MELPAR-A-GRAPH

MELPAR, INC. • A SUBSIDIARY OF WESTINGHOUSE AIR BRAKE CO.

Volume 6, Number 3 May, 1961

MELPAR AWARDED AUTONETICS CONTRACT

Company to produce high reliability circuit board assemblies and modules for the Air Force Minuteman ICBM electronic systems using production techniques developed by Autonetics, a division of North American Aviation, Inc.

The announcement by E. M. Bostick, President and Chief Executive Officer, on Wednesday, May 17, 1961, of the signing of a major subcontract with Autonetics climaxed a group effort by the successful Minuteman Proposal Team appointed last December by W. C. Purple, Vice President of Engineering and Manufacturing. Mr. K. E. Schreiber, leader of the proposal effort, noted that "there were many others in addition to the team members who participated in and made major contributions to the proposal. The performance of all concerned was an illustration of truly fine teamwork which will be continued and expanded during the program." Selection of Melpar for this contract was made after an exhaustive evaluation of twenty-seven firms who submitted detailed bids.

The Minuteman Proposal Team will form the nucleus of Melpar's new Minuteman Division to be located at the Leesburg Pike Plant according to K. E. Schreiber, Manager of the new division. Formation of the Minuteman Division to produce high reliability circuit board assemblies and modules to be used as "electronic building blocks" in the inertial guidance, flight control, and ground checkout systems which Autonetics produces for the Minuteman, and naming of Mr. Schreiber as its manager was announced on 25 May 1961, by Mr. Purple. According to Mr. Bostick and Mr. Purple, the new division will receive the same close attention and support from Melpar's management as was given the Minuteman Proposal Team.

Melpar will use electronic components developed during the past two years by Autonetics in conjunction with its thirteen high reliability program contractors. This development program for up-grading the reliability of semiconductors will eventually result in components one hundred times more reliable than those available at the start of the program. The meaning of Autonetics stringent reliability objectives is illustrated by the following example (used in Aviation Week, December 12, 1960)—if every component of a typical home TV receiver were to have the identical "mean-time-between-failure" rate currently required for Minuteman, it might operate continuously without failure for 25,000 years. Autonetics will make available to Melpar the production know-how developed in the assembly of the specialized components for the high reliability circuit boards and modules by its Minuteman manufacturing personnel.

U.S. Air Force Photo

SHATTERING ALL EXISTING FIRST FLIGHT RECORDS established in the research and development of long range ballistic missiles, this Air Force Minuteman ICBM was launched from the Air Force Missile Test Center, Cape Canaveral, 1 February 1961, on a successful 4600-mile test. Autonetics, a division of North American Aviation, Inc., produced the Minuteman guidance and flight control systems. Never before have all the stages of a multi-stage ICBM functioned on the first flight. And, never before on a first flight has the guidance system placed the re-entry vehicle on target. Melpar became a member of Autonetics Minuteman team on 17 May 1961, when a subcontract was awarded to produce high reliability circuit assemblies and modules to be used in the all-inertial autonavigator and ground checkout systems which Autonetics produces for Minuteman.

MELPAR ADDS NEW DOLLARS TO BOOKS DURING APRIL—HIGHEST SINCE JAN '60

According to Mr. N. J. Sargis, Director of Contract Administration, new dollars put on the books during April for new contracts, amendments and change orders totaled nearly five million dollars. Mr. Sargis observed that this is the largest amount of new money added to the Company's books for any month since January 1960. This is in addition to the $7,461,588 reported in the last issue for the first quarter of 1961 and brings the total for the year to $12,413,660 through April 30.

MELPAR HOLDS FIRST STOCKHOLDERS MEETING

The first public stockholders' meeting in the history of the Company was held 5 May 1961, at the Falls Church Plant.

Mr. Bostick advised those assembled at the meeting that, although the Company's sales and earnings were down for the first quarter compared with last year, a shift in emphasis in its military electronics work from manned aircraft systems to space electronics systems, increased emphasis on research, and an aggressive acquisition program will "over a period of time" better the Company's position.

The stockholders elected to office for the coming year the following incumbent members of the board of directors: Thomas Meloy, Chairman of the Board; Edward M. Bostick, President; Edwin C. Hodge, Jr., Chairman of the Board and President of Pittsburgh Forgings Co.; A. King McCord, President, Westinghouse Air Brake Company; Eric A. Walker, President, the Pennsylvania State University.

Formerly a wholly owned subsidiary of Westinghouse Air Brake Company, Melpar offered 210,399 shares of its capital stock to WABCO shareholders last September.

Following the stockholders meeting, the Annual Meeting of the Board of Directors was held at which the following Melpar Officers were elected:

Thomas Meloy, Chairman; E. M. Bostick, President and Chief Executive Officer; Arthur C. Weid, Executive Vice President; C. B. Raybuck, Vice President for Contract Management; R. T. Cosby, Vice President, Treasurer and Assistant Secretary; W. C. Purple, Jr., Vice President for Engineering and Manufacturing; Robert E. Miller, Vice President for Engineering Services; R. H. Wood, Secretary; J. A. Carlson, Assistant Secretary; Joan L. Fletcher, Assistant Secretary and Personnel Director; and N. J. Sargis, Assistant Secretary and Director of Contract Administration.

FREE ENTERPRISE STARTS YOUNG. Actor Cary Grant, Melpar stockholder, looks over stock certificates of another shareholder, Beverly Hills 8th Grader Geraldine Schnieders. The 13-year-old California girl learned about the stock market as part of her arithmetic studies at school. Learning that Geraldine was to attend Melpar's first stockholder meeting, Mr. Grant asked her to make notes and give him a report on the proceedings when she returned. Geraldine flew to Washington for the meeting, accompanied by her mother, Mrs. Aleta Schnieders.

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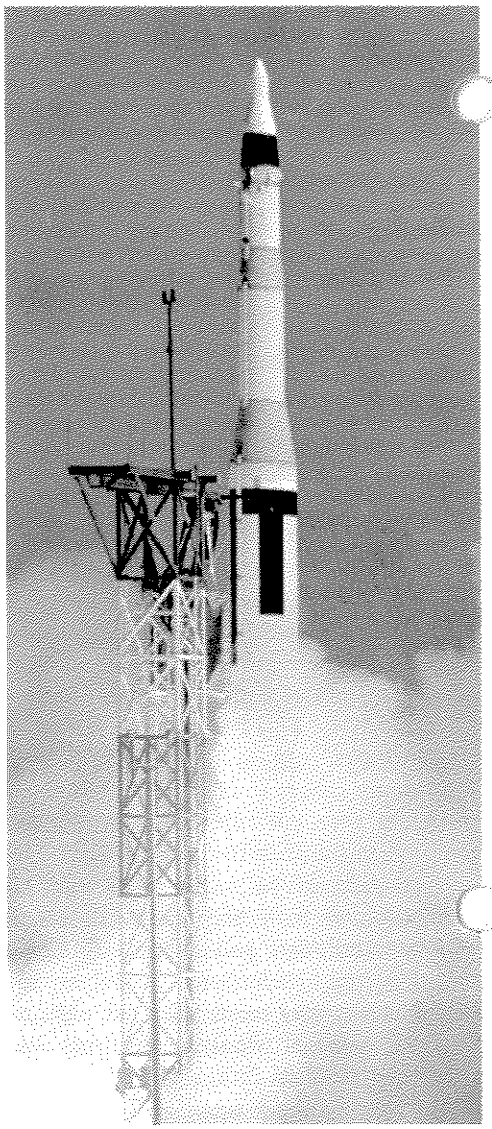
THIN FILMS PAPER PRESENTED AT 1961 ELECTRONIC COMPONENTS CONFERENCE

H. E. Culver, Supervisor of the Molecular Circuits Branch, presented a paper entitled "The Use of Rhenium in Thin Film Resistors" to the 1961 Electronic Components Conference in San Francisco on May 4th. The paper was co-authored by Dr. Charles Feldman, Head of the Physical Electronics Section of the Research Division.

The paper reported experimental evidence confirming the stability of rhenium films and discussed their properties as electrical resistors. The authors report that, due to the high degree of stability of rhenium film resistors, values of resistance from ten ohms per square to several thousand ohms per square may be successfully programmed. With improved high temperature potting material, practical film resistors, with low temperature coefficients, may operate to over 500°C.

The authors conclude that by employing thin film techniques developed by Melpar's Research Division, resistors can be provided for thin film circuits meeting any anticipated power requirements.



U.S. Air Force Photo

The United States first solid propellant ICBM, the Minuteman, will continue in flight test at Cape Canaveral for some time, while at Vandenburg AFB, California, underground silos are being constructed to provide for operational systems test later this year.

SYKES ELECTED PRESIDENT OF MANAGEMENT SOCIETY

Mr. H. F. Sykes, Assistant to the Executive Vice-President, has been elected President of the Washington Chapter of the Society for Advancement of Management (S.A.M.) for the year beginning July 1, 1961.

The Society is a recognized professional organization of management people in industry, commerce, government and education with national, regional a chapter activities. The purpose of S.A.M. according to its constitution, is ". . . to conduct and promote scientific study of the principles governing organized effort in industrial and economic life . . . for the general betterment of society . . ."

A New Decade, An Expanding Frontier

Mary Flaherty, ASD Secretary, examines historical marker in Watertown Square. In the background can be seen Melpar's Applied Science Division.

April 1961, marked Melpar's Tenth Anniversary of operations in the Metropolitan Boston area. Since the establishment of a Boston facility with five employees, three of whom celebrated their decade with Melpar last month, Melpar has developed into one of the area's leading research activities. The outgrowth of this effort is the Applied Science Division. The ASD is under the direction of Mr. J. M. Cryer and Dr. Arthur Kohlenberg.

Mr. Cryer is the former president of Corvey Engineering Company which became a division of Melpar in 1957. Dr. Kohlenberg, ASD Technical Director, is the co-founder of the former Boston Research Department.

Current special areas of activities at ASD include pattern recognition, communications theory, low-frequency signal analysis, geophysics including seismics and atmospheric physics, radiation and propagation of electromagnetic waves, computation and mathematical analysis, advanced circuit design and advanced biological, medical and physical instrumentation.

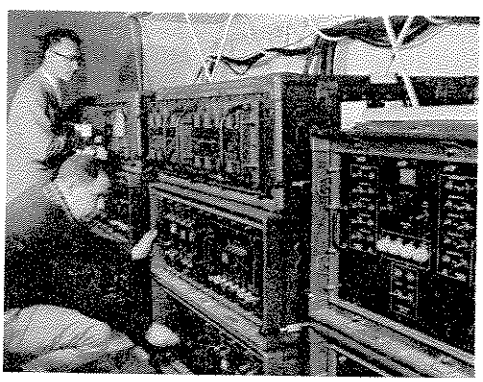
Six laboratories and a technical staff have been organized to develop these fields of endeavor. It is the function of these laboratories and the staff of technical consultants to apply the basis principles of electronics and macroscopic physics to advanced military and commercial problems.

T12 TESTER TO BE APPLIED TO NIKE SYSTEM

ASD's T12 Dynamic Tester recently delivered to the East Windsor-Hartford Nike Site in Hartford, Connecticut, is rapidly approaching demonstration of its applicability to the Nike missile system. Basically a device for high-precision testing of servo systems, the T12 feeds instructions taken from a programmed magnetic tape into a servo system. It then compares the resultant operation of the system under test with a predetermined correct output which has been programmed in parallel onto the same magnetic tape. The remaining T12's which were developed under separate contract at ASD's Engineering Laboratory have already been delivered to military installations for testing other weapon systems. The T12 Tester Contract was administered by the U. S. Army Ordnance District, Philadelphia.

TANIMOTO ADDRESSES N. Y. ACADEMY OF SCIENCES

Dr. Taffee T. Tanimoto, ASD Lab Head, addressed a joint meeting of the N. Y. Academy of Sciences on April 5, 1961. His paper, "A Nonlinear Model for a Computer-Assisted Medical Diagnosis Procedure," reported on the application of pattern recognition theory to diagnosis of human illness.



Leo Pouliot, ASD Electrical Engineer (L) and Irving Smith, ASD Senior Electronic Technician (R), check operation of T12 Tester while preparing for trial run at East Windsor, Connecticut Nike Site.

THREE REACH TEN YEAR MARK

Three ASD employees, Alvan S. Berner, William E. Crawford and Charles F. Saunders, have recently reached their tenth anniversary of employment with Melpar. Mr. Berner joined Melpar on May 15, 1951, as a Senior Engineer. Subsequently, he has held positions of Project Engineer, Section head, and Senior Staff Consultant. He is now lab head of the Pattern Recognition Applications Laboratory.

Mr. Crawford was hired on April 16, 1951, and has been on the guard force since that time.

Mr. Saunders was hired as a Maintenance Man on April 16, 1951. He presently is the Maintenance Group Leader at the ASD.

PROFILES OF ASD LAB HEADS

Alvan S. Berner—Head of the Pattern Recognition Application Laboratory is engaged in applying theories developed in the Pattern Recognition field to the construction of practical instruments. Prior to his current assignment, he directed the design and development of a wide variety of airborne and ground equipments and training devices. He has also been active in research programs conducted at ASD, including a study of potential applications of Melpar's Dynamic Tester in missile system testing. Mr. Berner received his B.A. in Electronic Physics from Harvard, and has taken graduate work at Northeastern University.

ALVAN S. BERNER

Robert H. Rosenbaum—Head of the Computer Laboratory, has been engaged in the analysis of large-scale dynamic electromagnetic complexes, including the development of several digital computer simulations. He has performed sensitivity analyses and evaluations of data processing requirements for several special-purpose observation systems, such as detection and tracking, trajectory analysis, command support, and weather forecasting. Mr. Rosenbaum received his B.S. and M.S. degree in Mathematics from the Massachusetts Institute of Technology.

ROBERT H. ROSENBAUM

Wesley Tannenbaum—Head of the Engineering Laboratory, was Project Engineer of Melpar's Dynamic Tester Program, which included design and development of i-f insertion accessories, a tape conversion unit and a digital error recorder. He also directed the design and development of an optical data reducer and a missile fire control system tester. Mr. Tannenbaum obtained a B.S. degree from City College of New York, and has attended Brown, Columbia, and Temple Universities.

WESLEY TANNENBAUM

MELPAR NAMES TANIMOTO HEAD OF PATTERN RECOGNITION LAB

The appointment of Dr. Taffee T. Tanimoto as head of the expanding Patten Recognition Theory Laboratory at Melpar's Applied Science Division has been announced by J. M. Cryer, Jr., Division Manager. Dr. Tanimoto comes to Melpar's Watertown, Mass., facility from IBM in Yorktown Heights, N. Y., where he was engaged in computer-oriented mathematical research, principally theoretical work in information retrieval.

Among the foreseeable applications of pattern recognition theory, according to Dr. Tanimoto, are the real time machine translation of spoken Russian into English, recognition of enemy submarines and automatic diagnosis of human diseases. The lab has been studying new mathematical techniques in this area for the last two years. Computer recognition of human speech is another area of exploration in which the lab has conducted basic research. As an outgrowth of these experiments, Dr. Tanimoto envisions the day when production of a typewritten page will be merely a matter of speaking into a microphone. With computers able to recognize spoken words, it also will be possible to give them verbal commands, or draw on their vast factual memories with mere verbal questions. At the moment, detailed abstract mathematical programs are required to perform these functions.

DR. T. TANIMOTO uses sonogram patterns for the words "speech and hearing" to demonstrate feasibility of pattern recognition techniques. For the curious, the letters "HIRING" shown above spell out the phonetic word for "hearing" used in the demonstration.

Dr. Tanimoto's work has involved considerable emphasis in medical data processing, including medical and biophysical diagnostic instrumentation for specific recognition problems. He has over eight years teaching experience as Assistant Professor of Mathematics at Allegheny College and at the Illinois Institute of Technology, and is a member of American Mathematical Society, the Mathematical Society of America, the Society for Industrial and Applied Mathematics, and Pi Mu Epsilon. Dr. Tanimoto's papers dealing with mathematical research have appeared in the Bulletin of the American Mathematical Society and various other technical journals.

Dr. Tanimoto received his B.A. degree from UCLA, M.S. degree from the University of Chicago, and Ph.D. degree from the University of Pittsburgh in 1950.

ASD SCIENTISTS HELP LOOK FOR HYDROMAGNETIC WAVES

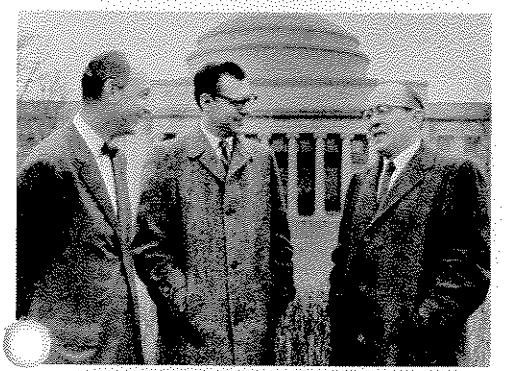
On March 25, 1961, at 10:17 A.M.—NASA's magnetometer-bearing Explorer X satellite was rocketed off Cape Canaveral on a 100,000 mile journey into space. Meanwhile, 1200 miles away, a team of Air Force Cambridge Research Center and Melpar ASD scientists waited at the base of the giant 85-foot radar antenna atop Sagamore Hill in Hamilton, Mass., to monitor the satellite's Rubidium vapor magnetometer measurement of the earth's magnetic field. To the experiment, Melpar had contributed a specially-instrumented multi-channel recorder and VLF real-time analyzer. The object was to determine the existence of hydromagnetic waves in the rarefied ionic plasma at a distance of 10 to 12 earth radii into space." This project was sponsored by the Air Force Systems Command of the U.S.A.F. Electronic Systems Division.

James M. Cryer, Jr., Division Manager, congratulates retiring ASD Purchasing Agent, Donald H. Lucas, on a job well done. Mr. Lucas has been associated with Melpar's Watertown Laboratory since July 18, 1951.

1961 RECIPIENT OF MELPAR FELLOWSHIP

William David Rummler, now a second-year graduate student of electrical engineering at Massachusetts Institute of Technology in Cambridge, Mass., has been selected to be Melpar Fellow by the Institute for 1960-1961 school year. The award consists of a $2400 cost-of-living stipend plus a full reimbursement of tuition.

A graduate from Drexel Institute of Technology, Philadelphia, Pennsylvania, in June 1959, Mr. Rummler's chief technical interest has been microwave electronics. His Master's thesis, "Characteristics of the X-Line, A Microwave Periodic Structure" completed last August, explored the efficiency of an unusual travelling wave tube as a microwave amplifier.



James M. Cryer, Jr., ASD Manager, and Dr. Arthur Kohlenberg, ASD Technical Director, shown during visit wtih Melpar "Fellow", William D. Rummler at M.I.T.

During this academic year, Mr. Rummler has passed his General Qualifying Exam, permitting him to enter into his Doctoral studies. He is now completing his pre-doctoral course work.

KOHLENBERG COMPLETES FIRST YEAR AS IRE EDITOR

Dr. Kohlenberg, Technical Director of ASD, has just completed his first year as editor of the "Transactions of the Professional Group on Information Theory" of the Institute of Radio Engineers. Dr. Kohlenberg cited a significant increase in the number of papers on pattern recognition and artificial intelligence being submitted for publication. The "Transactions" receives over 100 papers a year from authors throughout the free world from Japan to Sweden.

GOING UP!

Promotions include B. B. Armstrong to Electrical Engineer, C. B. Degges to Junior Electrical Engineer, M. L. Dunmire to Tabulating Equipment Operator, and T. Eliason to Senior Q. C. Engineer.

R. W. Keene advanced to Manager of Engineering Services, B. W. McCrery to Planner, R. L. Payne to Assistant Maintenance Supervisor, and P. R. Potts to Mechanical Engineer.

N. E. Steere rose to Senior Electrical Engineer, C. R. Taylor to Junior Engineering Assistant, and R. L. Thwaite to Electrician Group Leader. J. Wallen and H. L. Wilson were promoted to Senior Electrical Engineer.

MAESTRI AUTHOR OF TROUGH WAVEGUIDE MAGAZINE ARTICLE

An article by Senior Electrical Engineer A. Maestri of the Antenna Labortory was published in the March 3rd issue of "Electronics" magazine.

According to Mr. Maestri, Trough Waveglides — relatively unexploited for antenna use—have several desirable features as r-f energy radiators, including strip transmission line simplicity, waveguide propagation, wide-band response, and radiation that is easily controlled. These characteristics coupled with electromechanical scanning, make the trough waveguide an interesting feed for microwave antennas.

The article was based on a paper presented by Mr. Maestri to the 1960 IRE Convention in New York City and co-authored by W. Rotman.

ASD CONSULTANT REPORTS CODING TECHNIQUE BEFORE IRE

Dr. Robert G. Gallager, ASD Consultant, has presented a paper entitled "Low Density Parity Check Codes" before the March 21, 1961 Session on Coding Techniques of this year's National IRE Convention in New York City. This coding theory was originally developed by Dr. Gallager for his recent Doctoral Thesis at M.I.T.

ASD is now sponsoring Dr. Gallager's continuing study of this secure coding technique and its practical applications to an operational communications system.

THIN FILMS CIRCUITRY TOPIC OF APRIL TECHNICAL LECTURE

The April Technical Lecture—"A Topical Introduction to Melpar Thin Film Circuitry Research and Development"—was presented by Research Division Physicist R. W. Nichols. The talk described basic and applied research being conducted by the Research Division's Physical Electronics Section in the area commonly referred to as "molecular electronics". It was observed that the current use of the term, "molecular electronics", tends to obscure the essentially electronic phenomena being exploited in thin crystalline films and the term "physical electronics" is preferred.

During the lecture, Mr. Nichols discussed the integration of complex film systems to produce *components* (e.g., condensers and inductors), *elements* such as R. C. networks and a highly versatile function generator, and *systems* such as an extremely compact digital computer. He also displayed and discussed specimens of the thin films and a complete circuit model employing them.

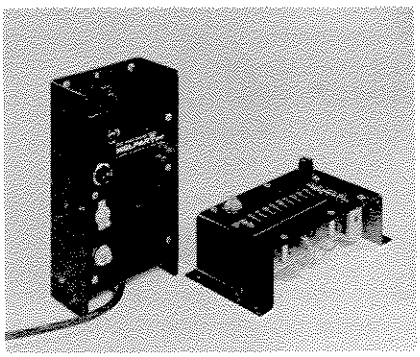
Theoretical and experimental evidence indicates that these studies of microminiaturization and physical electronics will lead to high reliability, high component density, mass produced, temperature and radiation resistant thin film components, circuits and systems. This research is supported jointly under Navy Bureau of Weapons and independent Melpar sponsorship.

CHILDS PRESENTS PAPER

A paper titled "A Selected Bibliography Concerning the Properties and Uses of Borides, Carbides, Nitrides and Silicides" was presented by E. E. Childs, Senior Ceramics Engineer in the Metals & Ceramics Branch of the Research Division, on April 26th to the 63rd Annual American Ceramics Meeting. A comprehensive survey was made of the literature concerning the various borides, carbides, nitrides and silicides with particular attention to synthesis and fabrication techniques for each of these classes of refractory and hard materials. According to the author, it is projected that many of these materials will find increased specialized usage in new space age requirements.

New Products Corner

(This is the twelfth in our series of reports on new products being marketed by Melpar's Special Products Division)



PHOTOELECTRIC CONTROL UNITS

Extending the line of Melpar Special Products is an impressive group of Photoelectric Control Units. When used with the previously announced Model 100, 150, and 200 Photoelectric Readers, these four new control units provide industrial users with a complete photoelectric sensing system. The reader detects the difference in reflected light caused by the motion of an object; the resulting resistance change of the photocell in the reader is converted by the control unit into relay action that can, for example, cause an alarm to sound, reject a half-filled bottle, or count the number of boxes passing on a conveyor.

These compact control units were designed to meet industrial needs, and contain an amplifier, power supply, and relay. A more sophisticated photoelectric control unit that can detect up to four different colors was introduced at the March IRE Show. A similar Melpar control unit was recently specified by a well known chemical firm for evaluation by their food packaging division. The growing field of industrial control holds great promise for this line of Melpar photoelectric control units featuring reliability, ease of maintenance, and versatility.

Antenna Lab Develops Improved RFI Device

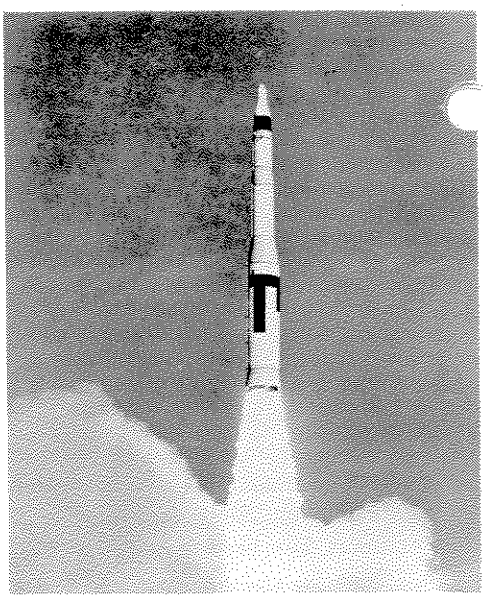
Capable of radiating simultaneously on all frequencies from 100 KC to 1000 mc, a broad band radiator recently developed in the Antenna Lab will reduce the time element involved in measuring interference susceptibility of communications equipment, particularly receivers. Eight of the devices are currently undergoing Air Force acceptance tests prior to delivery to Wright-Patterson Air Force Base.

The new device employs a band width ratio of 10,000:1, compared to the 4:1 ratio previously regarded as a wide band ratio. Design and development work was directed by Project Engineer H. H. Hibbs under a contract awarded by the Aeronautical Systems Center of the Air Materiel Command.

ASTEN AUTHORS PHOTOELECTRIC READER MAGAZINE ARTICLE

Senior Engineer W. P. Asten of the Special Products Division is the author of an article entitled "Photoelectric Reader Senses Reflected Light Intensity" published in the March issue of "Electro-Technology" magazine.

As previously reported in the Melpar-a-graph (February 1960), Mr. Asten and Melpar, his assignor, were awarded a United States Patent for the device described in the article. The Photoelectric Reader features a single lens system which makes possible its use in spots where the use of conventional photoelectric units would be impossible or impractical.



U.S. Air Force Photo

THE MINUTEMAN, designed for hardened and dispersed deployment in steel and concrete silos is under development by the Air Force Ballistic Missile Division (ARDC) for operational use by the Strategic Air Command. The Minuteman ICBM Weapon System is scheduled to become operational in its hardened and dispersed configuration in mid-1962.

Turtora Awarded Patent

Mr. John Tutora, Technical Assistant on the Technical Staff of the Vice President for Engineering and Manufacturing, is the inventor of a "Frequency Controlled Integrator" on which Patent #2,967,019 was issued 3 January 1961 by the U. S. Patent Office. The U. S. Government is the Assignee with Melpar receiving a nonexclusive royalty-free license in the patent.

New Thin Films Purification Technique Presented At Conf. Sponsored by USAF Cambridge Research Labs

A paper titled "Synthesis and Gas Chromatographic Purification of Organometallic Compounds for Semiconductor Application" by Dr. J. I. Peterson, Supervisor of the Analytical Chemistry Branch; L. M. Kindley, Supervisor of the Organic Chemistry Branch and Dr. H. E. Podall, Senior Scientist, was presented April 12th by Dr. Peterson at the Conference on Ultrapurification of Semiconductor Materials in Boston, Mass. The conference was sponsored by the Air Force Cambridge Research Laboratories, Hanscom Field, Mass.

According to the authors, gas chromatography can now be used to purify organometallic compounds which are used to deposit metallic films on surfaces for semiconductor applications. The new technique developed by the Research Division, yields germanium films that contain larger crystallites than do films made by vacuum evaporation due to the greater purity achieved with gas chromatography. Even though many potentially important organometallic compounds are solids or high-boiling liquids, it is possible to use gas chromatography to purify them.

The new method is a result of an experimental program in which the Research Division has been engaged for past year to develop methods of micro-miniaturization of electronic circuits. Dr. Peterson's presentation of the new techniques to the Air Force Conference was reported in the May 1st issue of "Chemical and Engineering News".