. Adams, Department of Physics, University of California, San Diego, La Jolla, California.

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Ph.D. or M.S. with interest in developing and teaching modern courses, both undergraduate and graduate, in electric machinery. Considerable scope for individual initiative is available. Opportunities for research and consulting. Address inquiries to Dr. V. Johannes, Chairman, Department of Electrical Engineering, Fairleigh Dickinson University, Teaneck, N.J.

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- 1 Electronic Engineer GS-855-9
- 4 Electronic Engineer GS-855-11
- 9 Electronic Engineer GS-855-12
- 3 Mechanical Engineer GS-830-12

Reply: Defense Electronics Supply Center (Attention DESC-A), Dayton 20, Ohio.

INSTRUCTOR POSITIONS

As a function of Texas A. and M. College, the Texas Engineering Extension Service is set-

(Continued on page 82A)




A current Bellcomm project

The Moon, Mars, Venus, long objects of wonder, are now destined for exploration. 📌 As you read this, Bellcomm is at work for NASA—planning early phases of this vast exploration, analyzing systems needed for landing man on the moon. 📌 If you're qualified, you might like to join the vanguard of the expedition. There are rewarding openings in the fields of physics, mathematics, engineering, flight mechanics, propulsion, man-machine relationships, aerodynamics and aeronautical engineering. 📌 Bellcomm, the newest company of the Bell System, is an equal opportunity employer located in Washington, D. C. Résumés will be promptly and carefully considered. Address them to Mr. W. W. Braunwarth, Personnel Director, Bellcomm, Inc., Room 501J, 1737 L Street, N.W., Washington 6, D. C. 📌



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☾♂♀ Left to right, above, astronomical symbols for the Moon, Mars, and Venus.

A black and white illustration of a solar system, viewed from space. The scene is framed by a large, dark, curved shape that resembles a window or a lens. Inside this frame, several celestial bodies are arranged vertically. At the top is a small, distant planet. Below it are two larger planets, one of which has a thin ring. The largest planet in the scene is Jupiter, with its characteristic bands. Below Jupiter is a smaller planet with a grid-like pattern, possibly representing a satellite or a specific moon. At the bottom of the frame is the Earth, showing its horizon and clouds. A thin line, possibly a satellite orbit or a probe, extends from the top of the frame down towards the Earth. The background is a dark, starry space.

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■ Nuclear propulsion is moving swiftly to the forefront of space exploration. For challenging solar and planetary missions or scientific investigations beyond the plane of the ecliptic, nuclear propulsion is essential. For lunar missions, it is highly attractive. This is substantiated by Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission: "I believe that nuclear propulsion could provide the most feasible means of accomplishing space missions involving heavy payloads and long voyages in the foreseeable future."

As NASA's industrial partner in the management and accomplishment of the RIFT (Reactor-In-Flight Test) program, Lockheed is a leader in this dramatic application of nuclear power to space flight. Lockheed's role is the design, development, integration, application and testing of the first nuclear-propelled space vehicle. Its purpose: To demonstrate the feasibility of nuclear propulsion in a space flight environment.

Moreover, Lockheed is involved in another important space application of nuclear energy: its use in nuclear electrical systems to operate auxiliary equipment, and eventually in electrical propulsion systems.

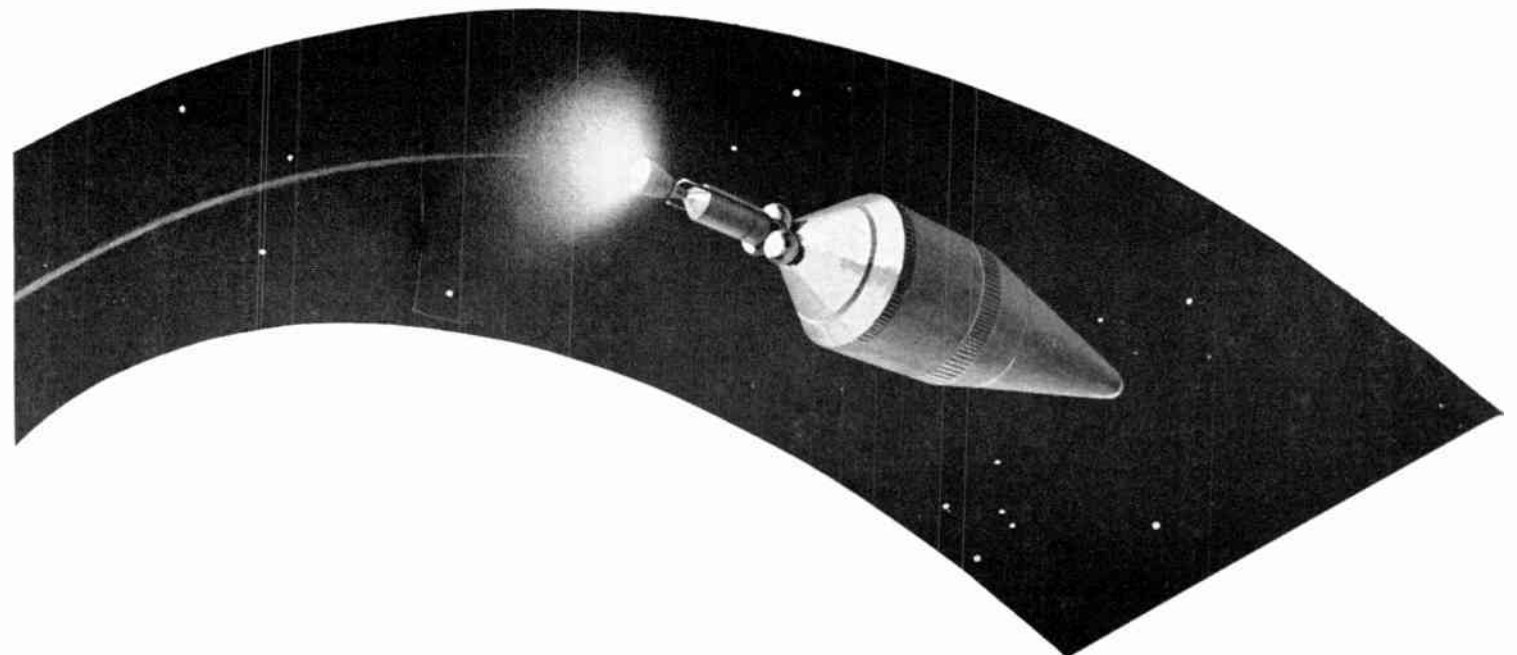
Nuclear space applications is but one of many areas being explored by Lockheed Missiles & Space Company. As one of the industrial leaders in current space investigations, many new positions are continually being opened for scientists and engineers of proved ability in all disciplines. And Lockheed's ideal location in Sunnyvale, on the beautiful San Francisco Peninsula, makes living as well as working invigorating and stimulating.

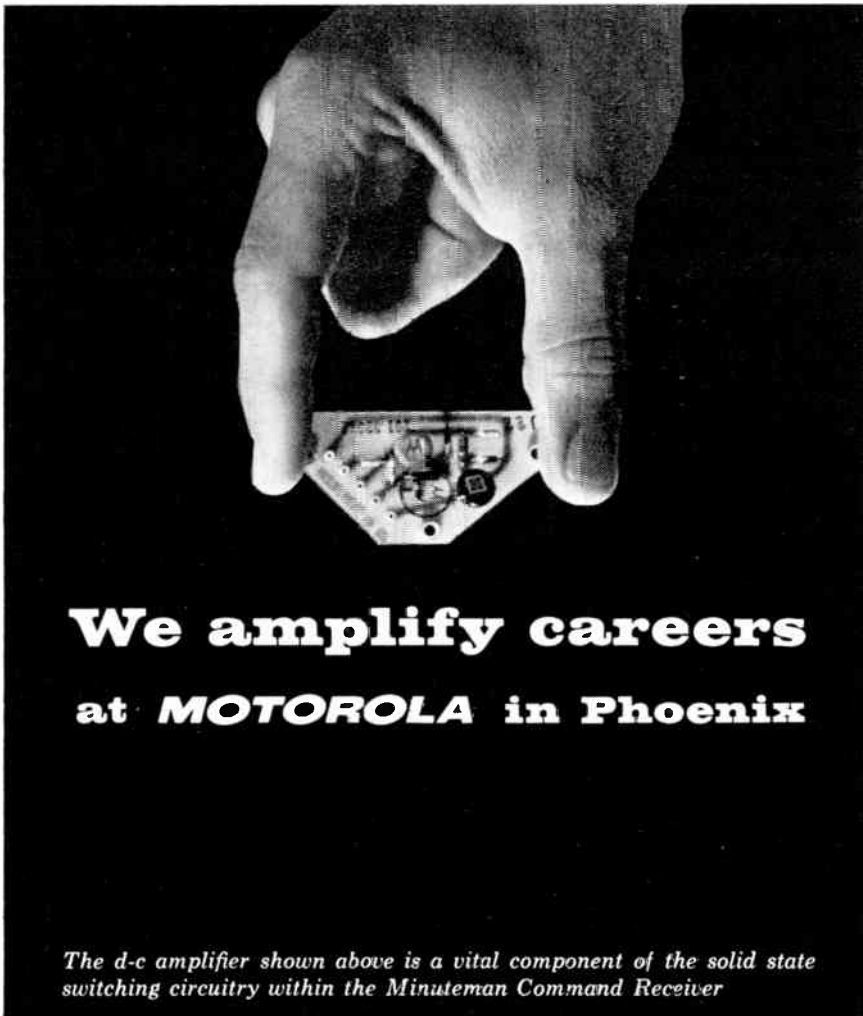
If you have proved ability and wish to work in a challenging environment, please write: Research & Development Staff, Dept. M-40E, 599 North Mathilda Avenue, Sunnyvale, California. Lockheed is an equal opportunity employer.

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Military Electronics Division

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Motorola also offers opportunities at Chicago, Illinois, and at Culver City and Riverside, California



Positions Open



(Continued from page 78A)

ting up an Electronic Technology Institute to open January 1963. Instructor positions are open for college graduates with several years experience in research, manufacturing, sales engineering, or similar related activities in the electronic industry. This two-year course is designed to train qualified students to "back-up" the engineer; to have the ability to communicate effectively with the engineer, and to carry out his suggestions in developing circuitry, breadboards, prototypes, and improvements. Special emphasis will be placed on training applicants to qualify for specific manufacturing and governmental job classifications. For further information write: L. K. Jonas, Division Chief, Engineering Extension Service, Box 236 F.E., Texas A. and M. College, College Station, Texas.

LIFE SCIENTIST Physiologist

Nature designed man's body for a groundling's life, never more than tree-top height above the earth's surface. Physicians with a speciality in physiology who are interested in analysis and experimentation in man's response to mill magnetic fields, acceleration and other unusual environmental factors are invited to apply to: G. P. Rentschler, Cornell Aeronautical Laboratory, Inc., Buffalo 21, New York.

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Ground floor opportunities in information Technology Systems at Itek, Stanford Industrial Park, California. These positions are the first of their kind in our newly formed Development Planning Department. Write to—R. W. Johnston, Dept 300, Manager, Administrative Operations, Itek, 2670 Hanover Street, Palo Alto, California.

SYSTEMS SCIENTIST

To analyze military and commercial operational problems, Perform systems design feasibility analysis and preliminary design of complete graphic and digital systems. Requires B.S. in physics and broad experience in experimental physics including optics and photo sciences. Write to—R. W. Johnston, Dept 300, Manager, Administrative Operations, Itek, 2670 Hanover Street, Palo Alto, California.

ELECTRONICS SYSTEMS ENGINEER

To perform conceptual design and feasibility studies; write proposals; perform preliminary design of information handling and graphic display systems. Prefer MSEE and experience in using electronic techniques including video and digital systems as part of a larger system. Write to R. W. Johnston, Dept 300, Manager, Administrative Operations, Itek, 2670 Hanover Street, Palo Alto, California.

MARKET ANALYST

To analyze markets, develop marketing plans, formulate promotion techniques and evaluate. Requires engineering degree. Experience in market analysis and market planning essential. Should know statistics and sources of data. Write to R. W. Johnston, Dept 300, Manager, Administrative Operations, Itek, 2670 Hanover Street, Palo Alto, California.

ELECTRONIC ENGINEER

Design and develop advanced video systems utilizing transistor-printed-board techniques for integration with larger graphic data handling

(Continued on page 84A)

COLLINS CALL

FOR SCIENTISTS & ENGINEERS

EQUIPMENT DEVELOPMENT

- BSEE — Elec. Eng. — 3 yrs. exp. HF or VHF (CR or D)
- BSEE — Elec. Eng. — 3 yrs. exp. Automatic Test and Checkout (CR or D)
- BSEE — Elec. Eng. — 6 yrs. exp. Power Servo Design (CR)
- BSEE — Elec. Eng. — 3-5 yrs. exp. UHF (CR or D)
- BSEE — Elec. Eng. — 3 yrs. exp. Command Control Systems (CR)
- BSEE — Elec. Eng. — 3 yrs. exp. Radar Beacon Work (CR)
- BSEE — Elec. Eng. — 3 yrs. exp. Television Transmission (CR)
- BSEE — GSE Supervisor — 5 yrs. exp. Equipment Development (CR)
- BSEE — GSE Eng. — 3 yrs. exp. Ground Support (CR)
- BSEE — Digital & Logic Design — 2-5 yrs. exp. (D)
- BSEE — Circuit Design — 1-5 yrs. exp. (D)
- BSEE — ECM — 2-5 yrs. exp. (D)

SYSTEMS

- MSEE — System Analyst — 5 yrs. exp. Modulation Technique (CR)
- MSEE or equiv. — System Analyst — 5 yrs. exp. Tracking and Ranging (CR)
- MSEE — System Analyst — 5 yrs. exp. Communications (CR)
- BSEE minimum — GSE Integration Supervisor — 5 yrs. exp. Ground Support (CR)
- MS or equiv. in Physics or Mechanics — System Analyst — 3 yrs. exp. Classical or Celestial (CR)
- BS — Field Supervisor — 5-10 yrs. exp. Airborne Electronics and Communications (CR)
- BS or equiv. in EE — Field Eng. — 3-5 yrs. exp. Com. (CR)
- BSEE minimum — GSE Layout Eng. — 5 yrs. exp. Layout (CR)
- BSME or equiv. — Mech. Eng. Supervisor — 8-10 yrs. exp. Management and Administration (CR)
- BSME or equiv. — Mech. Eng. — 3-5 yrs. exp. Packaging Designs (CR)
- MSME — Mech. Eng. — 3-5 yrs. exp. Thermal Design and Evaluation (CR)
- BSME or equiv. — Mech. Eng. — 3-5 yrs. exp. Environmental Test and Procedures (CR)
- BSEE — Elec. Eng. — 4 yrs. exp. Circuit Design and Com. (D)
- BSEE — Elec. Eng. — 3-5 yrs. exp. Microwave Systems (D)
- BSEE — Elec. Eng. — 3 yrs. exp. Tropospheric Scatter (D)
- BSEE — Elec. Eng. — 2-7 yrs. exp. UHF, Scatter, Microwave Systems Design (D)

GENERAL

- BSEE or higher — Resident Eng. — 3-5 yrs. exp. Communications (CR)
- BSEE or higher — Senior Staff Asst. — 8-10 yrs. exp. TV Theory (CR)
- BSEE — Test. Eng. — 3-5 yrs. exp. Communication Design, Testing (CR)
- BSEE desirable — Logistics Eng. — 2-5 yrs. exp. Space Program Logistics (CR)
- BSEE or higher — R&D Eng. — 1-5 yrs. exp. Antenna Systems (D)
- BSEE — Elec. Eng. — 1-5 yrs. exp. Design Review and Prediction (D)
- BSEE — Project Test Eng. — 1-5 yrs. exp. Quality Assurance (D)
- BSEE — Telephone Eng. — 4-7 yrs. exp. Central Office (D)
- ME or IE — Staff Eng. — 2 yrs. exp. in MTM (CR, D or NB)
- MS or PhD — Solid State Physics — 3 yrs. exp. Thin Film Dev. (D)
- BSIE — Prod. Methods — 1-4 yrs. exp. (CR)
- BSEE or higher — Comp. Designer — Exp. in Network Theory (NB)

DATA

- BSEE or higher — Senior Staff Asst. — 8-10 yrs. exp. Digital (CR or NB)
- MS or PhD — Applied Math — 10 yrs. exp. Business Computing (CR or NB)
- BSEE — Elec. Eng. — 5-8 yrs. exp. Digital Data Design (D or NB)
- MS Applied Math — Business Programming — ext. exp. (D or NB)
- MS Applied Math — Logic Program Designer — 8-10 yrs. exp. (D or NB)
- PhD Applied Math — Logic Program Designer — 8-10 yrs. exp. (D or NB)
- BSEE or higher — Logic Designer — (NB)
- BSEE or higher — Peripheral Equip. Designer — (NB)

PLEASE NOTE

Address all correspondence to Dept. PI.

On listings marked (CR), send resume to L. R. NUSS, COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA

On listings marked (D), send resume to C. P. NELSON, COLLINS RADIO COMPANY, DALLAS, TEXAS

On listings marked (NB), send resume to E. D. MONTANO, COLLINS RADIO COMPANY, NEWPORT BEACH, CALIFORNIA



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**Positions
Open**



(Continued from page 82A)

system. BS EE and experience with correlation circuitry, not necessarily digital, preferred. Write to R. W. Johnston, Dept. 300 manager, Administrative Operations, Itek, 2670 Hanover Street, Palo Alto, California.

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Electrical Engineer	GS-5	\$5335 pa
Industrial Engineer	GS-7	\$6345 pa
Employee Development Officer	GS-11	\$7560 pa
Supply Preservation & Packing Spec.	GS-12	\$8955 pa
Medical Officer (Occupational Health & Medicine)	GS-12	\$8955 pa
Electronic Engineer (Data Processing)	GS-12	\$8955 pa
Mechanical Engineer	GS-12	\$8955 pa
Electronic Engineer (Gen.)	GS-12	\$8955 pa
Electrical Engineer (Gen.)	GS-12	\$8955 pa
Civil Engineer	GS-13	\$10,635 pa

ASSISTANT PROFESSOR

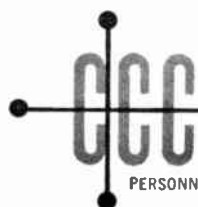
For February 1963 an opening on the Electrical Engineering Faculty rank of Assistant Professor in the field of Electronics and Computers. Ph.D. required. Write to Dr. H. Mahrous, Electrical Engineering Dept., Pratt Institute, Brooklyn 5, New York.

(Continued on page 85A)

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- DIGITAL & ANALOG DESIGN
- HF PULSE CIRCUITRY
- MULTIPLEXER DESIGN
- SECURE COMMUNICATIONS SYSTEMS
- SYSTEMS ANALYSIS
- TRANSMITTER, RECEIVER DEVELOPMENT

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Technical Employment Supervisor

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SYSTEMS
DIVISION**

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Positions Open



(Continued from page 84A)

OVERSEAS

Robert College, in Istanbul, Turkey, presents a challenge in education where East meets West. An opportunity to contribute significantly to the development of a young republic is available to specialists in engineering, business administration and economics, the sciences, the humanities, and English as a foreign language. Graduate degrees required. Write to Miss Shirley Osmon, Personnel Officer, Robert College, Bebek Post Box 8, Istanbul, Turkey; with copy to the Near East College Association, 548 Fifth Avenue, New York 26, New York.



Positions Wanted



By Armed Forces Veterans

In order to give a reasonably equal opportunity to all applicants and to avoid overcrowding of the corresponding column, the following rules have been adopted:

The IRE publishes free of charge notices of positions wanted by IRE members who are now in the Service or have received an honorable discharge. Such notices should not have more than five lines. They may be inserted only after a lapse of one month or more following a previous insertion and the maximum number of insertions is three per year. The IRE necessarily reserves the right to decline any announcement without assignment of reason.

Address replies to box number indicated, c/o IRE, 1 East 79th St., New York 21, N.Y.

FIELD SERVICE ENGINEER

Fifteen years of varied experience in communications and allied fields desires meaningful employment in field service engineering. Would prefer long term, family-type overseas location where command of Russian and German would be an asset. Salary should be interesting, but is secondary to interest in work and satisfaction gained in getting the job done. Age 34. Presently employed in field service division of large electronics firm. Write Box 4011 W.

DATA PROCESSING

B.S. Math. additional grad Physics. Age 39 with 12 years experience in electronic data processing. Includes Management, supervision, systems analysis and programming of such applications as Spares Provisioning, Parts Lists, data communications and cost reduction programs. Thoroughly familiar with special and general purpose computer design. Desires responsible position in computer applications area. Write Box 4012 W.

TECHNICAL SALES REPRESENTATIVE

Technical representative for firm interested in servicing any electronic program connected with the Electronics Command of the Dept. of the Army located at Fort Monmouth, New Jersey. Have MS in EE, 14 years experience in the de-

(Continued on page 86A)

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you ever made*



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Jet Propulsion Laboratory needs heads that work well. JPL needs imagination, inventiveness, experience and a boundless curiosity. There are many scientists and engineers that fit this bill. Maybe you're one of them. If so, maybe you'll put your head to work on the work we do: designing the spacecraft and instrumentation that will explore our moon and planets. A big job? Sure. But the satisfactions are big, too.

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name _____

address _____

city _____ state _____ phone _____

education and training:

degree	subject	school	date rec'd
BS			
MS			
PhD			

currently employed _____


how long on present job _____ salary _____

current position _____

primary specialty _____

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 Operated by California Institute of Technology for the National Aeronautics & Space Administration
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Positions Wanted



By Armed Forces Veterans

(Continued from page 85A)

sign and development and production of communications equipments. This includes management and supervision. Write Box 4017.

FIELD SERVICE ENGINEER

Married, age 43, retired army officer with 22 years communications experience. Since 1960 in managerial position, guided missiles range division, major airlines. Extensive background in communications facilities construction and installation. Including broadcast stations, telephone central office, microwave radio systems and missile tracking stations. Holder of FCC First Class Radiotelephone License, Western U.S. or foreign assignment preferred. Write Box 4018.

TECHNICAL REPRESENTATIVE

Semiconductor sales engineer, 39, many years electronic sales and service experience desires position as factory representative in Canada or Europe. Highest references previous associations with leading U.S. firms. Canadian subject. Foreign languages: German, French. Ex Royal Navy (W.W. II). Write Box 4023W.

PRODUCTION SUPERVISOR

Production supervisor of transistor test department. Assembly line production supervisor of electronic products. Familiar with quality control and government specifications. Married, age 32. Looking for a job with a future. Write Box 4024 W.

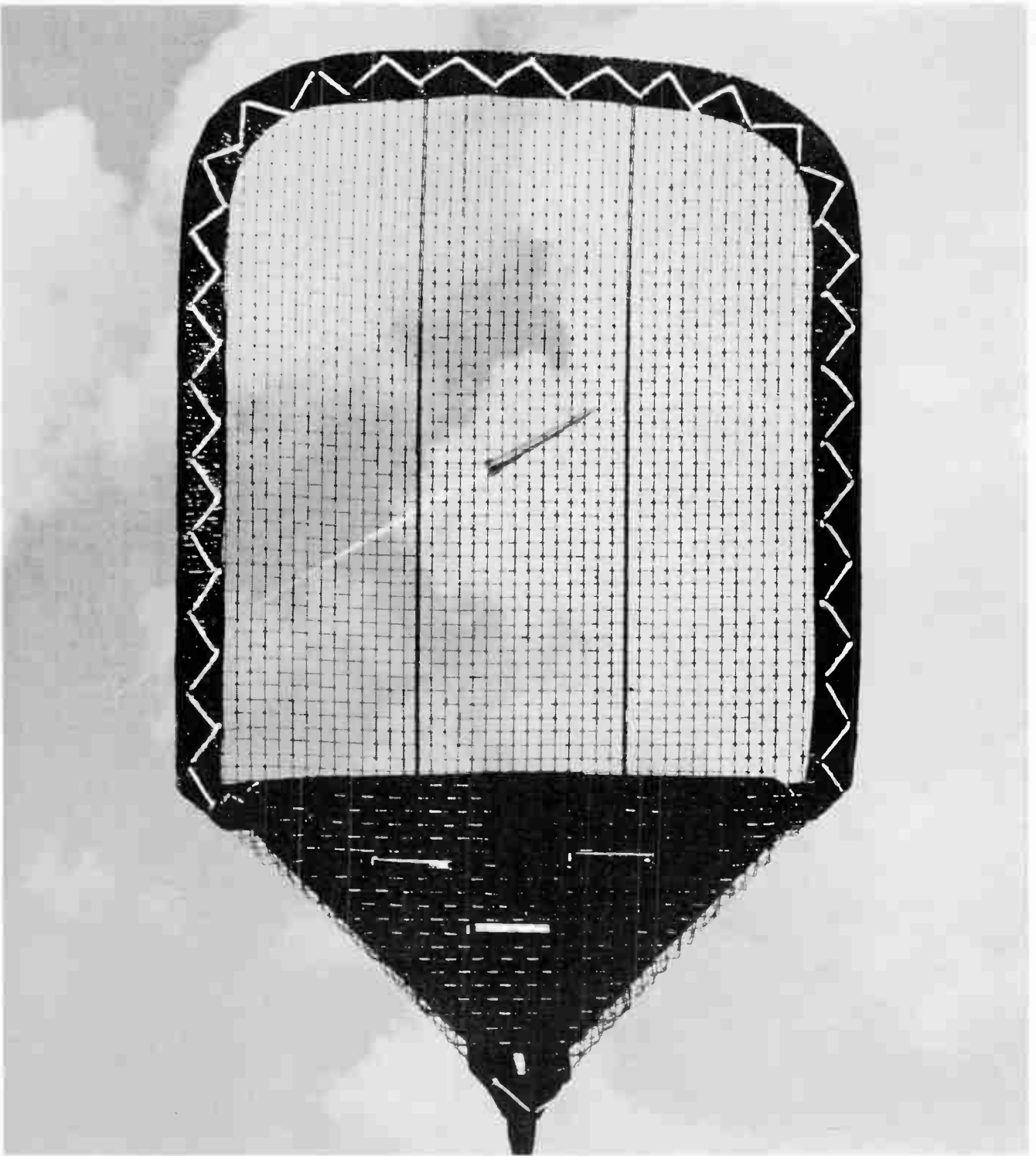


Industrial Engineering Notes

(Continued from page 73A)

6. D. C. Exports of electronic products from the U. S. in the first six months of 1962 increased 32 per cent over a year ago, totaling \$372.3 million compared with \$282.6 million in the first half of 1961, the Electronics Division, Business and Defense Services Administration, U. S. Department of Commerce, has reported in a compilation of Bureau of Census figures. Most of the rise was concentrated in "special category" items for which there is only limited detail, the Electronics Division said. The countries of destination are not shown in the report. Exports of radio communications equipment reportedly increased from \$45.5 million to \$50.5 million and exports of electronic detection and navigation equipment went from \$25.6 million to \$79.1 million. Exports of semiconductor devices, television receivers, recorders, electronic computers, and test equipment increased substantially while exports of electron tubes and broadcasting equipment declined. Statistics breaking down the types of exports in 1961 and January to June, 1961 and 1962 are available from the Electronics Division, BSDA, Department of Commerce, Washington 25, D. C. Factory sales of transistors moved back over the 20 million mark in August, regaining strongly from the

(Continued on page 88A)



COUNTER MEASURE

Challenging scientific work in the field of Electronic Counter Measures and other defense systems studies now exists at Sylvania. Openings are also available in the following fields: **Operations Research—Systems Analysis, Design—Design and Development of Antennas, Receivers, Transmitters, Transceivers, Servos—Analog Computers—Mechanical Design—Field Engineering.** Sylvania is located but 40 minutes south of San Francisco. Furthering your education? Sylvania encourages and sponsors graduate study at Stanford and other nearby institutions.



Write in confidence to
E. Quattrochi
SYLVANIA ELECTRONIC SYSTEMS • WEST
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THIS is a RESEARCH TOOL ?



It is not as sophisticated as our electron microscope or our hypersonic shock tunnels, perhaps, but it is of use to physicist Tom Mee as he pursues a research program of his own choosing. In this program Mr. Mee is using Cornell Aeronautical Laboratory funds to study water surface behavior under controlled conditions. With a modified Doppler radar he is trying to identify primary back-scattering elements in the wave surface and determine their behavior as the scale of wave motion is changed. Waves generated at one end of a long tank spend themselves on a "beach" at the other end. The rake is used to shape the beach.

Unlike Mr. Mee's project, most of our 250-or-so projects have sponsors. But the fact that we are willing and able to support many of the research ideas of our technical staff with our own funds is one of our hidden strengths. It is one reason some of the best men in your field stay with us, and it has repeatedly paved the way to seven-league strides in science.

Some of the fields in which we are making strides today are computer sciences, applied physics, electronics, operations research, aerodynamic and applied hypersonic research, flight research, applied mechanics, vehicle dynamics and systems research. The coupon below will bring you an interesting briefing on this community of science.



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(Continued from page 86A)

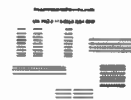
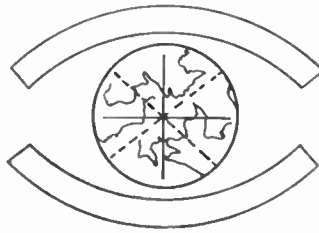
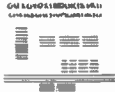
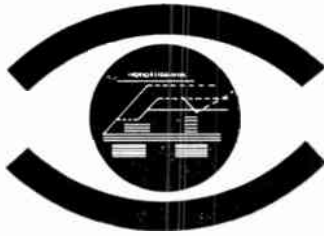
year's monthly low of 15.4 million in July, the EIA Marketing Services Department reported last week. Unit sales in August stood at 20,369,281, about a normal monthly level for 1962, with a total value of \$24,128,668. In July, the annual vacation month for many semiconductor plants, sales were 15,434,205 units worth \$19,476,017. Characteristic of this year, cumulative unit sales remained well ahead of the 1961 total, while dollars accrued remained behind. Through the eight-month 1962 period, 158,829,401 transistors worth \$193,841,914 were sold. During the same period last year, sales totaled 117,104,130 units valued at \$199,781,787. The EIA Marketing Services Department is mailing reporting forms this week to manufacturers of computing and data processing equipment to obtain their estimates of industry shipments. Estimates of the dollar value of shipments for five categories of computers, excluding those specially designed for military purpose, will be provided for the years 1961, 1962, and 1963. Participating companies will receive the composite results of the survey which will be presented in terms of a "high," "low," "median," and "average" for the universe of responses as well as for each quartile. Manufacturers of computing and data processing equipment, regardless of EIA membership, who wish to participate in the survey were asked to contact the EIA Marketing Services Department, 1721 DeSales Street, N.W., Washington 6, D.C., no later than October 31. The survey is being initiated at the request of the Computing and Data Processing Subcommittee, EIA Industrial Electronics Marketing Services Committee, chaired by C. E. Rice (General Electric Computer Department).

MILITARY AND SPACE

A four per cent increase during 1962 over the 1961 level of industrial research and development performance has been predicted by the National Science Foundation in a preliminary report on research and development funds published in NSF's September issue of "Reviews of Data on Research and Development." Funds for research and development performed by industrial firms totalled \$10.9 billion in 1961, a three per cent increase over 1960, according to the report. In recent years, NSF said, industrial firms have performed about three fourths of the nation's total R&D, measured in dollars. The outlook is for continued growth in funds for industrial R&D performance throughout the 60's, particularly in view of anticipated Federal expenditures for research and development projects in the field of space exploration and heavy reliance of the Federal Government on industrial firms for the work NSF stated. The bulletin presents the preliminary results of the 1961 survey of research and development. It includes industry statis-

(Continued on page 90A)

CRUCIAL SYSTEMS CHALLENGES OF THE '60's



Combating Information Saturation

Today's decisions at the highest level of military command require a range, precision and speed of communication and information processing beyond virtually anything conceivable in the past. Further, optimization of the electronic portion of a command control system cannot be considered independently of the capabilities of the ultimate, human decision-maker in the chair of command.

A good case in point is the SAC global command and control system 465-L, for which ITT International Electric Corporation carries systems development, design and management responsibilities. In order to further multiply the effectiveness of the military commander, faced with the crucial task of assimilating vast quantities of information projected on the

screens before him, ITT engineers and scientists recently added a remarkable new capability to 465-L: data presentation in color.

Operating at speeds that appeared incredible only a short time ago, the system enables computer outputs to be converted to alpha-numeric form...photographed...developed and projected on control center screens in as many as 7 colors in a matter of seconds.

This new capability opens up a whole new field of data format techniques to be explored. An obvious and immediate value is the enhancement of human perception through color changes denoting differing degrees of situation criticality.

OPPORTUNITIES IN MANY COMMAND AND CONTROL AREAS NOW OPEN TO SYSTEMS ENGINEERS AND SENIOR PROGRAMMERS

Many of these positions are on 465-L. Other opportunities relate to large-scale commercial digital communication systems, oceanic systems, and satellite control. Your inquiry about any of the positions listed below will receive immediate attention.

PROGRAMMERS/ANALYSTS. For real-time programming analysis and development. Broad activities encompass advanced programming systems, including special color display routines; diagnostic programs; automatic recovery; problem-oriented language; artificial intelligence.

OPERATIONS ANALYSTS. To establish systems requirements in satellite control, air traffic control, ASW and command/control. Also, assignments in man/machine communications and information retrieval.

SYSTEMS IMPLEMENTATION ENGINEERS. Electronic engineers to develop tests for stressing and evaluating communication-display-computer systems. Recommend improvement and refinements. Also, field positions for installation and integration of digital command/control systems.

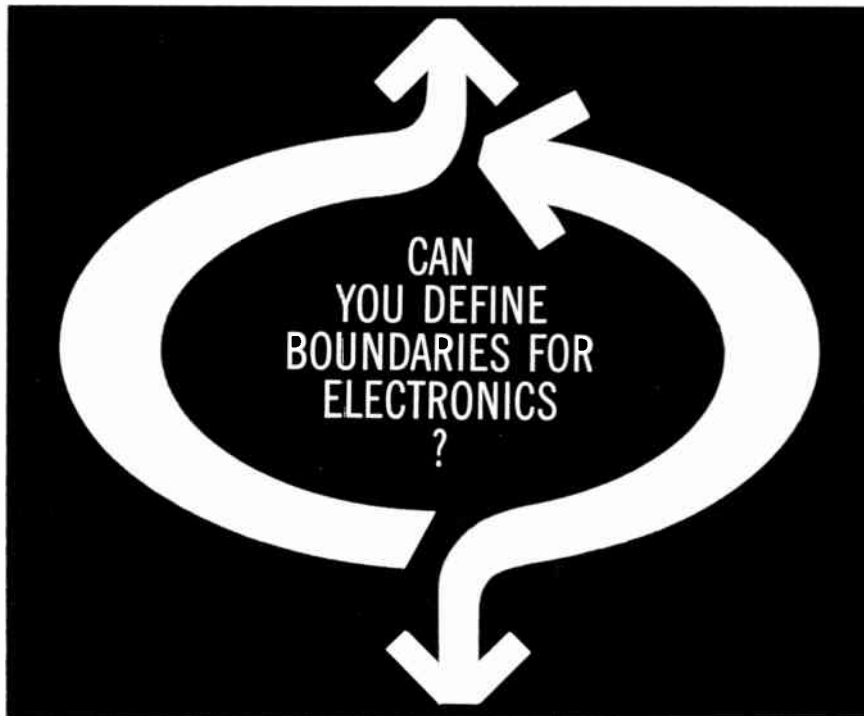
INFORMATION SYSTEMS ENGINEERS. For design of command/control and advanced communications systems. Experience in traffic, antenna and propagation theory, and mathematics as applied to communications and space technology.

DIGITAL SYSTEMS ENGINEERS. Engineers with management ability to direct sub-systems engineering effort on a global command/control system. Experience is desired in message traffic control, data processing systems, data display and multi-sequencing techniques.

Write fully in strict confidence to Mr. E. A. Smith, Manager of Employment, Box 86-C, ITT-International Electric Corporation, Route 17 and Garden State Parkway, Paramus, New Jersey.
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Engineers and scientists at the Electronics Laboratory believe no technology is so "remote" that it may not one day contribute to advances in one of the diverse areas conveniently labeled "electronics."

The result of this philosophy is an enriching collaboration among individuals from many different academic fields working toward the solution of common problems. At the Electronics Laboratory there are investigations into such diverse areas as optoelectronics, microwave acoustics, optical communications, self-organizing logic, and medical electronics.

If you are attracted by a multi-disciplinary intellectual climate, the Electronics Laboratory has the following opportunities:

Digital Circuitry

Electrical Engineer (BS,MS,PhD) To develop solid state and high power digital circuits and to devise ingenious circuitry solutions.

Information Processing

Mathematician, Physicist, Electrical Engineer (BS,MS) To formulate and design advanced information processing systems including switching theory and system organization.

Computer Devices

Physical Chemist, Electrical Engineer (PhD) To develop new solid state devices such as electroluminescent and photoconductor devices.

Organic Finishes

Chemist or Chemical Engineer (BS,MS) To initiate use of new organic finishes and develop new methods of application.

Device Circuitry

Electrical Engineer (PhD) To design low-noise amplifiers, detectors, mixers, receivers, and related circuits.

Functional Films

Physical Chemist (PhD) To develop new approaches to electronically functional films for device applications, also design and fabricate devices.

Acoustics

Physicist, Electrical Engineer (PhD) To develop devices utilizing interaction of acoustic and electric energy and electro-acoustic transducers.

Electro Photography

Electrical Engineer, Physicist (PhD) To guide investigations into nonphotographic light sensitive recording media including thermoplastic and other recording processes.

Write in confidence to: Mr. Richard J. Sullivan, Dept. 53-K, General Electric's Electronics Laboratory, Electronics Park, Syracuse, New York.

ELECTRONICS LABORATORY

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(Continued from page 88A)

tics on funds for R&D performances, sources of R&D funds, dollar volume of basic research performance, and full-time-equivalent number of R&D scientists and engineers. "Reviews of Data on Research and Development" is available from the Government Printing Office, Washington 25, D. C., at 15 cents a copy.



IRE People



(Continued from page 101D)

Kenneth J. Carlson (M'46) has been appointed Vice President and General Manager of Micro-lab, Livingston, N. J.



He was associated with General Mills for many years in various top executive positions, most recently as Vice President and General Manager of a subsidiary, The Daven Company, Livingston. He was earlier at General Mills' headquarters in Minneapolis for 12 years, serving in the electronics division in such posts as Director of Planning and Development, Director of Manufacturing and Manager of Manufacturing engineering. He was attached to the Naval Ordnance Laboratory in Washington as an Electronics Engineer in World War II and subsequently worked in a similar capacity for the Cornell Aeronautical Laboratory in Buffalo, N. Y.

Mr. Carlson is an electrical engineering graduate of the University of Minnesota. He is a member of the American Ordnance Association.



Daniel J. Crowley (A'48-M'55) has been appointed Marketing Manager of the Eastern operation of Sylvania Electronic Systems, a division of Sylvania Electric Products Inc.



He has served as Assistant Director of Engineering for the operation since January. He joined Sylvania in March 1955, in the Missile Systems Laboratory. In December, 1956, he was named Manager of the Electronics Department of the Laboratory, and in March, 1960, became Manager of the Systems Engineering Laboratory. Prior to joining Sylvania, he was affiliated with the Watson Laboratories in their Cambridge field station.

Mr. Crowley served as an officer with

(Continued on page 92A)



IF TODAY'S REALITY IS TOMORROW'S MYSTERY. What we know today is insignificant alongside what we will know tomorrow, and Philco Western Development Laboratories' advanced technology leads the way to better solutions for bigger problems . . . and to your career. With its space age achievement a matter of record in some of the Nation's most important satellite programs, Philco WDL extends a penetrating probe into the mysteries of tomorrow's universe: Cosmic ray and ruby laser optics, solid state microwave electronics, microwave miniaturization, signal detection techniques, deep-space communications. These are advanced fields being explored today at Philco WDL. Your career there can be as successful as your adventuring spirit. Tomorrow's space age problem is today's task at WDL.

Write in confidence for information on how you can find your career at Philco WDL, with the additional rewards of ideal living on the San Francisco Peninsula and professional and monetary advancement commensurate with your own ability. Requirements include B.S. or advanced degree (electronics, mathematics, physics), U. S. Citizenship or current transferable D.O.D. clearance. Address Mr. Patrick Manning, Department R-12.

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The rapidity with which we are reaching further and further into outer space . . . the many new and as yet completely unexplored related technologies . . . are giving birth to a vital new field—Aerospace Ground Electronics.

To be sure, ground support equipment, test equipment design and the like are involved. But the enormity of the tasks which lie ahead require different approaches than before and can only be described in new terms, and by the creation of a new master-field.

General Dynamics Electronics is very active in Aerospace Ground Electronics and expects to become even more heavily involved. Our preliminary ideas in the field evolve from the disciplines listed below. If you have the required background, we would like to explore the possibilities of AGE with you.

SYSTEMS ENGINEERING

Broad knowledge of Aerospace Ground Electronics design. Will analyze aerospace electronic subsystems for test requirements and determine test equipment needs. Experience in Air Force Shop or Naval Carrier Installations desirable, with emphasis on equipment layout, intercabling, work flow analysis, operational and calibration procedures.

PROJECT ENGINEERING

Project engineers to supervise design and integration of test equipments and test stations. Should be familiar with all types of testing equipment and techniques in one or more of the following areas.

- Flight Control Systems
- Radar
- HF-UHF Navigation & Communication Equipment
- Microwave Equipment
- Antenna Systems
- Electronic Countermeasures

DESIGN ENGINEERING

MICROWAVE—Engineers experienced in the design of signal generators and receivers in the following frequency bands: L, S, C, T, Ku, Ka. Should also know techniques for remote control of frequency and signal amplitude.

LOW FREQUENCY—Experience in the design of audio and sweep signal generators and servo systems test equipment. Knowledge of remote control of audio generator frequency and output using digital techniques is desirable, or in cathode ray tube sweep circuits.

HF-UHF—Engineers with experience in the design of HF and UHF signal generators, using both transistorized and vacuum tube circuitry. Knowledge of techniques for digital selection of frequency, such as frequency synthesis, and remote control of signal amplitude required.

CIRCUIT DESIGN

Digital and Pulse engineers with experience in the design of transistorized logic circuits, pulse generators and other digitally controlled circuits such as numerical indicators.

Assignments Immediately Available in:

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IRE People



(Continued from page 90A)

the U. S. Army Air Corps in the European Theatre during World War II. He received both the B.S. and M.S. degrees in physics from Harvard University. He has published a number of articles in the area of phased array radar and radio astronomy, and is a member of the American Rocket Society, the American Physical Society, American Ordnance Association and the American Management Association.



Howard D. Doolittle (M'46)
Associate Director of Engineering for The Machlett Laboratories, Inc., has been named to the post of Technical Director for the firm, a subsidiary of Raytheon Company. He will be responsible for overseeing the technological advancement of the company across its whole area of interests.



He joined the firm in 1945 and was named Associate Director of Engineering ten years later. From 1940 until 1945 he was on the staff of the Radiation Laboratory at Massachusetts Institute of Technology and prior to that was an Assistant Professor of Physics at Trinity College, Hartford, Conn.

Dr. Doolittle received the B.S. degree in physics from Trinity College and the Ph.D. degree from the University of Chicago. He is a Fellow of the American Physical Society and a member of the Electrochemical Society. He holds 24 patents on vacuum tubes and circuits and has written numerous technical articles.

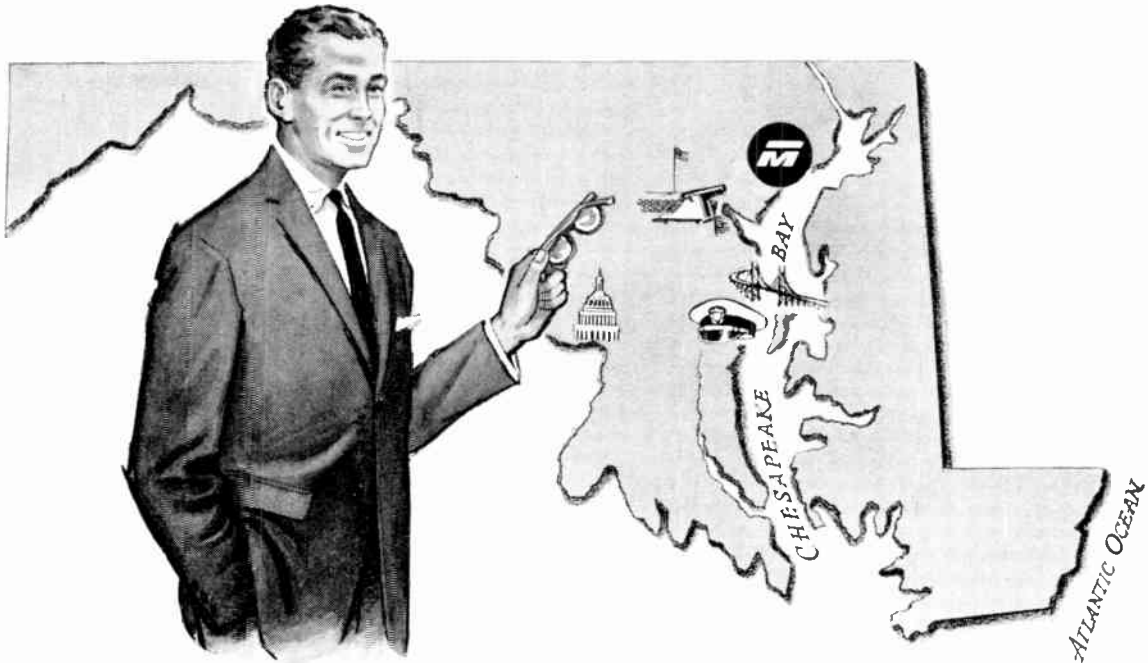


Ernest H. Krause (M'58) has been elected a Vice President of Aerospace Corporation, Calif. He will serve as General Manager of the newly established San Bernardino Operations.

Before joining Aerospace Corporation, he was associated with Aeronutronic Division—General Products Group of the Ford Motor Company. In 1955, he founded and became Chairman of the Board and President of Systems Research Corporation which engaged in research and development in space systems, weapons systems and electronics.

During World War II, he joined the U. S. Naval Research Laboratory. His work there included development of communications and countermeasure systems; development of the Viking missiles used in upper atmosphere research, and various phases of nuclear and electronic research and development. In 1954, he became Director of the Research Laboratories of the Missile Systems Division of Lockheed, where he worked in the early phases of the development of the ICBM and IRBM.

(Continued on page 91A)



MARTIN moves ahead in MARYLAND

At the Martin Company, Aerospace Division of Martin Marietta Corporation, we have openings for qualified GRADUATE ENGINEERS and SCIENTISTS in our:

ELECTRONIC SYSTEMS & PRODUCTS DIVISION

With our extensive and successful experience in this field, we are rapidly moving ahead on challenging, advanced electronic programs at our Baltimore location.

As these programs increase—both in scope and in number—we need additional top-level Scientists and Engineers. Many of these openings are at the supervisory and senior technical level, and many require advanced degrees.

There are immediate opportunities in the following areas:

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Microwave	Solid State Circuitry
Reconnaissance	Modern Packaging
Command and Control	Data Processing

If you are qualified, by virtue of education, experience and interest, please write Mr. J. W. Perry, Manager of Professional Employment, Martin Company, Dept. E-30, Baltimore 3, Maryland.

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SYSTEMS SPECIALISTS

Task requires a scientist with a minimum of five years experience in the technologies associated with the application and development of infrared systems. Applicant will act in a lead capacity in present programs and in initiating programs in new proprietary areas. An advanced degree in Physics or Electrical Engineering desired.

COMPONENT SPECIALISTS

Task requires a scientist with five or more years experience in research and development of advanced infrared detectors and optical components. Applicant will act in a lead capacity in present programs and in initiating programs in new proprietary areas. An advanced degree in Physics desired.

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IRE People



(Continued from page 92.1)

Born in Milwaukee, Wis., on May 2, 1913, Dr. Krause earned the B.S. degree in electrical engineering and M.S. and Ph.D. degrees in physics from the University of Wisconsin. He has served as consultant to the AEC; headed several projects of the Los Alamos Scientific Laboratory; served as Chairman of the Joint Air Force-Navy-Army Upper Atmosphere Research Panel and as a member of the Joint Research and Development Board panel on the upper atmosphere. He was awarded the Navy's Distinguished Civilian Service Award for achievements in rocket and nuclear weapons development. He is a Fellow of the American Physical Society, senior member of the American Rocket Society, and a member of Sigma Xi.



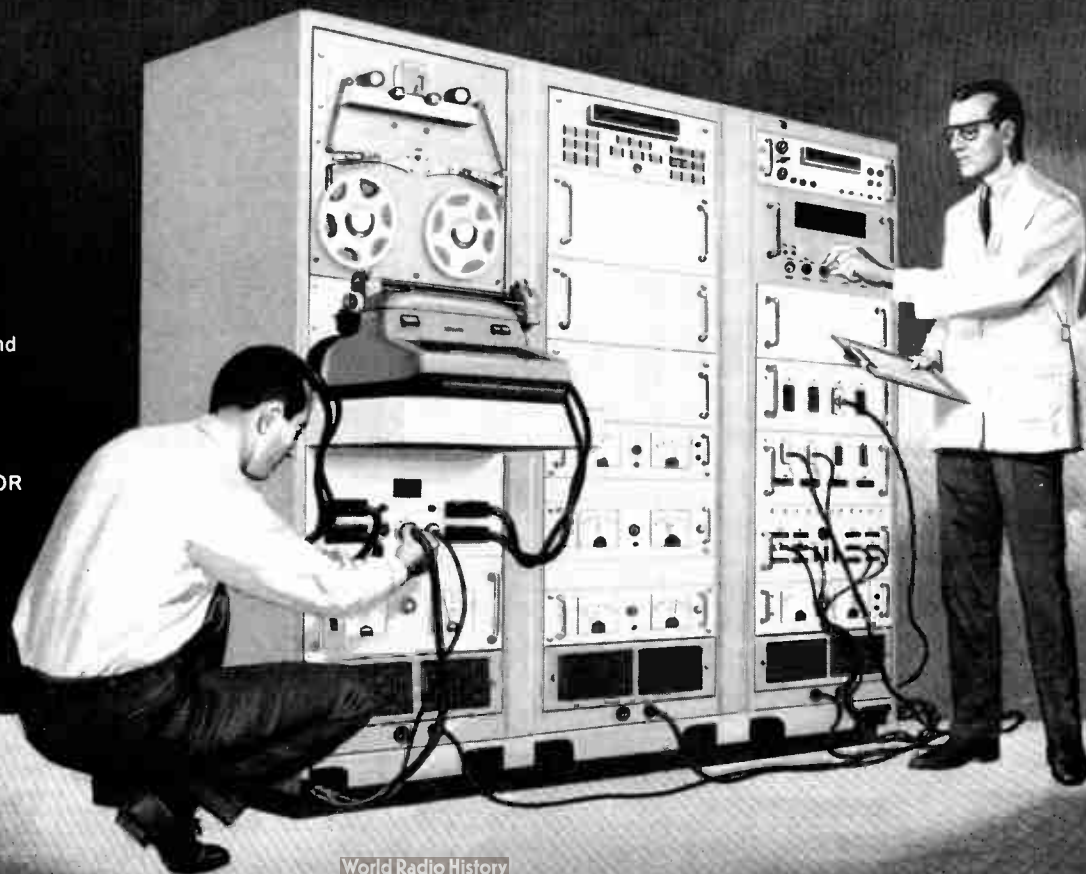
Ralph S. La Montagne (M47-SM56) has been appointed a Vice President of the UNIVAC Division of Sperry Rand Corporation. As Vice President, Defense Marketing, he will be responsible for the sale of special purpose UNIVAC



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DEMON is the second generation of Curtiss-Wright's programmed comparator automatic checkout equipment. It consists of 4 major sections: Command generator, stimuli generators, system exerciser, and output translator. The equipment combines increased test capacity with simplified NOR logic circuitry. The display unit can be automatic typewriter, punched paper tape, alphanumeric printer or visual indicator.



electronic equipment to defense agencies.

He joined UNIVAC in May of this year as Manager of Military Marketing. Prior to this, he was Marketing Manager of the Electronic Systems Division of Sylvania Electric Products, Inc. From 1956-1961 he was Manager, Marketing Department, Missile Electronics and Controls Division, and Marketing Manager of the Airborne Systems Department of Radio Corporation of America. He was in the United States Air Force until 1956, where his assignments included that of Chief, Lincoln Project Office, Air Research and Development Command.

Mr. La Montagne received the B.S. degree in military science from the University of Maryland and has taken courses at Boston University, M.I.T. and George Washington University.



Samuel Levine (A'44-M'55) has been elected Assistant Vice President-Advanced Systems Development of The Teleregister Corporation. He joined Teleregister in 1955 as Systems Engineer and has been Manager of Systems and Design Engineering, and Manager of Systems Engineering since that time. He has been responsible for the development of large scale on-line or real time digital data processing systems to automate airline passenger reservations, savings bank accounting, stock quotations and inventory control.

From 1940 to 1955, he was with the Signal Corps Engineering Laboratories

(Continued on page 96A)

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Send us 3 complete resumes, stating your present and desired salary, the kind of work you want and where you would like to live. You will get fast action on the job you desire. There is NO COST TO YOU!

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At Curtiss-Wright, new applications of science and technology develop products which become integral parts of military and industrial programs.

Product in Point: Demon—a new approach to testing and checkout for today's weapons systems. Demon is a highly reliable modular Go/No-Go automatic checkout system which can be custom configured. It is adaptable to projects ranging from readiness determination of satellite launch vehicles, missiles or aircraft to the high speed production line testing of subsystems and components.

There is an intensive program for the development of Demon and related projects (digital computer controlled systems, automatic waveform analyzers, peak reading voltmeters) being carried forward at Curtiss-Wright Electronics Division. These and other advanced activities have created immediate opportunities for systems engineers and circuit designers with specific experience on automatic checkout equipment.

For complete information, please write Mr. Gene V. Kelly, Manager of Professional Placement, Electronics Division. An equal opportunity employer.

ELECTRONICS DIVISION



CURTISS-WRIGHT CORPORATION

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At MITRE engineers and scientists are working to create the command and control systems that protect our country from attack. This is a job of global scope and national importance.

You know some of these systems by name — SAGE, BMEWS, NORAD Combat Operations Center. Here is an opportunity for you to become intimately acquainted with their design, development and integration. And perhaps most important — to help in the creation of systems yet unnamed.

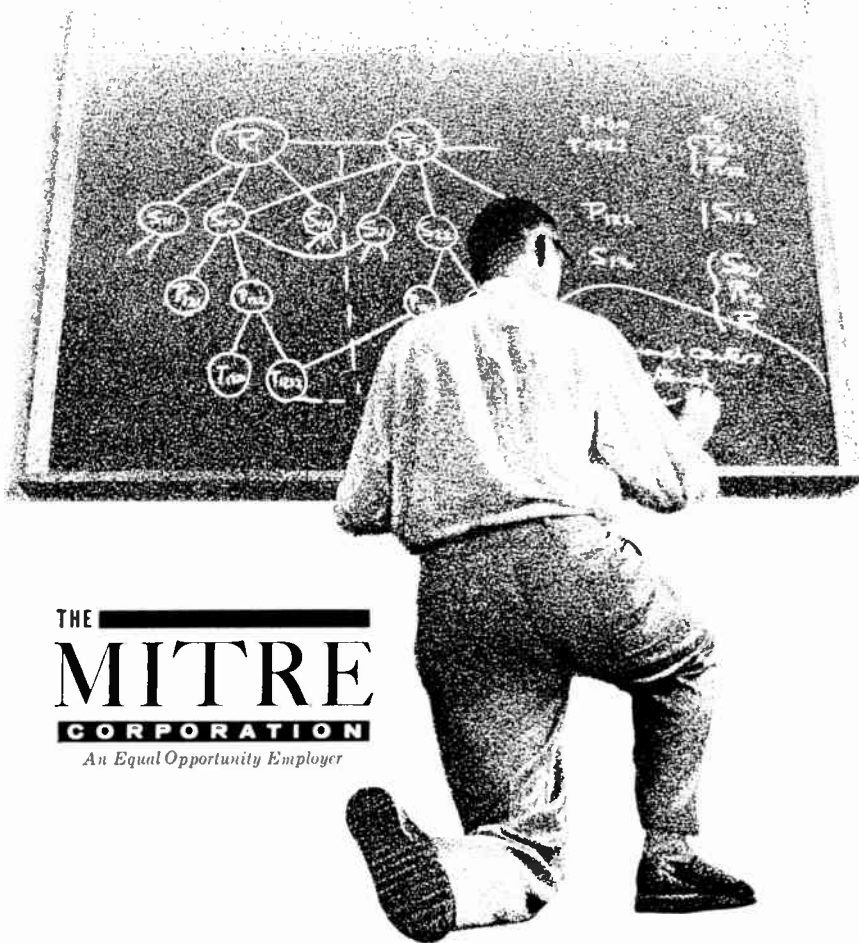
Your work at MITRE would lead you into new areas of work — spawned by the growing new science, Military Command Technology. You might be developing survivability techniques, or proc-

essing intelligence data with one of the world's largest computers, or designing new systems for tracking space hardware.

Whatever you do — and there are many opportunities for a systems man at MITRE — your work will be of great importance to the country. Your participation, in fact, will involve you with the basic defense of the free world.

MITRE is located in pleasant, suburban Boston. Rewards are competitive. Requirements, B.S., M.S. or Ph.D. in these disciplines — electronics, physics, and mathematics.

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MITRE, an independent nonprofit corporation, working with — not in competition with — industry, serves as technical advisor to the Air Force Electronic Systems Division, and is chartered to work for such other Government agencies as the Federal Aviation Agency.



IRE People



(Continued from page 95A)

and contributed to the development of improvements to early Army radars, development of electronic identification systems (IFF), ground navigation and surveying systems, missile tracking beacons, anti-aircraft and missile fire direction systems, and air defense systems.

Mr. Levine received the B.S. degree in electrical engineering from the City College of New York in 1938 and did graduate work at Polytechnic Institute of Brooklyn and Rutgers University from 1946 to 1950.

He is a member of the AIEE, ACM, AAAS, AFCEA and Stamford Engineering Society. He is active on several AIEE national committees including the Computing Devices Committee and the System Science Committee and has served as Chairman of the Computer Systems Subcommittee. He has also served on committees of the Electronic Industries Association, and from 1946 to 1949 represented the U. S. Army on Research and Development board panels on Land Navigation, Radar Beacons, and Identification.



Frederick B. Llewellyn (A'23 F'38), Scientific Adviser to the Director of the Institute of Science and Technology (IST) at The University of Michigan, was honored September 22, 1962, by the Stevens Institute of Technology. He received the 1962 Stevens Alumni Award from the school's alumni organization.

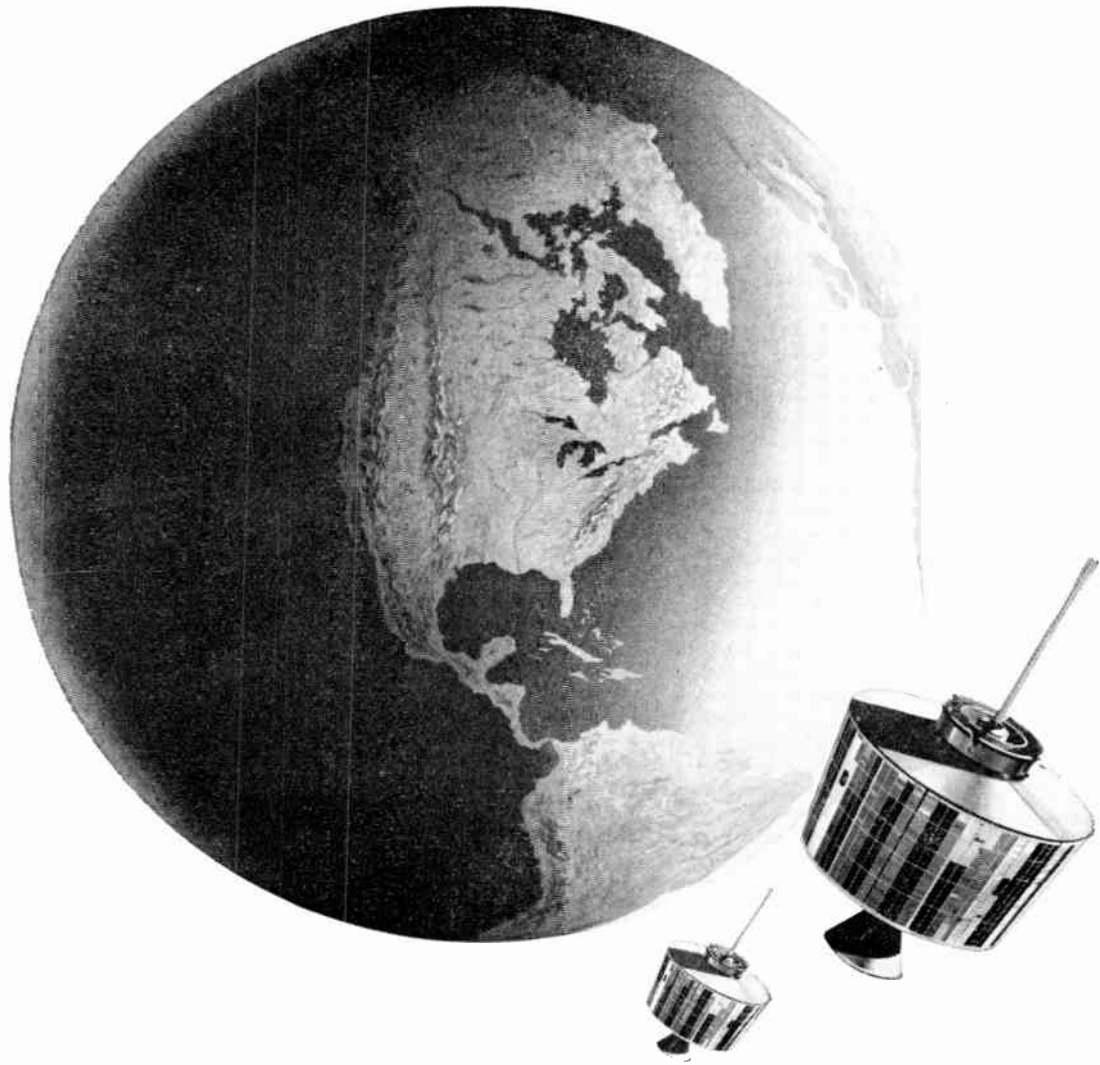
Before coming to IST, he was Assistant to the President at Bell Telephone Laboratories. At the University of Michigan, he is a Research Physicist. He assists the IST director in current research direction and long-range planning of IST research, and conducts research in his own areas of interest as well.

Dr. Llewellyn received the M.S. degree from Stevens Institute of Technology in 1922, and the Ph.D. from Columbia University. He has served as Scientific Consultant to the Secretary of War and the Secretary of Defense, and as Executive Secretary to the President's Scientific Advisory Committee. He is a fellow of the American Physical Society. In 1935, he was awarded the IRE's highly-valued Morris Liebmann Award. Called "one of the most active and loyal Stevens graduates" by that school's alumni association, Dr. Llewellyn is a Past President of that association and a member of the Stevens Board of Trustees. He has also been on its executive committee for many years, and was the author of its Alumni Constitution.



Lee B. Lusted, M.D. (A'45-SM'53-F'59) has joined the staff of the Oregon Regional Primate Research Center, Beaverton, Oregon, as Senior Scientist and head of the Division of Biophysical Sciences. Included in the Division are departments of Bioengineering, Automatic

(Continued on page 98A)



circuit designers...is your appointment in space with Hughes?

Today at Hughes you will find one of the country's most active space-electronics organizations. Important new and continuing projects, including SURVEYOR, SYNCOM, Missile Defense and POLARIS guidance systems are growing at unprecedented rates.

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of the most advanced components; the design of low noise radar receivers using parametric amplifiers; solid state masers and other advanced microwave components; radar data processing circuit design, including range and speed trackers, crystal filter circuitry and a variety of display circuits; high efficiency power supplies for airborne and space electronic systems; telemetering and command circuits for space vehicles, timing, control and display circuits for the Hughes COLIDAR (Coherent Light Detection and Ranging).

If you are interested and believe that you can contribute, make your appointment today.

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Research and Development
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Massachusetts Institute of Technology
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LEXINGTON 73, MASSACHUSETTS



IRE People



(Continued from page 96A)

Data Processing and Mathematics, and Radiology.

A graduate degree program in bio-engineering has been developed in cooperation with Oregon State University. The biophysical sciences research and graduate training activities have been an integral part of the planning since the inception of the Oregon Regional Primate Research Center.



Lawrence Miller (M'60) has been appointed Manager of Government Relations at Philips Laboratories, Division of North American Philips Company, Inc., Irvington-on-Hudson, N. Y. He will be responsible for liaison with Government agencies and prime contractors on technical programs. Prior to joining Philips, he was Vice President of United Service Associates, Inc., Washington, D.C. where he served as Government Representative for a number of American Corporations.

Mr. Miller graduated from the U. S. Military Academy at West Point in 1946. He did graduate work in mechanical engineering at Oklahoma A & M College in 1940 and 1950, and in electrical engineering at University of Pennsylvania in 1951 and 1952. He was in active service until 1959, when he resigned as Major in the Ordnance Corps. During this thirteen year period, he was active on missile-associated research and development programs and served in engineering, staff and command capacities.



Emil Misisco (SM'58) has been appointed Program Manager for Philips Space Development, Mount Vernon, N.Y. The space groups is managed by Philips Electronic Instruments. He came to Philips from Bulova Research and Development Laboratories, where he was Assistant Project Manager. He served on the project management staff responsible for the Pershing missile adaption kit program.

From 1956 to 1958, he was Project Engineer for Bulova. He was responsible for radar fuzing and missile sub systems which involved the electronic system support program for the Jupiter missile adaption kit. He also supervised design and development of the Bulova Tachtester. With Reeves Instrument Corporation from 1952 to 1956, he held the position of Assistant Project Engineer and worked on radar systems. He was involved in the design and development of photo optical systems, alignment procedures and flight



ANNOUNCING: Senior electronic systems engineering opportunities

Minneapolis-Honeywell's Ordnance Division is seeking senior electronic engineers to add to its expanding Minneapolis-based design engineering staff. These positions on chief engineers' staffs will be filled by individuals who have M.S. and/or Ph.D. degrees in EE and at least ten years experience in one or more of the following areas:

- * PROXIMITY AND RADAR FUZING
- * RF ANTENNA DESIGN, SEARCH RADAR, AND TELEMETRY SYSTEMS
- * DATA AND SIGNAL PROCESSING
- * SERVO MECHANISM DESIGN
- * VEHICLE FIRE CONTROL SYSTEMS DESIGN
- * SOLID STATE CIRCUIT ANALYSIS, INCLUDING DIGITAL COMPUTER CIRCUITRY

This experience should include management responsibilities and should have been with organizations in the military products business.

The positions open offer opportunities to join a rapidly expanding engineering organization, well based with design and evaluation capabilities and facilities. These individuals will also work closely with Honeywell's Corporate Research Center and Military Products Group's applied research labs, both located in Minneapolis.

Candidates desiring more information please write or call collect to: William W. Craven, Tech. Manager Mgr., Minneapolis-Honeywell Ordnance Division, 600 2nd Street North, Hopkins (Minneapolis), Minnesota. Area Code 612, WEst 5-5155

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testing of missile instrument radar, and depot test equipment for radar and communication systems.

Mr. Misisco received the Bachelor of Electrical Engineering Degree from Polytechnic Institute of Brooklyn in 1952. He served as Electronic Technician in the Navy from 1946 to 1948, attending Electronics Material School the first year and doing experimental work on Sonar the second year.

Richard B. Mulock (M'56) has joined Lenkurt Electric Co., Inc., San Carlos, Calif., as a Reliability Consultant in Commercial Products Engineering.



Prior to coming to San Carlos, Mulock was a Supervisor in reliability engineering and quality assurance at Sylvania Electronic Systems Division, Sylvania Electric Products, Inc., Amherst Laboratory, Buffalo, N. Y.

Mr. Mulock received the B.S. degree in Engineering and the M.S. degree in Business Administration from Stanford University, Calif. He is a senior member of the American Institute of Electrical Engineers, and the American Society for Quality Control.

Paul H. McAfee, Jr. (A'43-SM'62) has been appointed Senior Field Engineer of Granger Associates. He is temporarily assigned in the Washington, D. C. area, and will be responsible for the installation, Maintenance engineering and operation of Granger Associates products in the field.

He joined the firm after 27 years with the U. S. Navy in ship and shore communications, electronics and nuclear activities. He was most recently associated with base electronic systems installation engineering for the Navy.

He attended Auburn University and several Navy schools, with emphasis on electrical and mechanical engineering, mathematics and the physical sciences. He also contributed instruction courses and developed laboratory procedures for Navy training school programs. He is a member of the U. S. Naval Institute.

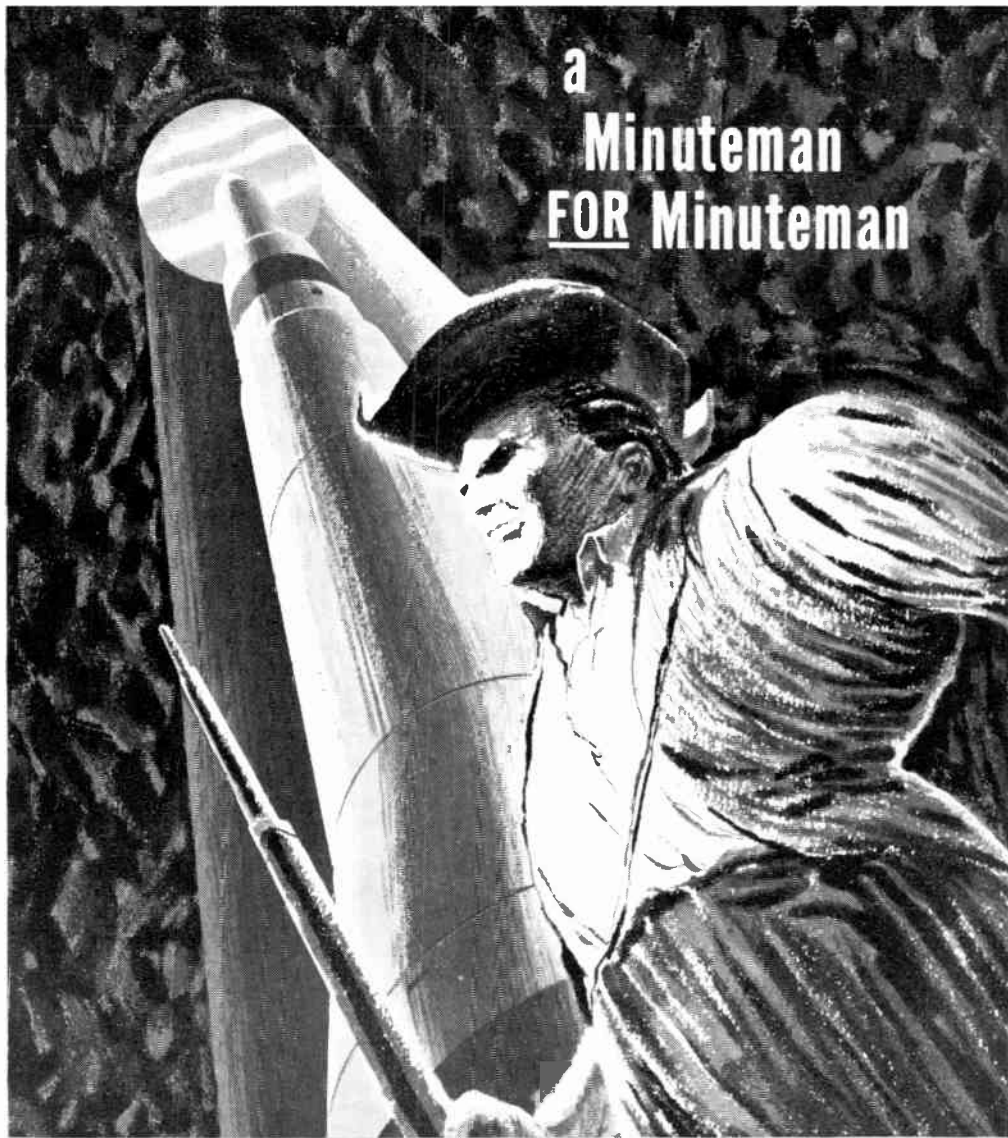
George G. Hoberg (S'48-A'49-M'55-SM'56) has been elected President of Monitor Systems, Inc., Fort Washington, Pennsylvania, a subsidiary of EPSCO, Incorporated.

He was formerly Chief Engineer for Tele-Dynamics Division of American Bosch Arma Corporation. He has also been associated with RCA, Camden, N. J. and Burroughs Corporation, Paoli, Pa.

Mr. Hoberg is a graduate of Villanova University. He holds the M.S. degree from the Massachusetts Institute of Technology, and has studied at the University of Pennsylvania. He is active in the American Institute of Electrical Engineers. He holds nine United States patents and is the author of a number of technical papers.

(Continued on page 100-A)

a Minuteman FOR Minuteman



Protecting the Air Force's Minuteman against accidental or deliberate firing by unauthorized persons will be one of several functions of an improved ground electronics command and control system currently being developed by SES—Central and her sister SES facilities. Terms of this prime contract also provide for continuous control of unmanned missile sites, monitoring operational readiness and, if needed, transmitting of firing orders and target information.

CONTRIBUTORS URGENTLY NEEDED to man this and other recently-acquired programs include:

ELECTRONIC SYSTEMS ENGINEERS with experience in Space Communications Systems, Command and Control Systems, ECM Systems, Navigation Systems, Instrumentation Systems or Systems Requirements.

DESIGN/DEVELOPMENT ENGINEERS familiar with Digital Communications Design, Transmitter-receiver Design, Antenna Design or Solid State Circuit Design.

PROJECT ENGINEERS with administrative abilities to assume program responsibilities. Must have thorough knowledge of the design and development of equipments.

We are located ten miles northeast of Buffalo in the picturesque suburban village of Williamsville.

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Government Systems Management
for **GENERAL TELEPHONE & ELECTRONICS**

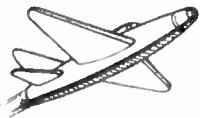


*Please send resume in confidence to
Robert E. Artman*

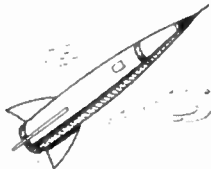
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ENGINEERS • PHYSICISTS



Expansion of our Electron Tube operation in commercial, industrial and military markets has created several outstanding opportunities for qualified candidates.



Engineers and Physicists with experience or interest in R&D, Product Design, Manufacturing Engineering, or Application Engineering are invited to explore immediate openings in the following areas:

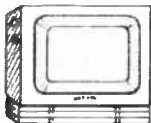
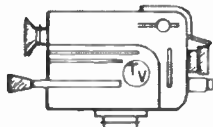


IMAGE TUBES. Storage tubes and devices, image display devices, pick-up tubes, circuitry.

CATHODE RAY. Black and white picture tubes, industrial and military, radar display devices.



POWER TUBES. Radiation detectors, industrial R.F., mercury pool, high vacuum switch, communication.

MICROWAVE TUBES. Magnetrons, klystrons, TWT's, special electron devices, fundamental study programs on interaction circuits, beam study programs.

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Write or send resume to:

Mr. Wm. Kacala, Technical Recruiting
P.O. Box 284, Elmira, New York
or phone collect REgent 9-3611



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- LOGIC DESIGNERS
- PROJECT ENGINEERS
- ADVANCED ELECTRONICS

Scientists and engineers needed with experience in all phases of digital computer and control system design.

Systems organization, logic design, magnetic core and drum memories, dynamic analysis, and electro-optical correlation devices. Also advanced areas such as high-speed tunnel-diode techniques, thin films, and hybrid analog-digital techniques. Applications include airborne digital equipment, numerical machine control, photogrammetric equipment, and special-purpose control computers. Both commercial and military programs, emphasizing advanced development and research. We think you will find this work unusually stimulating and satisfying. Comfortable and pleasant surroundings in suburban Detroit.

If interested, please write or wire A. Capsalis,
Research Laboratories Division, The Bendix Corporation,
Southfield, Michigan.

Research Laboratories Division



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IRE People



(Continued from page 99A)

Alfred Multari (M'56), Vice President and former Director of Engineering of Tempo Instrument Inc., has been appointed Technical Director of all company activities.



A co-founder of Tempo, he is a graduate of the City College of New York and the Polytechnic Institute of Brooklyn, and is a member of Tau Beta Pi and Eta Kappa Nu. He is a recognized authority in the field of transistor digital and analog computer circuits. At American Bosch Arma Corp. he had design responsibility for the electronic equipment employed in the B-52 Fire Control System. Prior to his present position, Mr. Multari was in charge of all circuit development at Servomechanisms, Inc., specializing in advanced transistor digital computer circuits. His original work in that field has led to numerous patent applications.



Jacques Murachver (M'53) has been promoted to Product Sales Manager of Components for Edgerton, Germeshausen and Grier, Inc. He will be responsible for the company's thyratron, krytron, flash tube, triggered spark gap and milli-mike lines.

Before joining Edgerton, Germeshausen and Grier, Inc., Mr. Murachver was associated with Sylvania Electric Products, Inc., in the capacities of R/D Test Engineer, Applications Engineer, and Supervisor, Engineering Test Laboratory. Most of his work was in magnetrons, thyratrons, planar triodes, and microwave tubes.

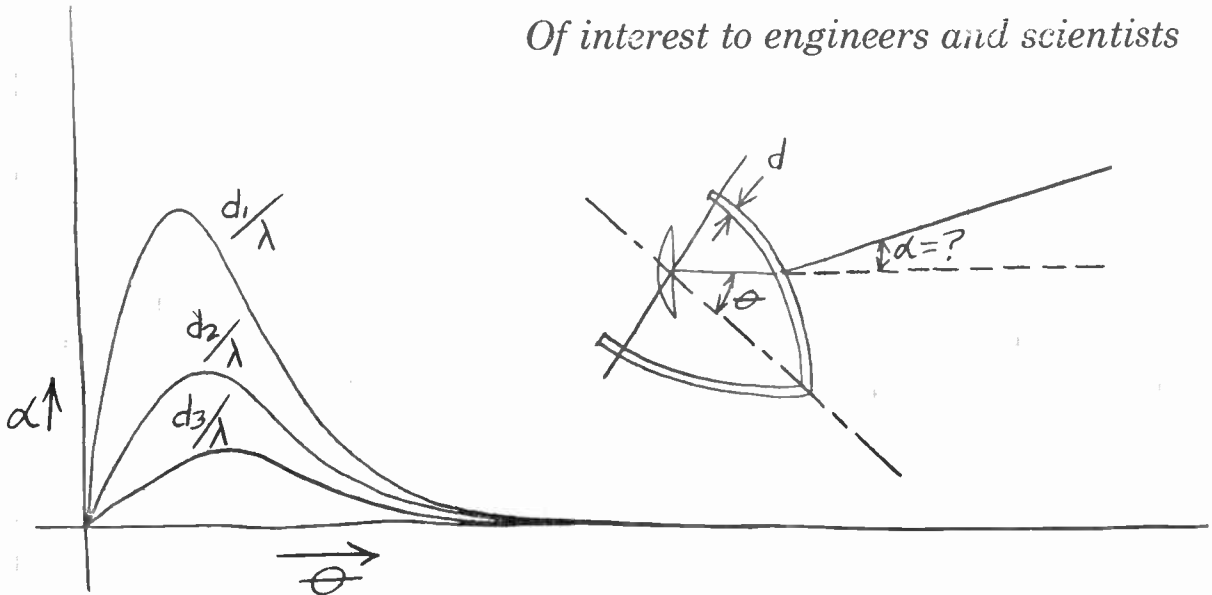
Mr. Murachver holds the B.S. degree in electrical engineering from the University of Massachusetts and has done graduate work at Northeastern University. He is a member of the Radio Club.



John R. Pierce (S'35-A'38-SM'46-F'48) and **Alton C. Dickieson** (SM'44-F'60) of the Bell Telephone Laboratories were named "Aerospace Men of the Year" by the Air Force Association at its annual convention held in Las Vegas, Nevada, September, 1962. They received the General H. H. Arnold Trophy, AFA's

(Continued on page 102A)

Of interest to engineers and scientists



ELECTROMAGNETIC WINDOWS

...one of more than 500 R & D programs under way at Douglas

Douglas is engaged in an intensive program to further development of radomes and antennas that will operate with precision in high performance missile and re-entry vehicle applications.

The following are a few of the areas under investigation: methods of radome construction to extend the usefulness of presently known materials to temperatures beyond present state of the art limits; new materials that will provide "see through" capabilities at temperatures all the way up to 6000°F; methods of measuring electrical properties of dielectric materials at elevated temperatures.

Urgency of this research is emphasized by the mechanical and electrical inadequacy of fibre-laminates at the temperature levels of high-speed technology.

Of career interest to engineers and scientists

Douglas is seeking electronics specialists and others with disciplines related to aerospace at all degree and experience levels. Applicants can be assured of stimulating work assignments and wide professional growth opportunities as they participate in vital defense, space, research and commercial programs. Some of these undertakings extend 10 years into the future.

Send us your resume or fill out and mail the coupon. Within 15 days from the receipt of your letter, we will send you specific information on opportunities in your field at Douglas.



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Engineering or scientific field

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Senior and intermediate-level engineers will find rewarding careers in responsible positions at Raytheon's ASW Center in the following areas:

UNDERWATER ACOUSTIC SYSTEMS

Will develop advanced underwater acoustic systems concepts of detection, classification, communications and tracking. Applicants must be specialists in communications theory or systems engineers with extensive experience in either sonar, radar, communications, or fire control theory.

WEAPONS SYSTEMS

Will engage in the analysis of weapons systems. Applicants must be specialists in operations research or have extensive experience as weapons systems engineers.

APPLIED RESEARCH

Must have extensive experience in any of these fields: propagation, matched filter theory, pattern recognition, statistical communication theory, underwater communications, statistical decision theory.

Please send resume to:

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Raytheon Company
Submarine Signal Operation
Portsmouth, Rhode Island



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IRE People



(Continued from page 100A)

highest award, for their leading roles in developing the Telstar communications satellite. Dr. Pierce and Mr. Dickieson were cited for "outstanding contributions to aerospace progress in being primarily responsible for the concept, design, systems engineering, and management of the Telstar communications satellite project."

Immediately following the presentation, President Kennedy addressed the Honors Night audience by television in a message relayed by Telstar. He paid tribute to Dr. Pierce and Mr. Dickieson for making possible his unusual "appearance" before the convention.



Robert B. Phinizy (M'54) has been promoted to the position of President and Manager of the Western Division of IMC Magnetics Corp. He was previously Vice President in Charge of Engineering for the division, located in Maywood, Calif.



He has held engineering positions for the past seven years with IMC Magnetics Corp. He is responsible for the establishment of the Western Division synchro product line. Previously, he was Chief Production Engineer with Beckman Instrument, Inc., and was also with Hughes Aircraft Co.

Mr. Phinizy graduated from the University of Arizona in 1951, and did post-graduate work at the University of California from 1951 to 53. He holds several patents on rotary solenoid devices and is a member of the American Institute of Electrical Engineers as well as several fraternal and honor societies.

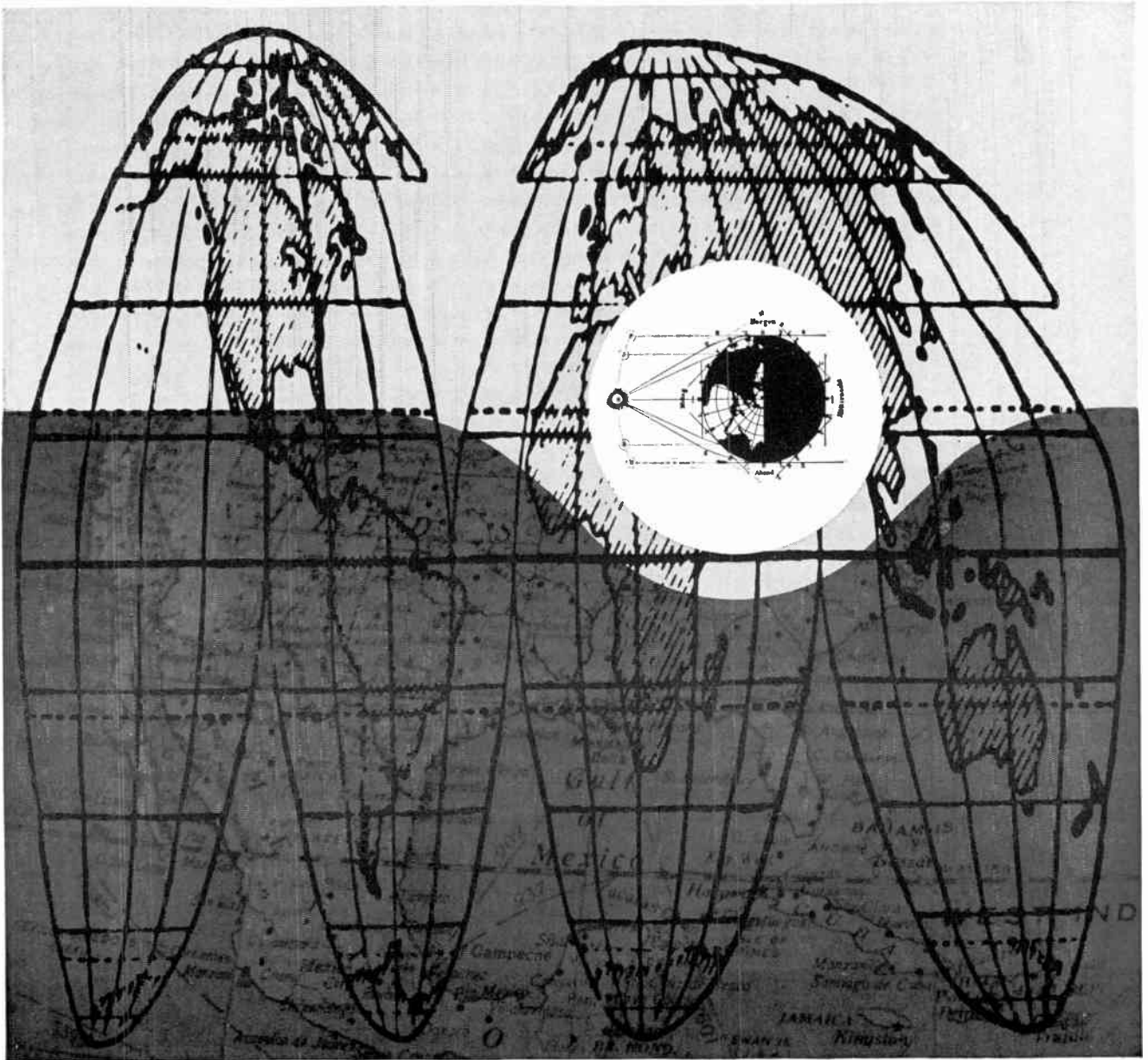


Arthur L. Samuel (A'24-V'A'39-SM'44-F'45) has been named Editor of the *IBM Journal of Research and Development*, a quarterly scientific journal published since 1957. He continues as Director of Research Communications with responsibility for coordinating IBM's internal scientific communications.



He joined IBM in 1949 as Assistant Manager of the Poughkeepsie Engineering Laboratory, heading the research and advanced development program. He was appointed Corporate Research Advisor in 1953, adding the duties of Resident Manager of the Poughkeepsie Research Laboratory in 1957. In April 1961, he was ap-

(Continued on page 101A)



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The men of Aerospace exercise high technical competence and constructive imagination in the creation and assessment of form and configuration for advanced ballistic missile and space systems. □ As a partner of the Air Force-science-industry team, Aerospace Corporation is chartered exclusively to serve the United States Government in this mission. The men of Aerospace provide advanced systems analysis and planning; theoretical and experimental research; general systems engineering and corresponding technical direction of programs. □ Through concept, research, development and completed mission the men of Aerospace improve the form of components, equipments, and systems. Trade-offs and interface considerations are objectively appraised on the basis of performance, reliability, and cost. □ Men with the depth and breadth of experience required to solve these interdisciplinary problems are needed by Aerospace Corporation, an equal opportunity employer. Highly skilled engineers and scientists with advanced degrees are invited to contact Mr. Charles Lodwick, Room 109, Aerospace Corporation, P. O. Box 95081, Los Angeles 45, California. □ Organized in the public interest and dedicated to providing objective leadership in the advancement and application of science and technology for the United States Government.



ELECTRONIC ENGINEERS

Argonne National Laboratory, the largest midwestern research and development Laboratory of its kind, has rapidly increasing needs for creative electronics and electrical engineers in its Particle Accelerator and Electronics Divisions. Argonne is located in the suburban Chicago area, 25 miles southwest of the Chicago Loop.

B.S., M.S. and Ph.D. electrical engineers with three or more years' experience in one or more of the following areas required:

Scintillation and Solid State Spectrometry

- Analog devices such as linear amplifiers and gates
- Pulse multipliers and other particle identification devices
- Analog to digital converters
- Fast analog storage devices
- Multichannel and multi-dimensional analyzers
- Very low and/or very high level counting equipment
- Compact lightweight spectrometric devices

Nanosecond Devices

- Gas, liquid and solid scintillation counters and chambers, Cerenkov counters, solid state counters, spark chambers, and other imaging devices
- Multi-fold coincidence-anticoincidence circuits
- Amplifiers, discriminators, fan outs, mixers and scalers
- Time-to-pulse height converters
- High voltage pulsers and oscillographic devices
- Electron ballistics devices
- Hodoscopes and other counter arrays

Ultra Precise and Stable Nuclear Electronic Devices

- Programmable and manually variable high voltage and magnet current supplies
- Mass spectrometer instrumentation
- Electrometer and other low level measuring, indicating and control devices
- Reactor and accelerator control and safety devices
- Transducers and instruments for the measurement of diverse physical and chemical properties
- Function generators and feedback control devices

Data Processing and Recording

- Logic circuitry design and implementation
- Ferrite core, aperture, thin film and other memories for processing of data in complex nuclear physics experiments
- Electro optical and electromechanical devices
- Data transmission devices
- Adjunct equipment for multichannel and multi-dimensional analyzers
- Multi-scalers and time analyzers
- Analog computers

Other Areas

- High voltage (500 KV) rectifiers and/or components
- Analog and digital pulse circuit design
- Transistor data transmission, processing and recording devices
- Feedback measurement, indicating, and control devices
- Wide-band and low noise amplifiers
- Radiation detectors and associated instruments
- High stability high voltage devices

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IRE People



(Continued from page 102A)

pointed Director of Research Communications at the IBM Thomas J. Watson Research Center, Yorktown, New York.

After two years as an Instructor at M.I.T., he joined Bell Telephone Laboratories in 1928 and for 18 years was engaged in research and development in electron tubes and vacuum tubes at ultra high frequencies. Since 1947, when he was appointed Expert Consultant to the Office of the Secretary of War, he has been Chairman of the Advisory Group on Electron Devices of the Office of the Director of Defense Research and Engineering.

Dr. Samuel received the A.B. degree in mathematics from the College of Emporia, Kansas, in 1923, and the B.S. and M.S. degrees in electrical engineering from M.I.T. He did graduate work in physics at Columbia University, and was awarded an Honorary D.Sc. degree from the College of Emporia in 1946. He is a Fellow of the American Physical Society and the American Institute of Electrical Engineers, and a member of the American Association for the Advancement of Science, the Association for Computing Machinery and Sigma Xi.



W. H. Schaunberg (M'58) has been named Head of Engineering and Development for the VIRON Division of Geophysics Corporation of America. The post involves technical direction and administration of engineering activities associated with the design, development, and fabrication of inflatable devices for use in scientific and military programs in the upper atmosphere and space environments.

He was formerly associated for seven years with Maico Electronics, Inc., of Minneapolis, where he served first as a project engineer and later as Manager of electronics equipment and components development.

Mr. Schaunberg was born in Lomira, Wis., on April 23, 1923. He obtained the B.S. degree in electrical engineering from the University of Wisconsin in 1947, and the M.S. degree there in 1949. He has attended courses in science, engineering, economics, mechanical design, and management at a variety of universities and is presently enrolled in the Masters of Business Administration program at the University of Minnesota. He is an honorary member of the Eta Kappa Nu and Pi Mu Epsilon.

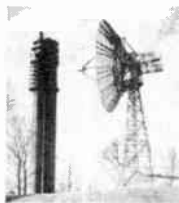


Andrew A. Sterk (A'48-M'55) has recently joined AMF (American Machine & Foundry Co.) Alexandria Division, Alexandria Va., as Manager of the Instrument and Sensor Laboratory. For the last ten years, he was Chief Development Engineer at Philips Electronic Instruments, Mount Vernon, N. Y., where he headed R & D programs in space instrumentation.

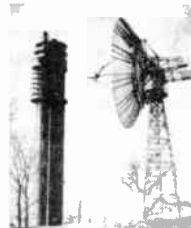
From 1950 to 1953 he was Technical Director of Magnetic Amplifiers, Inc., where he invented magnetic amplifier cir-

(Continued on page 106A)

CLIP THIS DIRECTORY OF IMMEDIATE OPENINGS AT ITT FEDERAL LABORATORIES IN NUTLEY, NEW JERSEY



The 300-foot microwave test tower, and radio telescope (used for satellite tracking, communications and space research) are two distinctive landmarks of ITT Federal Laboratories in Nutley. Here, modern facilities house 17 laboratories engaged in missile and space systems, avionics, communications, research in the physical sciences, and sophisticated electronic manufacturing operations. ■ Today's opportunities are especially well timed for the engineer seeking a significant career jump now, and a progressive series of professional assignments that will provide substantial growth impetus during the months and years to come.



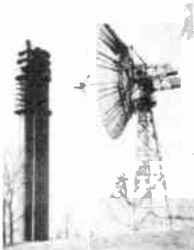
We are most interested in talking with engineers offering backgrounds in any of the areas listed below.

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COMMUNICATIONS

Mechanical Engineer, for antenna design and development. Experience in the field of satellite and missile communication antennas highly valued. Also experience in electronic equipment packaging, servo-systems and structural analysis. 5 years minimum experience.

EE; PhD desirable, with 4 years' experience in sophisticated microwave communications and tracking receivers using coherent detection and signal processing—frequency range, 1,000 mc through 10 kmc; power range, 1 through 50 kw. In addition, at least 2 years' background in communication systems design.



EE, experienced in microwave equipment design; prefer individual with post graduate courses in communications theory.

EE, with heavy design experience in high power amplifiers for communications; background in design of solid state control circuitry and amplifier circuitry in UHF through SHF ranges.

ME or EE, with at least 2 years' experience in electrical design and testing of multi-conductor, power, and communication cables and conductors to mil specs. If an ME, must be familiar with basic principles of electrical

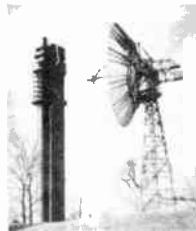


engineering such as attenuation, impedance, etc.

Project responsibility on microwave communications equipment development. Must be capable of supervising design of transistorized transmitters, receivers and modulators... able to handle all phases of proposal preparation.

BSEE or equivalent, with 5 to 10 years' experience in test equipment design and engineering re-design of equipment for manufacturing radio transmitters and receivers in UHF and VHF regions.

EE, with several years experience at major research organization, good background in solid state theory. Specific duties and responsibilities will involve research and theoretical studies on electron tunneling phenomenon in thin films, band structure of wide gap semiconductors.



Physicist, with good background in thermodynamics, high vacuum techniques, or solid state theory for work in thermionics. PhD preferred; MS minimum.

Senior Scientist, theoretically oriented, experienced in communication networks, troposcatter and line-of-sight radio communication and system analysis.

Data Processing Analysis Manager, with 4 to 8 years' experience, including analysis and programming on a large scale digital computer; knowledge of diagnostic, utility and execu-

tive programming; experienced in planning and leading groups of programmers and analysts. BS in Mathematics, Engineering or Physics.

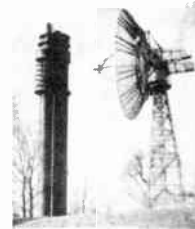
EE, with 5 to 8 years' experience in design and applications of microwave antennas, transmission lines, duplexers, filters and other similar microwave components for tropo and line-of-sight systems.

AVIONICS

Managerial position, calls for 8 to 10 years' experience in the field of project management, demonstrated capability in management of the engineering and production aspects of large electronics systems contracts.

EE, with 4 to 5 years' experience in frequency control or communications field; background in frequency synthesis, HF and UHF communications.

EE, with 6 to 10 years' experience in the airborne electronic field, preferably commercial avionics; ability in the area of video circuitry or airborne communication or navigation equipments.



MISSILES AND SPACE

Senior position involves leadership of structural design group working on satellite and other space-borne payloads. Requires a minimum of 5 years' experience in space vehicle stress analysis.

Forward your resume in full confidence to Mr. W. Bieszard, Box 86-C, ITT-Federal Laboratories, 500 Washington Avenue, Nutley, New Jersey. An Equal Opportunity Employer.

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RADIOWAVE PROPAGATION ENGR.

Will operate transmitters and field intensity measuring and reporting equipment and supervise technicians and non-skilled crew in site installation. Make decisions involving engineering judgement (measurement techniques and procedures) and perform limited field data analysis. BS in EE with experience in communications or field testing. Positions available in Washington, D.C., Arizona, and overseas.

EE, CIRCUIT DESIGN

To work with newly formed tele-products group in Washington, D.C. The position requires a BS in EE and two years' experience in the digital data and logic field. Experience in magnetics as applied to logic circuits and carrier as applied to data field is also desirable. Duties will include circuit design of data equipment in the communications industry.

ELECTRONIC DEVELOPMENT ENGINEER

To participate in R&D in high atmospheric physics, meteorology, and oceanography. Duties include design, development, and test of electronic instruments and equipment. Applicants should have specific experience in physical measurements, electronic circuitry, electromechanical devices and transducers, and data-handling equipment. BS or MS in EE.

SPECTRUM SIGNATURE ENGINEER

Will formulate detailed test plan for signature measurement program as applied to communication, navigation, and radar equipments; devise solutions to other problems connected with spectrum signature measurements and radio frequency interference. BS in EE or equivalent.

Send resume to: Dept. 136
Director, Professional Employment

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IRE People



(Continued from page 104A)

cuits and solid state control systems. Prior to this, he was Assistant Chief Engineer at Federal Manufacturing and Engineering Corp., responsible for development and design of RF signal generators. From 1947 to 1949, he was Senior Development Engineer at Servo Corporation of America, and from 1946 to 1947 he was Research Engineer at Automatic Electric Company.

Dr. Sterk received the M.S. and Ph.D. degrees in electrical engineering from the Polytechnical Institute of Milan, Italy. He is a member of AIEE, ASTM, and EMSA, and the author of numerous publications.



A. D. Suttle, Jr., (SM'56) Vice President for Research at Texas A & M College, College Station, will take a leave of absence to serve as Deputy Director for the special staff group in research and engineering, Department of Defense. The special staff group is one of the major divisions of research and engineering in the Department of Defense, coordinating the activities of other divisions within Research and Engineering office.

Since joining the Texas A & M faculty and staff in July, 1962, he has been planning, developing and coordinating research activities on campus. Before coming to Texas A & M, he was Director of the Mississippi Research Commission and Vice President for research and graduate studies at Mississippi State University. Previously he was a research scientist with Humble Oil and Refining Co. His principal areas of research include the application of radio chemistry techniques to refining problems and the initiation and development of a broad program in radiation chemistry. More recently, his interests have been in the application of prompt nuclear devices as sources of energy for various purposes.

Dr. Suttle graduated with highest honors from Mississippi State University in 1944. He received the Ph.D. degree at the University of Chicago. He is the author of scientific articles and inventor or co-

inventor of 25 patents or patent applications in the United States and Britain.



George R. Tallent (M'59) has been promoted to Director of Reliability and Quality Control for Motorola Semiconductor Products Inc. He is responsible for the total reliability and quality control activity including inspection, in-process quality control, test instrumentation and standards, quality and reliability assurance, and special high-reliability studies.



Prior to being appointed Director of Reliability and Quality Control, Tallent was Manager of Transistor Production and was responsible for fabrication and assembly of all transistors manufactured at Motorola Semiconductor. In 1960, he was Program Manager of Motorola Semiconductor Products Division's Autonetics Minuteman Reliability Program, Mesa Product Group. In this position Tallent was responsible for program direction and coordination of engineering, production, quality control, and marketing efforts. Before joining Motorola Semiconductor Tallent was Manager of Quality Control and Reliability in the Semiconductor Operations of CBS Electronics. He also served at RCA, Victor Division as a Quality Control and Manufacturing Engineer on cathode ray tubes and electron tube component parts.

Mr. Tallent received the B.S. degree in Statistics from Boston University. He also attended Northeastern University and Lowell Technical Institute, both in Massachusetts, where he studied electronic engineering. Tallent is a member of the American Management Association. He is the author of an article on "Reliability of NPN Switching Transistors."



Emanuel Poulos (M'60), Vice President and Chief Engineer of Research, has been appointed Head of the new Department of Advanced Engineering of Tempo Instrument Inc., Plainview, N. Y. He will be responsible for research and development of all new products.

(Continued on page 108A)

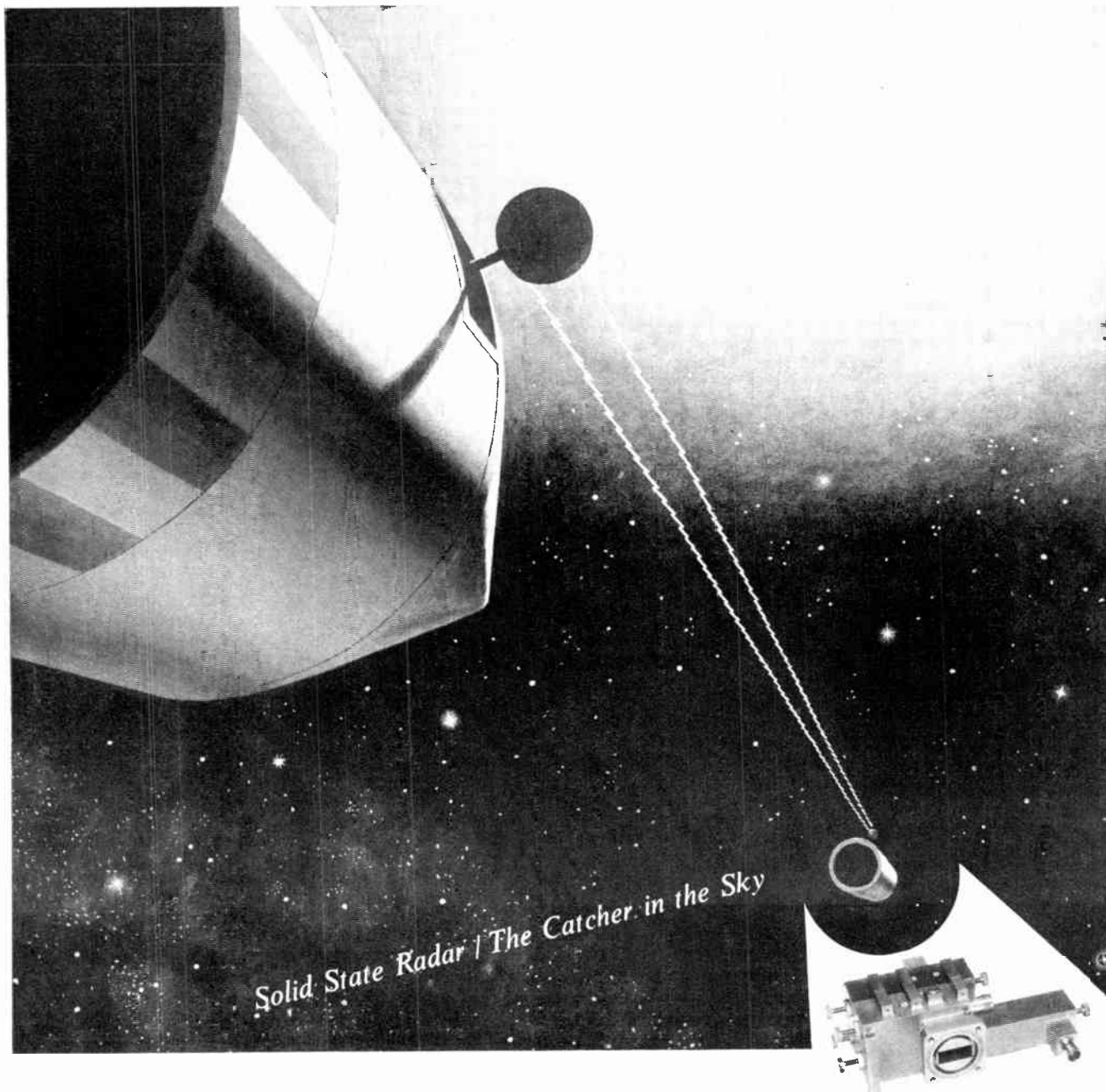
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Solid State Radar | The Catcher in the Sky

A new solid state radar system built by STL engineers and scientists can send out and receive signals at X-band frequencies to help man rendezvous and dock vehicles in space. STELATRAC is its name. It is the first solid state system of its kind. The X-band transmitter is shown above. It has successfully passed temperature and vibration tests. STELATRAC can also be used as a command link between vehicles in flight. By altering its module design, the flexible radar system operates as an altimeter and doppler velocity sensor to guide spacecraft safely to the surface of the moon and planets. Today STL is busy on many such projects as STELATRAC. STL is also prime contractor for NASA's OGO and a new series of classified spacecraft for Air Force-ARPA. And STL continues Systems Management for the

Air Force's Atlas, Titan and Minuteman programs. These activities create immediate openings in Theoretical Physics • Systems Engineering • Radar Systems • Experimental Physics • Applied Mathematics • Space Communications • Antennas and Microwaves • Inertial Guidance • Analog Computers • Solid State Physics • Computer Design • Telecommunications • Space Physics • Digital Computers • Guidance & Navigation • Electromechanical Devices • Engineering Mechanics • Aerodynamics • Propulsion Systems. For Southern California or Cape Canaveral positions, write Dr. R. C. Potter, Department 112, One Space Park, Redondo Beach, California, or Box 4277, Patrick AFB, Florida. Your inquiry will receive a prompt reply. STL is an equal opportunity employer.



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PhD, with 2-3 years experience, preferably in semiconductor materials or devices, to assume major responsibility in experimental program of applied nature on electronic components, involving investigations of semiconductors, ferroelectrics, conductive oxides, insulators, thin films, and composite materials. Excellent opportunity for advancement within steadily expanding technical department of medium sized company long established in components field. Position is located at new laboratory facilities in Niagara Falls, New York. Direct replies to:

Director of Research
Speer Carbon Company
Packard Rd. at 47th St.
Niagara Falls, New York



IRE People



(Continued from page 106A)

An outstanding specialist in the development of linear and digital pulse transistor circuits, he obtained his undergraduate and graduate schooling at the City College of New York and Adelphi College. His experience before joining Tempo included advanced research and development at American Bosch Arma Corp., and Servo-mechanisms, Inc., where he worked with a wide range of electronic equipment.



Marcel Wallace (A30 SM'43), Founder, Board Chairman and Research Director of Panoramic Electronics has been appointed as Consultant for Singer Metrics, Division of The Singer Manufacturing Co. Panoramic was recently acquired by Singer.



He is noted for his pioneering of some of the major scientific achievements of recent years. His basic inventions have resulted in more than 50 electronic instru-

ments, many of which made significant contributions throughout World War II. Most noted among these was the visual frequency scanning instrument, which could quickly locate and intercept enemy radio transmissions; analyze radar signals and expedite radar countermeasures. One of his early pioneering developments, in 1923, was the design and marketing of a batteryless ac-de radio receiver—the forerunner of millions of such receivers produced today.

He also visualized, and was active in the early development of radio beam navigation—a principle adopted nearly thirty years later. His look into the future requirements of air navigation resulted in a precision instrument which showed altitude separation of aircraft, thus permitting the "stacking" of planes waiting to land. The more than 60 patents bearing his name have provided new possibilities for advanced spectrum analysis, radio band supervision, instantaneous direction finding methods, telemetry communications and navigation instrumentation.



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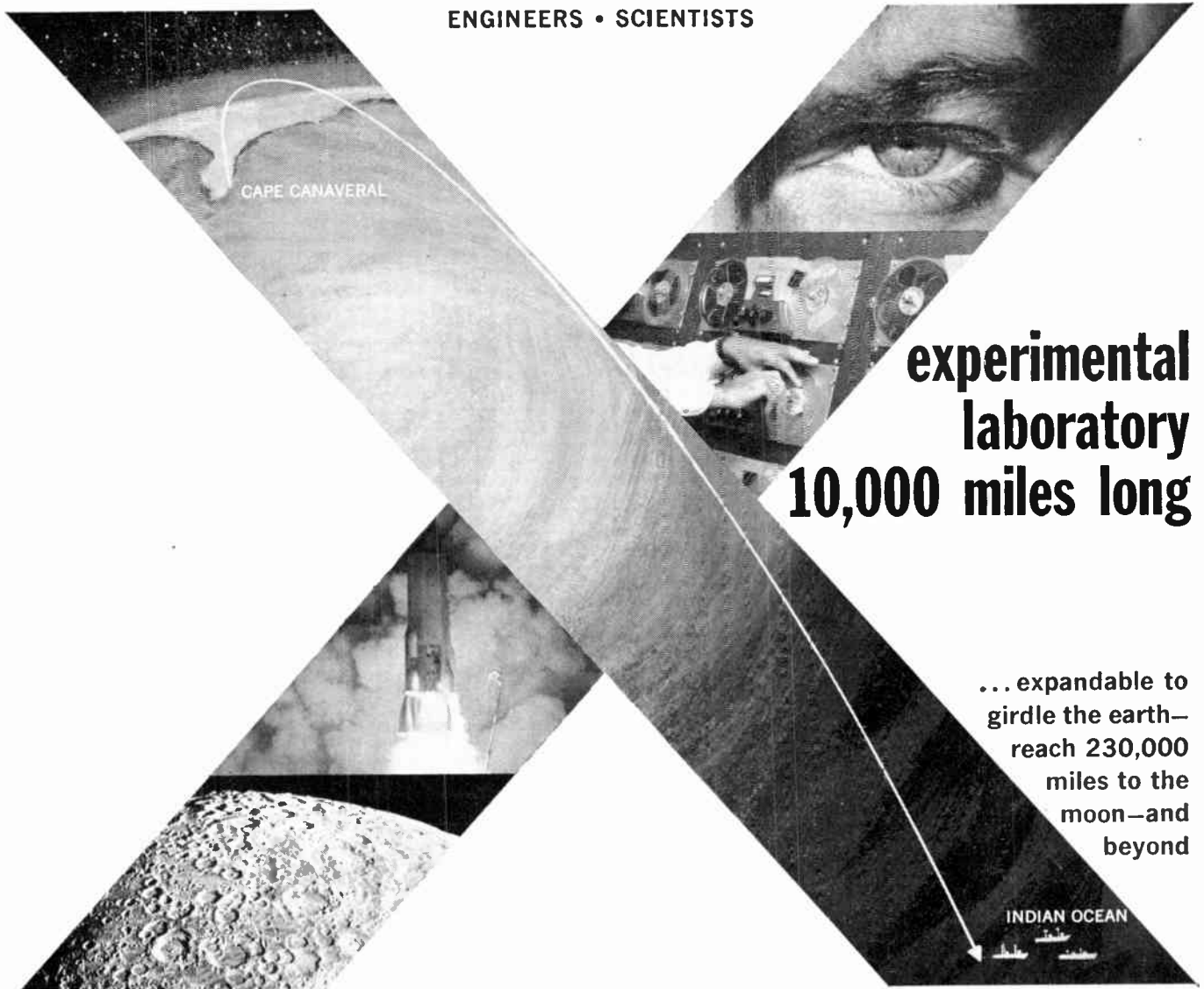
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reach 230,000
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moon—and
beyond**

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This is the giant laboratory where the nation's major missile systems and space vehicles come for their crucial flight tests, research, and development, under a true operating environment. It's more than hemisphere long, for ballistic missiles. Linked with other national ranges, it provides orbital coverage and impact location, as in recent Mercury launches. Right now, Advanced Planning Groups are working to raise its capabilities to encompass recording all relevant data from lunar flights, including voice communications. Already solutions for problems of data acquisition from the interplanetary missions of the 70's are under study. □ Taken all together—this is a task of great magnitude in which PAN AM's Guided Missiles Range Division is by no means alone. In carrying out the triple responsibilities assigned the Division by the USAF for range planning, engineering, and operation, PAN AM cooperates with many segments of American industry:

- **GMRD**, by designing individual range instrumentation systems to match the requirements of each new program, collaborates with Range Users, who create the new vehicles and spacecraft.
- **GMRD** works closely with the radar, telemetry, computer and communication industries providing specifications and technical direction for the development of new equipment.
- **GMRD** and its subcontractors operate and service the tracking and other electronic equipment of the range.

In addition, PAN AM provides launch and operations support at Cape Canaveral and Down Range.

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Instrumentation Planning Engineers, EE, Physicists with specialized knowledge in advanced instrumentation systems
Technical Staff & Advance Planning Groups MS, PhD—Physics • Electronics • Mathematics • Celestial Mechanics • Astronomy**

Why not write us today, describing your interests and qualifications in any of the areas above. Address Dr. Charles Carroll, Dept. 63M, Pan American World Airways, Incorporated, P.O. Box 4465, Patrick Air Force Base, Florida.

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GUIDED MISSILES RANGE DIVISION

PATRICK AIR FORCE BASE, FLORIDA

Senior Design Engineer

Pulse Power Equipment

TECH/OPS has developed a new ultra-high power, high voltage pulse discharge system which develops voltages in excess of 100,000 volts and delivers energies up to 200,000 joules. The system has a wide variety of applications in industrial, medical, and government research programs. Among the many uses of the system are high temperature generation, hypervelocity and exploding wire studies, pressure and insulation testing, and weapons effect studies. Two systems have already been built and are in operation. We are about to start work on two more.

Development of this system has led to the formation by TECH/OPS of a division to market, engineer, and produce this equipment. Creation of the Pulse Power Division has made available an opportunity with unusual growth potential for a very senior project engineer with a demonstrated capability to take equipment at the laboratory stage and transform it into a fully engineered product. The man we seek must have substantial design experience in such fields as electrical energy storage systems, pulse transformers, vacuum systems and techniques, high current switches, and related areas. Accelerator experience would be particularly desirable.

The man selected for this position will play a key role in the development of this device into a commercial reality and will hold a senior position in the TECH/OPS Pulse Power Division. The compensation will be on a commensurate level. Initially the position will be in Burlington, Massachusetts. At a later date, the operations of the Pulse Power Division will be assigned to San Carlos, Calif. All replies treated in strict confidence.

ROBERT L. KOLLER

TECHNICAL OPERATIONS, INC.

Burlington, Massachusetts

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NEWS New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 12A)

Multiplexer

Towson Laboratories, Inc., 200 E. Joppa Road, Baltimore 4, Md., now has available a Caplexer, capacitive sampling multiplexer, which is compatible with its airborne and ground based capcoders. A single plug-in board accommodates four channels of analog information with external programming. Any number of channels can be handled by appropriate assemblies of plug-in boards.

Analog inputs in the range of 0 to ± 10 volts can be sampled with effective sampling apertures of 0.25 microsecond or less at rates as high as 200,000 per second. Sampling errors of less than 0.5 millivolt are available. Single ended or balanced inputs can be provided. Complete freedom from common mode problems is possible on balanced input devices. Cross-talk is unusually low with the technique.

Caplexer incorporates low-pass sampling filter characteristics with wide range of filter properties possible. Filters are available ranging from simple RC type to more elaborate RLC combinations. An active low-pass filter is available which is small, simple and uses very little power

and has the unique advantage of complete freedom from DC amplifier drift.



The photo shows a 32 channel caplexer. Included in this unit is a charge transfer amplifier arranged to provide an output of ± 2.5 volts for full scale inputs of ± 250 millivolts. External programming is employed. Power consumption of a typical 32 channel unit at maximum sampling rate is less than 1 watt.

For further information contact the firm.

(Continued on page 112A)



Granger Associates: Impetus in hf communications

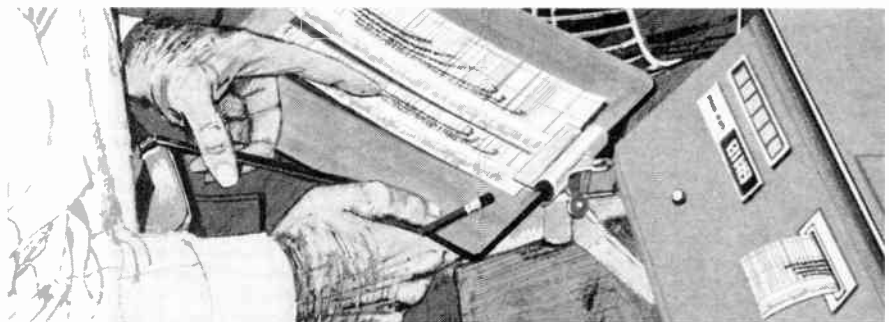
G/A is the pacemaker in translating hf communications research into practical hf hardware. Its management is composed of engineers. Its emphasis is on proprietary developments. An example of



Granger Associates proprietary product development is shown in our advertisement on page 7A. If you are qualified to contribute to developments such as this please contact Jerry Franks.

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seeks the creative engineer and scientist to become a vital part of a rapidly expanding Engineering Department probing the vast and challenging region of microwave theory and technique. Openings exist for those men who have the imagination, resourcefulness and sufficient background in the following areas:

CIRCUIT DESIGN ENGINEERS

E.E. or Physics grad. with 4 or more years experience in design of electronic circuits and sub-systems. Background in transistorized pulse, gating or I.F. circuit development is required.

SENIOR SYSTEMS ENGINEERS

To contribute to advanced techniques in the field of electronic instrumentation. Should have at least 6 years experience including recent work in system analysis, synthesis and integration. An advanced degree in E.E. is desired.

SENIOR APPLICATIONS ENGINEER

B.S.E.E.—5 years experience in electronics—solid state or related microwave fields. Must have experience in commercial and military sales, sales objective forecasts, microwave components. Must be capable of developing sales contacts, establishing sales objectives and meeting forecasts.

APPLICATIONS ENGINEER

B.S.E.E. or equivalent experience. Minimum 5 years experience in sales covering military and commercial contacts. Must be familiar with system instrumentation such as automatic check-out equipment for beacons, telemetry, etc. and spectrum surveillance instrumentation. Must be responsible for establishing sales objectives and meeting forecasts.

SENIOR RELIABILITY ENGINEER

Career opportunity. Head up all engineering aspects of reliability and coordinate other departments activities in this area. Perform reliability analysis and MTBF predictions. Conduct design reviews, analyze parts, failure reports and prepare technical reports. Three years reliability engineering experience on full-fledged reliability programs plus minimum of 2 years in circuit design, derating and redundancy techniques, etc. Must have B.S.E.E. with suitable academic background in mathematics.

RESEARCH

A few unusually challenging openings are available for individuals with Ph.D. or equivalent backgrounds.

Master of Engineering degree (University of Florida) may be obtained locally under company-paid program.



Contact: Mr. R. C. Carroll,
Employment Supervisor
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Emerging problems have led to openings for:

Applied Meteorologists and Seismologists to explore

- New areas of instrumentation for nuclear detonation detection
- Extra terrestrial/terrestrial interaction Telluric currents

Microwave Physicists for studies of

- Microwave plasma interactions
- Microwave parametric amplification

Maser-Laser Engineers and Physicists to

- Investigate techniques of utilizing Masers and Lasers in electronic systems

Electromagnetism Theorists for research in

- Space reconnaissance and exploration

Molecular Circuit Designers for developmental research on

- Thin films • Polycrystals
- Monocrystals

Systems Theory Specialists for studies of

- Optimal control techniques
- Coding systems
- Statistical decision processes
- Network theory • Sampling systems

Applied Mathematicians for Research in

- Information theory
- Switching theory • Digital theory
- Analog to digital conversion processes
- Stochastic processes • Error analyses

Scientists and engineers with PhD, MS or equivalent experience are invited to communicate with John Haverfield, Manager, Professional Placement,



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Who we are: Engineering-Physics has a professional staff of fifteen, of whom two have Ph. D. degrees and seven have M.S. degrees. The company was started two years ago by Dr. Vincent Cushing, who now serves as president and technical director. All stock in the company is held by staff members.

What we do: We are prime contractors to Army, Navy, Air Force, NASA, and the Advanced Research Projects Agency. We are engaged in the study and development of highly sophisticated but practicable instruments used in rocket engine controls, space research, cryogenic systems, explosion research, and study of nuclear weapons phenomena.

Where we work: We occupy a small and modern building in a residential suburb of Washington, D. C. The laboratory is well equipped and includes an IBM 1620 computer. Public schools in the area are rated among the best in the nation; five nearby universities offer graduate courses. You have a choice of city, suburban or country living.

Your inquiry will be answered immediately. Write to: Mr. R. M. Kimzey

Engineering—Physics



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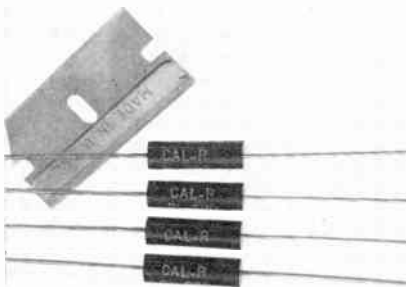


These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 110A)

Inductive Resistor

A series of inductive resistors for use in low frequency Flip-Flop circuits, developed by California Resistor Corp., 1631 Colorado Ave., Santa Monica, Calif., helps insure true readings from the logic circuits.



These very small units of the RL Series can protect against false readings by preventing the logic module from acting more than once when an abnormally long timing signal occurs.

A nominal inductance of 275 microhenries is typical of RL Series resistors.

Other characteristics include nominal resistance of 1400 ohms; power rating of $\frac{1}{8}$ watt minimum at 55°C; self-resonant frequency above 5 mc. The RL Series resistors are encased in molded epoxy with a 0.200" diameter and 0.700" length. The resistors meet applicable environmental requirements of Mil-R-105091D.

This firm, also produces designs to meet specific requirements submitted by customers. For further information on these and other precision resistors, contact the company direct.

Test Chamber for Doppler Microwave

Production-testing of microwave equipment will be made simpler by a new test station developed by Burche Microwave Division of Ovitron Corp., Melrose, Mass. The Burche anechoic chamber is said to be the only one being produced specifically to meet the requirements of assembly-line test of doppler microwave components and systems.



(Continued on page 111A)

ELECTRONIC ENGINEERS FEDERAL AVIATION AGENCY DUTY IN ALASKA

Career opportunities with the Federal Aviation Agency in Alaska. Apply the latest knowledge of electronics to air traffic control, avionics, telecommunications, and air navigation aids in the installation, modification and maintenance of electronic systems on Federal airways.

Additional training provided at Government expense, to keep abreast of technical advancements in the Electronics Field, through assignment to the Federal Aviation Academy located at Oklahoma City, Oklahoma.

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RETIREMENT	25% COST-OF-LIVING ALLOWANCE

REQUIREMENTS

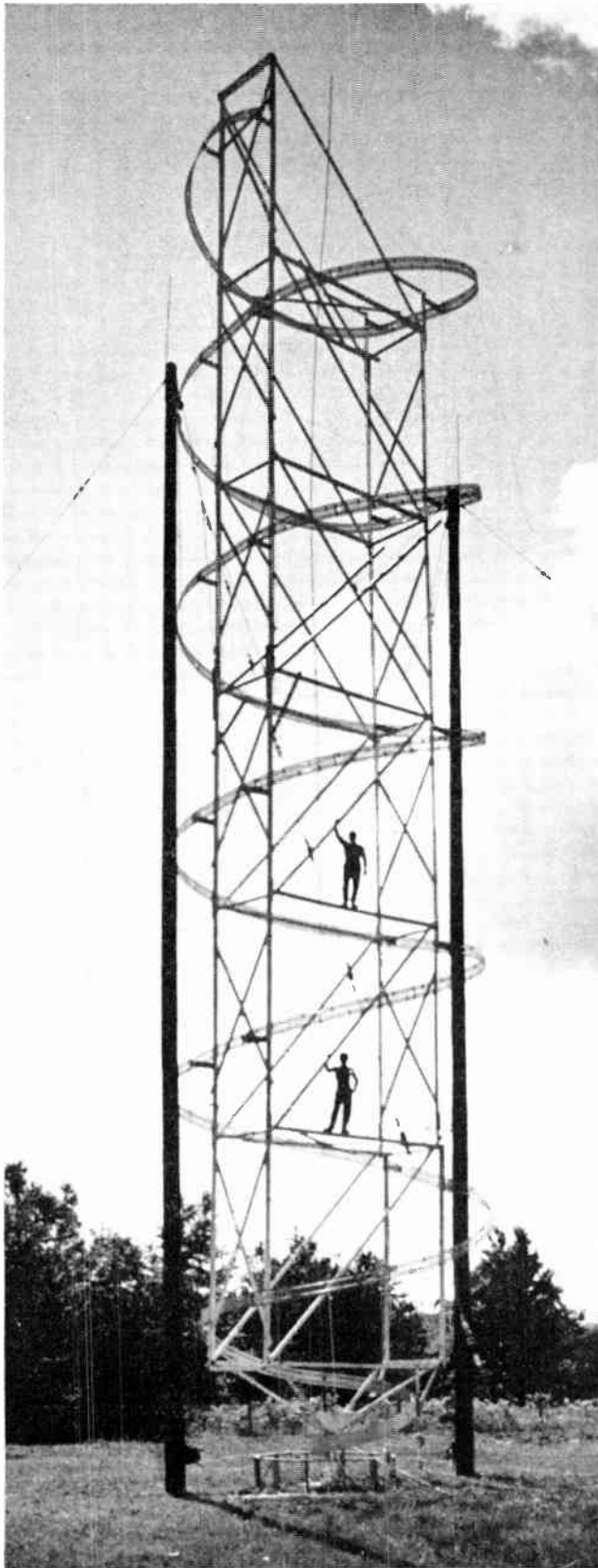
Applicants must be United States Citizens and possess BSEE degree from accredited engineering school or demonstrate comparable background through Civil Service Engineering examination. In addition to minimum experience and training requirements, applicant must have had professional engineering experience as indicated below for each grade:

GRADE	BASE SALARY	GROSS SALARY	EXPERIENCE REQUIRED
GS-5	\$5,365	\$ 6,702.25	None
GS-7	6,465	8,081.25	1 Year
GS-9	7,125	8,906.25	2 Years
GS-11	8,575	10,718.75	3 Years
GS-12	9,475	11,843.75	3 Years

Gross salary includes 25 percent Alaskan cost-of-living allowance which is non-taxable for Federal Income Tax purposes. Engineers in travel status away from the Anchorage headquarters receive a travel allowance. The best qualified applicant will be selected regardless of race, color, creed or national origin.

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High standards assure even higher creative achievements . . . the goal of the Electro-Physics Laboratories. This 100 foot HF helical antenna designed and built by our scientific and engineering staff is exemplary of the many unusual antennas used to increase our capabilities in experimental investigation of ionospheric phenomena. Its development is in keeping with the continuous quest for knowledge by our staff. Other advanced projects being undertaken at this time include the development of unique long distance communications techniques, and the investigation of upper atmospheric phenomena by means of unusual rocket probe techniques.

The Electro-Physics Laboratories offers outstanding career opportunities to creative scientists and engineers . . . imaginative men able and eager to work at the periphery of scientific knowledge. Research staff members at the Electro-Physics Laboratories guide their projects from the concept stage through applied research to prototype development. Efficient administrative support is provided which permits the members to focus their full talents on the scientific aspects of assignments. The significance of our research effort gives each member the satisfaction of contributing both to science and to our national purpose.

For additional information, please send your resume to:

Dr. John M. Kelso
Director of Research

ELECTRO-PHYSICS LABORATORIES

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a
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RESEARCH
DEPARTMENT**

This group is now forming at Bell Aerosystems Company to perform a variety of investigations in the aerospace field. Current studies are on advanced high-performance chemical propellants, nuclear propulsion systems and electrical propulsion devices in the very low-thrust ranges. Other planned projects include energy conversion for new sources of electrical power for space equipment, space dynamics, solid state physical materials, and the effects of radioactivity in the Van Allen Belt on rocket engine components and other materials for space applications.

Available to staff members are the most modern research tools, including an IBM 7090 computer, and extensive test facilities. In addition, researchers at Bell benefit from the knowledge and experience of the men responsible for the XP 59, America's first jet airplane, the world's first jet VTOL aircraft, the highly reliable AGENA rocket engine, the SKMR-1 HYDROSKIMMER, the largest ground effects machine in the United States, and the first completely automatic, all-weather aircraft landing system.

Inquiries are invited from Scientists and Engineers with advanced degrees in electronic engineering, physics, metallurgy and nuclear physics. Please write to Mr. T. C. Fritsch, Dept. SB.



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DIVISION OF BELL AEROSPACE CORPORATION - A **Textron** COMPANY

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(Continued from page 112A)

Production-line testing of doppler systems has hitherto been complicated by the fact that the simulation of free space in a small area is extremely difficult. The energy sent out from a microwave antenna—which is normally dissipated into free space—reflects from nearby surfaces and sets up interference patterns, with the result that hot spots and null points are built up. Existing test stations are made with straight sides, and rely almost entirely on the efficiency of an absorbent material—usually a horsehair matting—or on the insertion of multiple baffles in the walls, to absorb the energy. In the Burche station, the construction of the chamber causes it to act as an efficient baffle, and a polystyrene-based solid absorber designated BL-2 further increases operating efficiency.

Absorption of -60 db is standard; in some parts of the chamber, the absorption figure is even higher, with highest absorption recorded for incidence angles of 90°. The energy is not absorbed on the first bounce, but reverberates in multiple bounces until absorbed, without returning to the radiating body being tested.

The Burche test station was designed primarily to test doppler systems, which generally put out an average power of about 1 watt or less. The station routinely handles such systems, but can also be built with added baffles if the systems to be tested require a higher absorption figure. The chamber is effective across the spectrum from 8.2 to 15 gigacycles (the effectiveness of the chamber is cut off by its physical design below 8.2 Gc; legal regulations prohibit doppler use above 15 Gc.).

The chambers are built to test systems, not just antennas. The configuration is ideally suited for testing doppler systems with lens-antenna assemblies; for paraboloid antennas, a different chamber configuration is employed. Most doppler systems are now built with lens-antenna assemblies, and most are being built to operate in the 13.2-Gc. region of the spectrum, so that a standardized test-chamber design is now economically practical. The Burche chambers are built to order to meet customer requirements; standardized basic design is equipped with various types of internal test and measuring gear—receiving horns, phase shifters, turnstile junctions, and so forth—as required by the user.

**Power Supply for Airborne
Computer**

A compact power supply capable of furnishing four independent supplies totaling 175 watts from an overall unit size of 10" long, 2" wide and 6" high, has been developed by Industrial Control Products, Inc., Caldwell Township, N. J.

(Continued on page 116A)

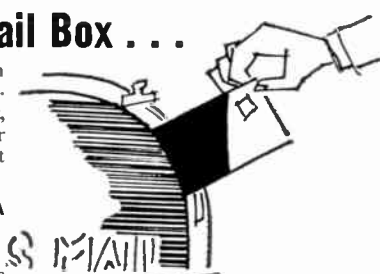
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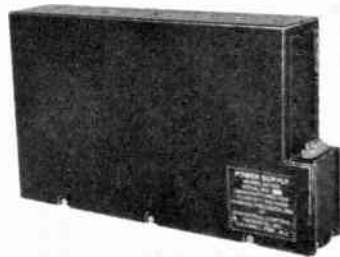
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HUGHES AIRCRAFT COMPANY



(Continued from page 111A)



Conceived as a power supply for an analog type airborne computer where space for the power supply is severely limited, the unit required a precisely regulated reference supply and other DC voltages, closely regulated, for the operation of the computer.

Designed to be mounted on a 100°C "cold" plate to operate in an ambient of 125°C, the four-in-one power supply is also designed to perform under the variations of 400 cps input voltage and frequency in accordance with MIL-STD-704.

The reference supply furnishes 25 volts with a regulation of $\pm 0.02\%$ or 5 millivolts over the full input voltage range and the full range of ambient temperature. The maximum temperature coefficient as measured in $0.0015\%/^{\circ}\text{C}$.

The three other supplies furnish main power at 28 volts, 5 amperes, 25 volts at 1 ampere, and 60 volts at 80 milliamperes. All four supplies are independent and fully isolated from each other and the incoming 400 cps power.

A data sheet is available from the firm.

Closed Circuit Television Tape Recorder

The new closed circuit television tape recorder, the MVR-10 developed by Mach-Tronics, Inc., 185 Evelyn Ave., Mountain View, Calif., was demonstrated publicly for the first time in June in San Francisco. A technical presentation of the various features of the recorder was made, as well as the actual recording and playing back of tapes in order to indicate the quality of both the audio and video signals. As indicated in the initial announcement that stated that such a recorder had been developed, pricing, specifications and availability were also announced.



(Continued on page 118A)

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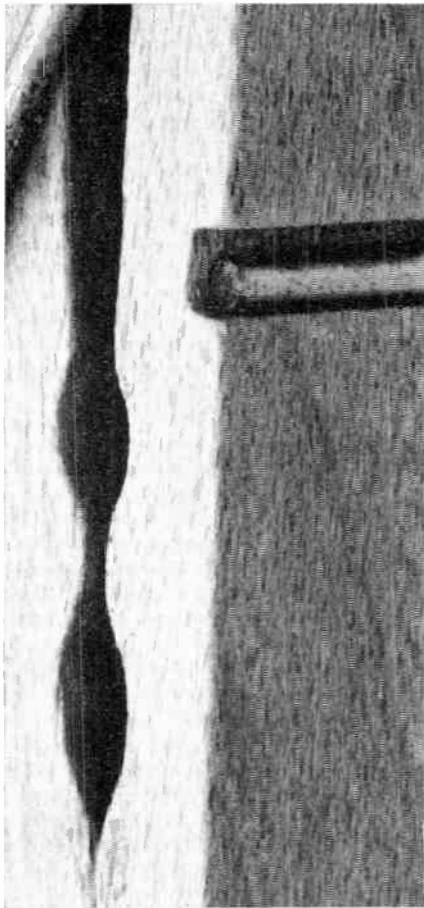
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NEWS New Products



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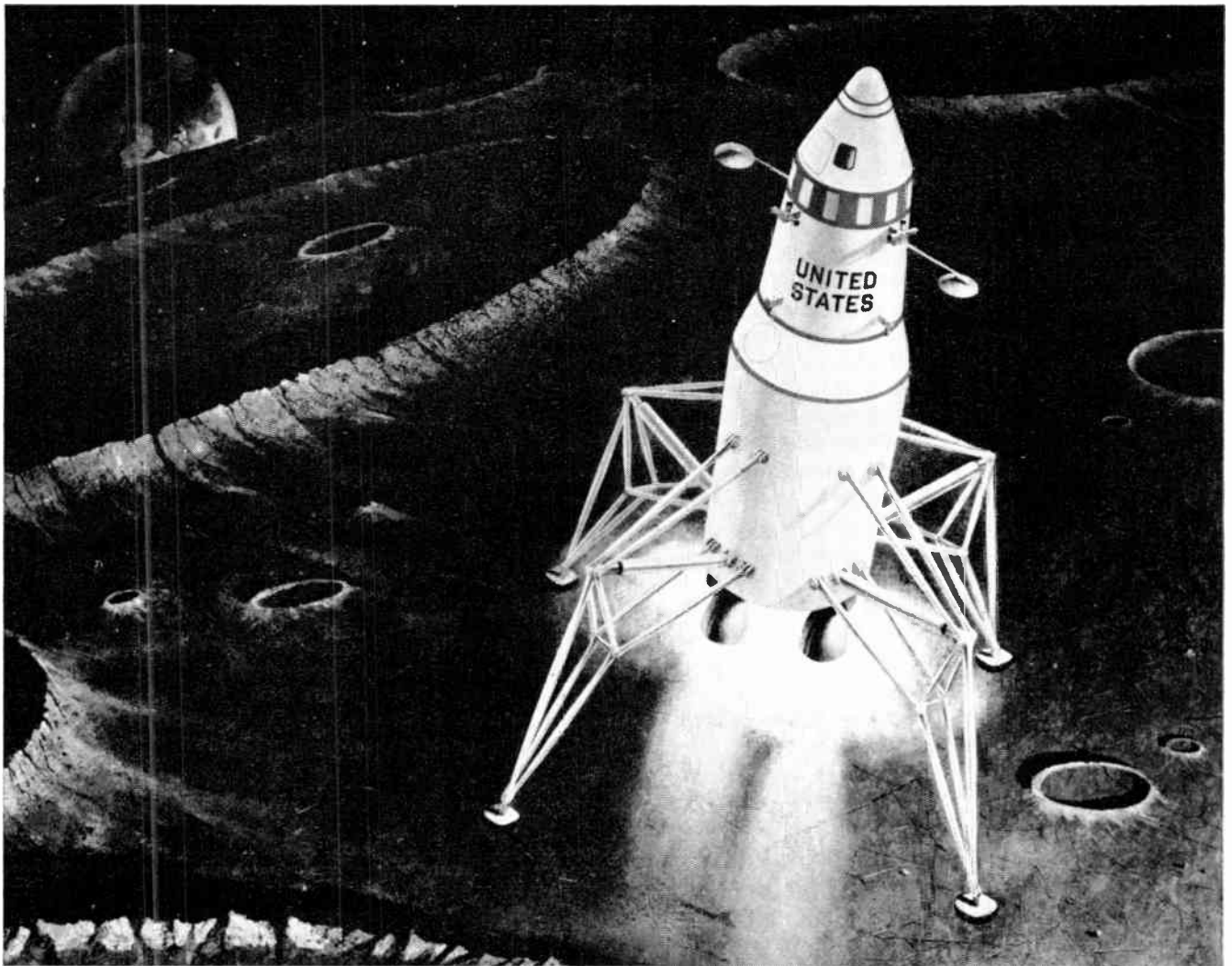
(Continued from page 116A)

The recorder measures 24"×11"×15", weighs 90 pounds, and will sell for \$10,300, F.O.B. Mountain View, Calif., with the integral 8" television monitor. The price of the recorder without the monitor will be \$9,800. This price is said to be lower than that of other closed circuit television recorders which have been announced by other firms. This factor coupled with the operational savings made possible by the fact that the recorder uses one inch tape rather than two inch, and runs at 7½ inches per second, means that many new markets heretofore restricted by economic considerations will now have access to a recorder designed to meet their needs. Additionally the ability to store 96 minutes of information on a tape will be a very significant advantage in many applications of the recorder.

All tapes recorded on the MVR-10 will be interchangeable with respect to their ability to be played back on any other MVR-10. This feature will be extremely important in those cases where there is a very definite need to exchange instructional or training tapes prepared by educational institutions or various groups within the military.

The recorder employs the helical scanning principle with two video recording heads which are placed 180 degrees apart. Each head records one field of television information so that a complete rotation of the scanning assembly makes one complete frame. The video frequency response of the recorder will be ±3 db, from 30 cps to 3 mc with reference to 100 kes and down no more than 6 db at 3.5 mc. This frequency response plus a signal-to-noise ratio of 40 db or better rms noise to peak to peak video results in a picture of a quality equal or better to that seen on most home

(Continued on page 121.)



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(Continued from page 118A)

television sets. Machein stated that the subjective response of those individuals who have seen the recorder in operation, with respect to picture quality, has been overwhelmingly favorable in every instance.

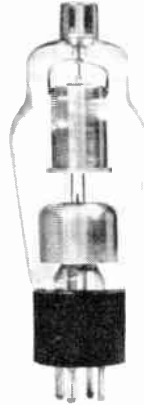
Trigger Current

A new hermetically-sealed all-purpose packaged trigger circuit for use with silicon controlled rectifiers is now available from VecTrol Engineering, Inc., 85-100 Magee Ave., Stamford, Conn. VecTrol, a subsidiary of the Sprague Electric Co., supplies control for SCR circuits.

The new VecTrol Bridge Flat-Top Drive fires on SCR twice during a 360° current cycle. It controls proportionately either ac or dc power output. Only a 5 mw control signal is required. The packaged circuit has four control windings to provide for multiple control circuit functions. The device is fail-safe. Loss of control signal completely removes the gate pulse from both half-cycles. It has been engineered so there is no accidental firing in alternate half-cycles and there is no power cutoff through pulse overdrive. The constant pulse amplitude avoids gate overloads.

The new drive has a linear phase shift of firing angle and permits shifting the SCR output over a full 180° without bias. With it, silicon controlled rectifiers are operable safely up to 90% of their nominal dc rating. Three different designs of the unit are available to meet different equipment needs.

Half-Wave Vacuum Rectifier



A new high-power half-wave vacuum rectifier, designated Type 5825 is announced by United Electronics Co., 42 Spring St., Newark 4, N. J. The Type 5825 is a ruggedized, long-life tube intended primarily for use in high voltage power supplies, and high-voltage RF power supplies. Maximum inverse plate

(Continued on page 126A)

alpha >.003924

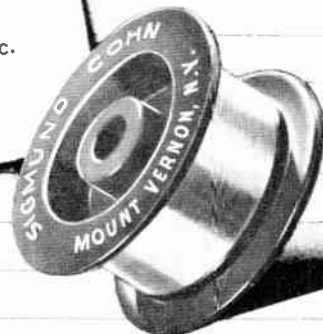
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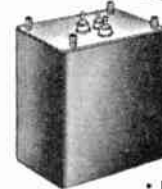
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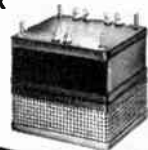


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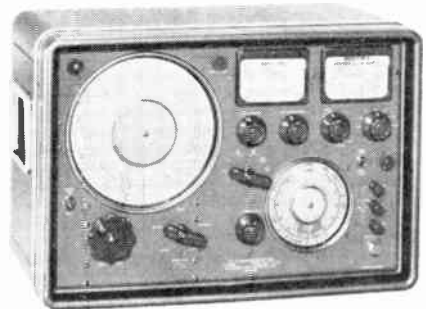
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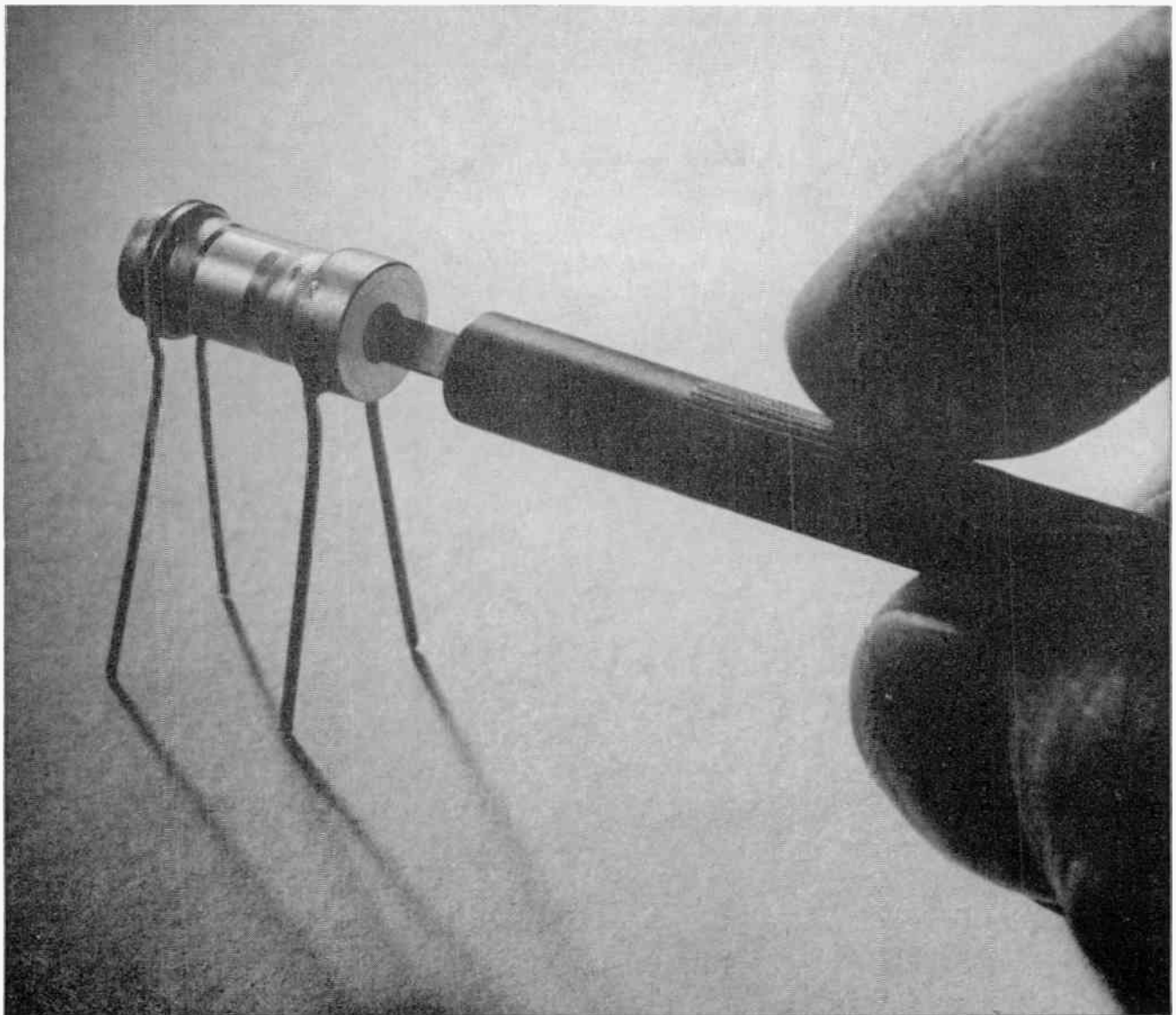
This new Delco 250 VA power supply converts 28 volts DC to 115 volts, 400 cps. Its circuits are a model of simplicity.

The unit is designed for continuous full-load operation at 71 degrees C. still air, yet weighs only 10 lbs., measures 6 $\frac{1}{4}$ " x 7 $\frac{3}{8}$ " x 5". A minimum of components assures extra-high reliability.

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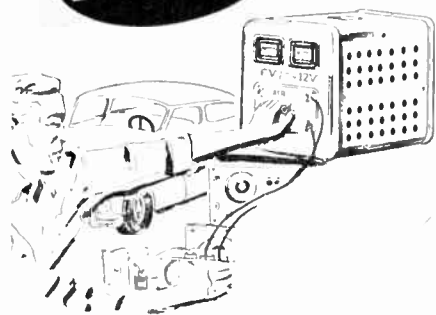
Dimensions: panel mount, $\frac{2}{64}$ " to $1\frac{3}{32}$ " behind panel, $\frac{1}{4}$ " front of panel; printed circuit, $\frac{2}{64}$ " to $1\frac{3}{32}$ " overall.

You can get *fast* delivery on Corning Mini-Trimmers from your nearest Corning distributor. You can get more information and data sheets fast from us—Corning Glass Works, 3902 Electronics Drive, Raleigh, N. C.

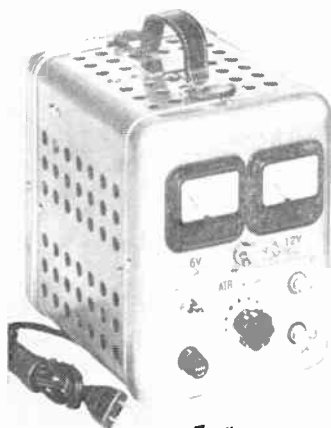
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(Continued from page 121A)

voltage is 60,000 volts, peak. Maximum peak plate current is 40 milliamperes. The tube is contained in an ST-16 bulb with medium shell small 4-pin basing.

Full technical data on the Type 5825 are available on request.

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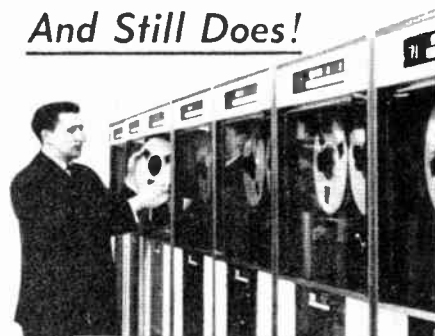
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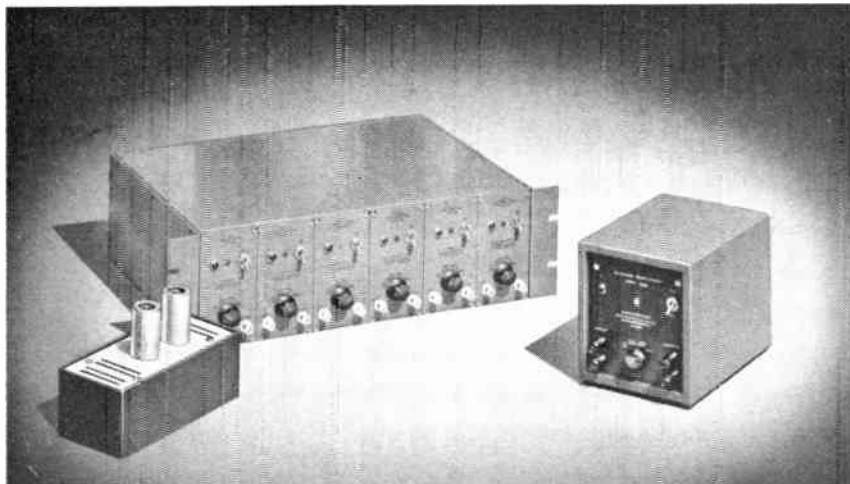
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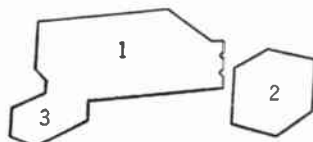


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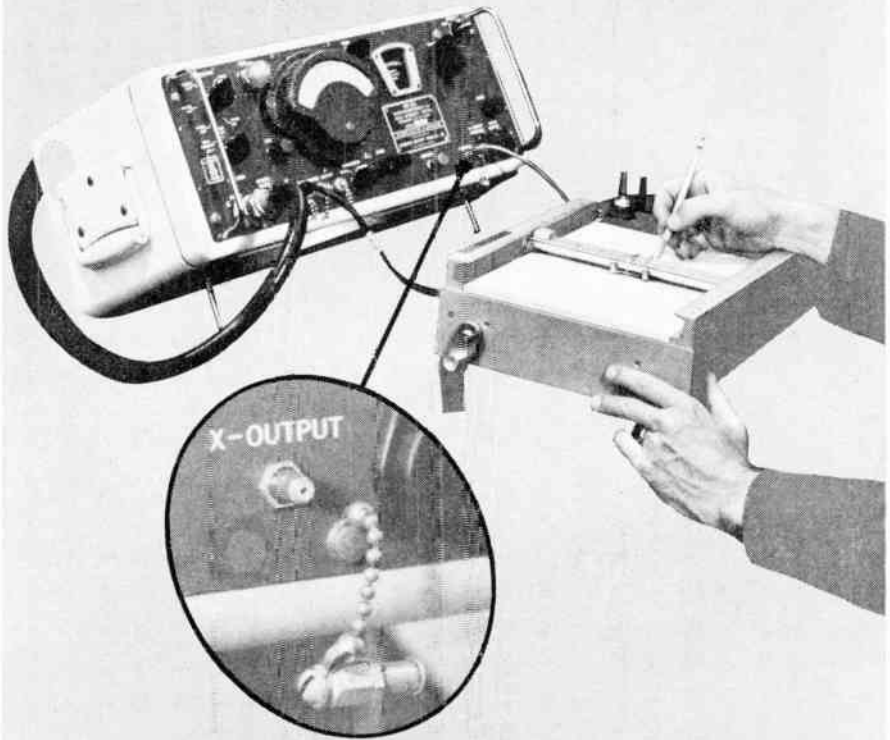
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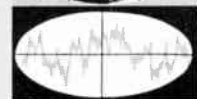
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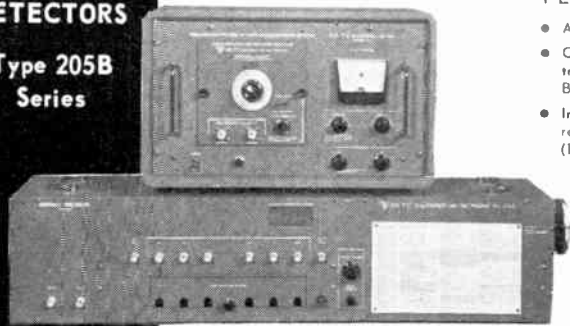
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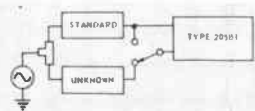
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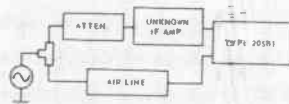
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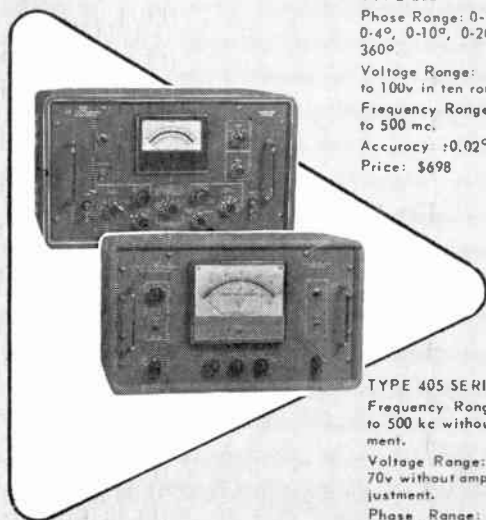


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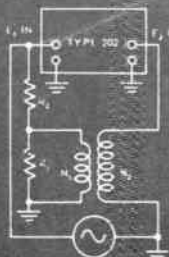


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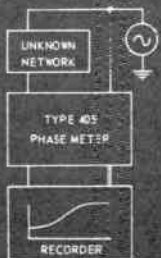


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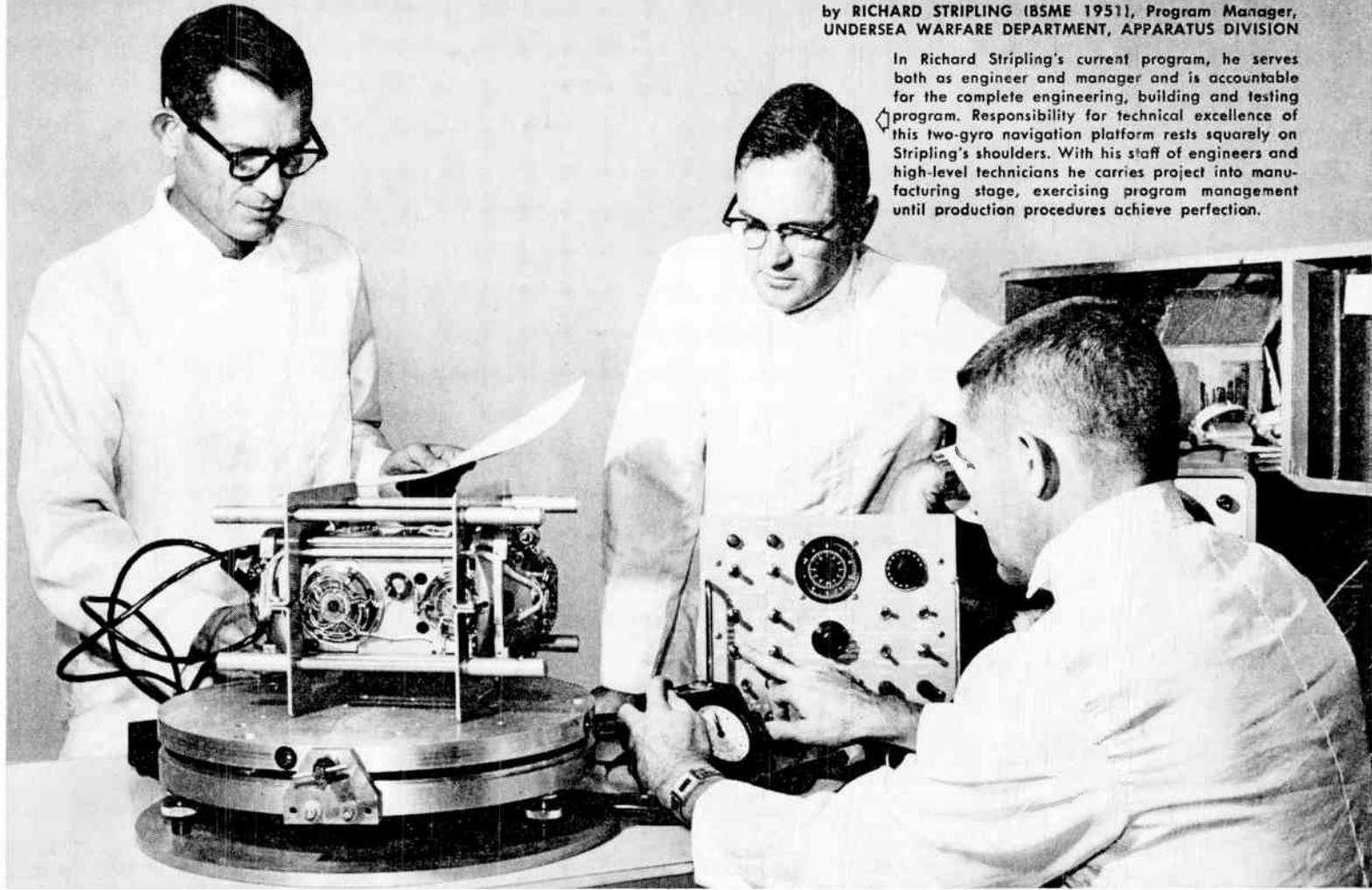
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by RICHARD STRIPLING (BSME 1951), Program Manager, UNDERSEA WARFARE DEPARTMENT, APPARATUS DIVISION

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APPARATUS DIVISION



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INCORPORATED

6000 LEMMON AVENUE

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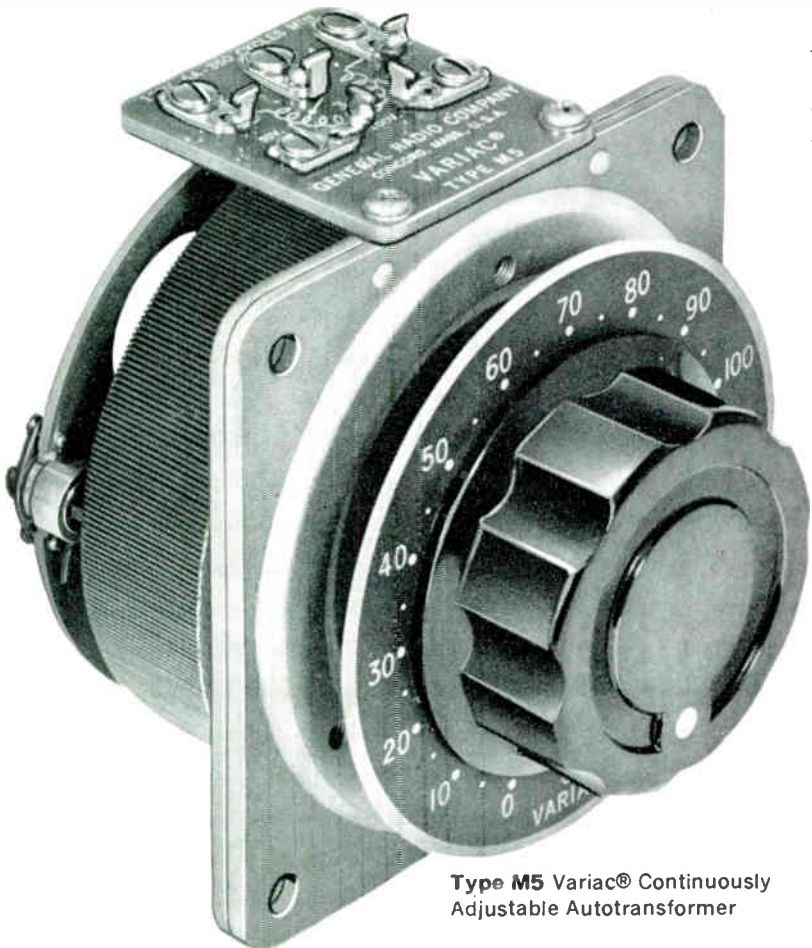
An Equal Opportunity Employer

World Radio History

Militarized Variacs



for 350- to 1200-cycle applications



Type M5 Variac® Continuously Adjustable Autotransformer

- ★ Approximately 60% lighter in weight than their 60-cycle equivalents.
- ★ Built to withstand shock, vibration, and extreme environments . . . meet many military specifications.
- ★ Moisture-fungicide protected.
- ★ Core completely enclosed by two cup-shaped winding forms of molded phenolic, not fiber or tape wrap-arounds — precision molded grooves insure positive positioning of turns.
- ★ Patented DURATRAC brush contact surface prevents track deterioration and permits momentary overloads up to 1000% without damage.
- ★ Triple Formvar-coated copper wire provides high breakdown strength between banked turns at elevated temperatures.
- ★ Terminal board equipped with both screws and soldering lugs — imprinted with terminal numbers, wiring diagram, and nominal voltage between taps.
- ★ Large radiating surface — protects brush and track from heat damage.
- ★ Counterbalanced rotating parts hold setting under shock and vibration.
- ★ Low-loss, high-silicon steel, strip-wound core.
- ★ Brush designed for constant and correct contact pressure.
- ★ Resin-impregnated glass cloth insulation between coil and base.
- ★ Winding taps concealed for protection from damage.
- ★ 2-ampere model (Type M2) has over 400 turns for applications requiring high resolution.
- ★ Overvoltage taps standard on all models.
- ★ Ganged and motor-driven models available.

Continuously Adjustable Output Voltage from 0-120 volts or 0-140 volts

TYPE	RATED INPUT VOLTAGE	LINE-VOLTAGE CONNECTION				OVERVOLTAGE CONNECTION		NET WEIGHT POUNDS	PRICE
		OUTPUT KVA AT MAXIMUM OUTPUT VOLTAGE	RATED OUTPUT CURRENT AMPERES	OUTPUT VOLTAGE RANGE	MAXIMUM OUTPUT CURRENT AMPERES	OUTPUT VOLTAGE RANGE	*RATED CURRENT AMPERES		
M2	120	0.37	2.4	0-120	3.1	0-140	2.4	2	\$14.50
M5	120	0.94	6	0-120	7.8	0-140	6	3½	18.50
M10	120	1.56	10	0-120	13	0-140	10	6½	30.00
M20	120	3.12	20	0-120	26	0-140	20	13	48.00

*Rated current should not be exceeded for the overvoltage connection.



Write for the new Variac Bulletin.

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