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# RESEARCH REPORTS

June 13, 1958
Vol. 29, No. 6

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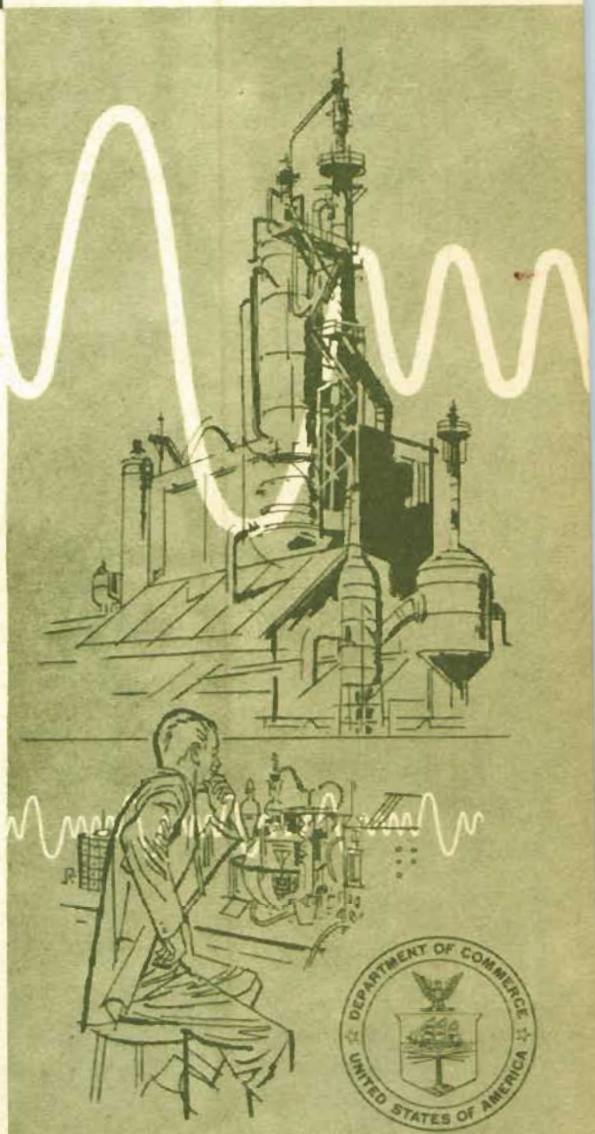

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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, August 22, 1955.

U. S. DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

U. S. Government RESEARCH REPORTS

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# Contents



## *Printed Reports Available from OTS Announced in This Issue*

## BIBLIOGRAPHY

Aerodynamic studies: Forces acting on an air vehicle, a review of the literature, by M. Z. Krzywoblocki. Chicago. University. Advisory Board on Simulation, Chicago, Ill. Project 7060. Contract AF 33(616)-2797. Order separate parts described below from OTS, giving PB number of each part ordered.

Part I. May 1957. 116p diagr. $3.00. PB 131452

This work is an annotated bibliography of the scientific literature published prior to July 1953 which pertains to the methods of calculating the aerodynamic forces acting on an air vehicle. In this initial segment of the work the author discusses the basic categories of theoretical work in fluid dynamics with emphasis on the supersonic and hypersonic regimes. The problems of transition in the boundary layer (from the overall point of view) and of the calculation of friction drag also are covered. Continues similar work under Contract AF 33(038)-15068, Supplement no. 2. AF WADC TN 56-360, Part I.

Part II. Jul 1957. 46p. $1.25. PB 131453

1. Airfoils - Pressure distribution - Bibliography 2. Airfoils, High speed - Bibliography 3. Flow, Supersonic - Theory - Bibliography 4. Flow, Compressible - Bibliography 5. Shock waves - Bibliography 6. Drag, Frictional - Bibliography 7. AF WADC TN 56-360, Part II

Part III. Jul 1957. 56p. $1.50. PB 131454

The planning of a simulation facility demanded practical answers to the following questions: (1) What are the most general and most reliable expressions used to day for the aerodynamic forces on air vehicles? (2) What are the fundamental hypotheses behind these expressions and the limitations inherent in them? (3) What are the boundaries of accuracy for calculating forces by present methods? (4) In what areas and in what directions can significant advances in understanding aerodynamic forces be expected in the immediate future? (5) In what areas are the problems of such a profound nature that significant advances cannot be expected in the foreseeable future. AF WADC TN 56-360, Part III.

Part IV. Jul 1957. 73p. $2.00. PB 131455

1. Missiles - Aerodynamics - Bibliography 2. Airfoils - Pressure distribution - Bibliography 3. Flow, Supersonic - Theory - Bibliography 4. Airfoils, High speed - Bibliography 5. Flow, Compressible - Bibliography 6. Shock waves - Bibliography 7. Drag, Frictional - Bibliography 8. AF WADC TN 56-360, Part IV.

Part XVII. Jul 1957. 156p. $4.00. PB 131519

The present segment of the work includes material reviewed by the author in the period January 1956 through March 1956. The more interesting papers and reports (from the viewpoint of aerodynamics) are discussed briefly; others are listed without comment. For Part 16, covering the period Oct- Dec 1955, see PB 131385. AF WADC TN 56-360, Part 17.

Part XVIII. Jul 1957. 112p. $3.00. PB 131456

The present segment of the work includes material reviewed by the author in the period April 1956 through Jun 1956. AF WADC TN 56-360, Part 18.

Photo interpretation techniques, a bibliography, by Joseph A. Gwyer and Vincent G. Waldron. U.S. Library of Congress. Technical Information Division. Mar 1956. 170p. Order from LC. Mi $7.80, ph $25.80. PB 126834

The bibliography, compiled in conjunction with a larger bibliography on vegetation and other land-surface phenomena important to photo interpretation, consists of annotated references to published literature on the subject issued during the approximate period of 1935-1953. Material on the theory, principles, methods and techniques of photo interpretation and the application of the techniques in various scientific and technological fields, has been included.

Selected bibliography on water pollution caused by the petroleum industry, by Muriel E. Whalley. National Research Council of Canada. Technical Information Service, Ottawa, Canada. Feb 1956. 17p. Order from LC. Mi $2.40, ph $3.30. PB 126852

1. Water - Pollution - Bibliography 2. NRCC TIS 47

Spark gap switches for low-jitter radar service, report of a literature survey, by James B. Woodford, Jr. Carnegie Institute of Technology, Pittsburgh, Pa. Jan 1954. 20p diagrs. Order from LC. Mi $2.40, ph $3.30. PB 126797

Abstracts are presented of 15 papers relating to fixed spark-gap systems. The survey disclosed that there are few fixed-gap switches which will meet low-jitter and moderate-to-high power requirements. A discussion is presented of the sequence spark gap in which a large number of gaps are used in series as a switch; the associated circuits are arranged to break down the gaps in sequence. This system employs very large overvoltages and minimizes the time jitter. A unidirectional sequence spark-gap system is described for operation at high repetition rates. Recommendations are made for the further study of both the sequence spark gap and the unidirectional-sequence spark-gap systems. AD 31-422. Contract AF 30(602)-915. Contract AF 30(602)-96, Phase 7. AF RADC TN 54-125.

## CARTOGRAPHY

Combined engineering and service tests of the photo mapping train, by George S. Hanlen and Robert E. Dudley. U.S. Army. Corps of Engineers. Engineer Research and Development Laboratories, Fort Belvoir, Va. Sep 1955. 106p photos, drawings, diagr, tables. Order from LC. Mi $5.70, ph $16.80. PB 126859

Report covers the engineering and service tests of the Photomapping Van Section developed by the Corps of Engineers as a part of a motorized photomapping train for the Army topographic field units. Engineering tests of the section include road tests, electrical power determination, radio interference tests, arctic climatic tests, storage at extreme temperatures, lifting for shipboard loading, air transportability, and weight determinations. Engineering aspects of the section during operational tests include van stability, communication, suitability of interior arrangement, heating and air conditioning, and effects of noise. Dept. of the Army project: 8-35-03-205. Appendix A not included. ERDL R 1428.

Development of spherical map sections and transparent conforming overlays, by Charles C. Lane. U.S. Army. Corps of Engineers. Engineer Research and Development Laboratories, Fort Belvoir, Va. Mar 1956. 39p photos, diagrs. Order from LC. Mi $3.00, ph $6.30. PB 126857

The design and production of spherical map sections displaying a portion of the globe at a scale of 1:1,000,000 are described. The report covers formulation of an International Sphere, study of existing and proposed designs for spherical sections, final specification of the great circle section, production of the master male die and construction of the spherical sections, selection of the map cover, and tests of positional accuracy on the finished spherical map section. Dept. of the Army project: 8-35-03-122. ERDL R 1440.

# CHEMICALS AND ALLIED PRODUCTS

## Drugs and Pharmaceuticals

Toxicity studies on hydrazine, methlhydrazine, symmetrical dimethylhydrazine, unsymmetrical dimethylhydrazine and dimethlnitrosamine (U), by Sidney Rothberg and Ogle B. Cope. U.S. Chemical Corps. Chemical Warfare Laboratories, Army Chemical Center, Md. May 1956. 14p. tables. Order from LC. Mi $2.40, ph $3.30. PB 127385

Dimethylnitrosamine and methylhydrazine were the most toxic, I.V.; and unsymmetrical dimethylhydrazine, the least toxic. Hydrazine and methylhydrazine were the most toxic, percut; and dimethylnitrosamine, the least toxic. Symmetrical dimethylhydrazine, unsymmetrical dimethylhydrazine, and dimethylnitrosamine produced signs of systemic poisoning or death without evidence of local skin damage. Hydrazine produced a severe corrosive effect, while methylhydrazine caused a mild edema which disappeared after 24 hr., leaving a blanched appearance at the site of application. Hydrazine caused permanent corneal damage, while the other 4 compounds showed transient effects lasting 2-7 days. Project no. 4-61-14-002. CC CWL R 2027.

## Organic Chemicals

Breaking the methyl borate-methanol azeotrope by distillation, by Dorothy R. Gould. Ethyl Corporation. Chemical Research Laboratory, San Bernardino, Calif. Mar 1944. 5p tables. Order from LC. Mi $1.80, ph $1.80. PB 124985

The purpose was: (1) To study third components which form azeotropes with methanol and thus permit the recovery of pure MB (methyl borate) from its azeotrope with methanol. (2) To test the method of separation based on agitation with a mixture of sulfuric acid and kerosene followed by distillation. LTD 44-14.

Fundamental investigations in the chemistry of organic sulfur compounds. Final report under Contract AF 18(600)-482, for the period 1 Dec 1952 to 1 Dec 1955, by D.S. Tarbell. Rochester. University. Dept. of Chemistry, Rochester, N.Y. Jan 1956. 4p. Order from LC. Mi $1.80, ph $1.80. PB 126965

The report summarizes the work on the following problems, all of which has been published: kinetics of basic hydrolysis of some lactones, hydrogen bonding involving the thiol group, the rearrangement of diaryl thioncarbonates to diaryl thiolcarbonates, free radical substitution in 3,4-benzypyrene, the action of base on alkyl allyl sulfides, and studies on thioesters related to coenzyme A. AD 120431. Project no. Chem 30-15. Contract AF 18(600)-482, Final report. AF OSR TN 57-15.

Ignition of normal propyl nitrate by compression of air-normal propyl nitrate vapor mixtures, by Ernest A. Hogge and Joseph B. Levy. U.S. Naval Ordnance Laboratory, White Oak, Md. May 1956. 12p graph, tables. Order from LC. Mi $2.40, ph $3.30. PB 126952

The ignition of liquid n-propyl nitrate by the rapid compression of entrapped air bubbles has been studied in a locked-stroke compressor. A minimum bubble size for ignition under the particular conditions has been observed and ease of ignition has been found to increase with increasing bubble size. The results have been analyzed in an approximate fashion. NAVORD 4296.

Influence of ultrasonic waves on some chemical conversions of organic compounds, by D.L. Currell. California Institute of Technology. Division of Chemistry and Chemical Engineering, Pasadena, Calif. Jul 1957. 16p tables. Order from OTS. 50 cents. PB 131365

It was reported earlier that upon exposure to ultrasonic waves, in the presence of silver nitrate, certain halogen derivatives yielded silver halide precipitates which contained silver acetylide, silver diacetylide and (when pyridine was treated) also silver cyanide. It has now been shown that similar cleavage reactions can also be realized in the absence of silver, with benzene, bromobenzene, phenol, tropolone, pyridine and pyrrole. Under these conditions free acetylene and/or hydrogen cyanide evolved. They were retained in convenient traps and determined. For the sweeping of the gaseous products into the traps either nitrogen or argon was used; the ultrasonic cleavage was accelerated by the presence of argon. AD 136437. Contract AF 18(600)-385, Final report. AF OSR TR 57-51.

Separation of the methyl borate azeotrope with lithium chloride, by W.R. Wilkinson. Ethyl Corporation. Chemical Research Laboratory, San Bernardino, Calif. Mar 1944. 9p tables. Order from LC. Mi $1.80, ph $1.80. PB 124984

A number of salts were tested for the property of separating the MB azeotrope into two liquid phases, one phase being MB containing a very small amount of methanol, and the other being the salt dissolved in methanol and a small amount of MB. Lithium chloride and zinc chloride were found to be the best salts, giving MB of 99/100% purity. LTD 44-15.

Spirans and other rigid molecules, by D.J. Cram. California. University. Dept. of Chemistry, Los Angeles, Calif. Jun 1957. 92p tables. Order from OTS. $2.50. PB 131341

The chemistry of spiro[4.4]nonane has been investigated. The preparation and determination of the stereochemical structures of 1,6-dihydroxy [4.4] nonane and of 1-keto-6-hydroxyspiro [4.4] nonane have been made.

The synthesis of 1-spiro nonene, 1, spiro [4.4] nonadiene and 1,6-spiro [4.4] nonadiene are described, as well as the behavior of the conjugated diene as a reactant in the Diels-Alder Reaction. The substitution and reduction reactions of [2.2] paracyclophane have been investigated. The synthesis of a second semirigid system, 1,7-cyclododecadiyne, has been accomplished. Attempts to make the more strained lower homologues of this system failed. AD 130872. Project 3044, Task 70324. Contract AF 33(616)-146. AF WADC TR 56-540.

Steric effects in chemical reactions. Final report under Contract N7 onr-394, T.O. III, NR 055-127, by Herbert C. Brown. Purdue University. Dept. of Chemistry, Lafayette, Ind. Nov 1955. 47p diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126476

The investigation undertook to develop a quantitative theory for the role of steric effects in chemical behavior. The study of the formation and dissociation of molecular addition compounds provided quantitative data on the magnitude of steric strains in molecular systems of a given structure. The results were then applied to the interpretation of the effect of structure on chemical behavior. It was discovered that steric effects are a major factor in chemical behavior. This is indicated by the various topics which were studied and which are summarized in the present report: Dissociation data for gaseous addition compounds, Steric requirements of the proton, Strained homomorphs, Steric effects in aromatic substitution, Steric effects in displacement reactions, B-strain, Steric assistance in unimolecular reactions, Steric effects in elimination reactions, Steric effects in ring compounds. For earlier reports under this Contract see PB 105365, 117573, 118330 and 125848.

Studies on organic fluorine compounds: Vol. III: Final report, under Contract N6 onr 231, Task order VI, Project NR 056-105, by J.D. Park and J.R. Lacher. Colorado. University. Dept. of Chemistry, Boulder, Col. n.d. 301p diagrs, graphs, tables. Order from OTS. $5.50. PB 121702

Summarizes work from 1 Jan 1950 to 31 Aug 1954. Contents: Vapor phase heats of hydrobromination of the isomeric butenes, by J.R. Lacher, T.J. Billing, E. Campion, K.R. Lea and J.D. Park. - Vapor phase heat of chlorination of diborane, by J.R. Lacher, R.E. Scruby and J.D. Park. - Reaction heats of organic fluorine compounds. III: Vapor phase heats of hydrobromination of some simple fluoroölefins, by J.R. Lacher, K.R. Lea, C.E. Walden, G.G. Olson and J.D. Park. - Addition of hydrogen chloride to acetylenic compounds. - Aluminum chloride disproportionation studies of the "Freons". - Vapor phase chlorination of tetrachloroethylene. - The magnetic susceptibilities of some methyl derivatives of methane and ethylene, by J.R. Lacher, J.W. Pollock, W.E. Johnson and J.D. Park. - Anomalous susceptibilities of three-membered ring compounds, by J.R. Lacher, J.W. Pollock, and J.D. Park. - Physical properties of some 1, 1-difluoro-2, 2 dichloroethyl alkyl ethers, by J.D. Park, Curtis M. Snow and J.R. Lacher. - Action of alcohols on 3, 3, 4, 4-tetrafluoro-1, 2-dichlorocyclobutene-1, by J.D. Park, C.M. Snow and J.R. Lacher. - The preparation and brominating properties of some halogenated N-bromoacetamides, by Joseph D. Park, Henry J. Gerjovich, Wilford R. Lycan and John R. Lacher. - A study of some fluorine-containing $\beta$-diketones, by J.D. Park, H.A. Brown and J.R. Lacher. - Codimerization of 1, 1-dichloro-2, 2-difluoroethylene with 1-chloro-1, 2, 2-trifluoroethylene. - Aluminum chloride replacement reactions of some fluorinated propenes. - Fluorination of hexachlorobutadiene. - The stepwise chlorination of 1, 1, 2, 2-tetrafluoroethyl ethyl ether. - Infrared absorption spectra of cis-and trans-1, 2-dichlorohexafluorocyclobutane, by John R. Lacher, Alfred Buchler, and J.D. Park. - The kinetics of the vapor phase dimerization of tetrafluoroethylene and trifluorochloroethylene, by J.R. Lacher, G.W. Tompkin and J.D. Park.

## Agricultural Chemicals

Mechanism of development of insect resistance to insecticides, by H.F. Schoof. U.S. Dept. of Health, Education, and Welfare. Public Health Service. Communicable Disease Center, Atlanta, Ga. 1955. 46p photos, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 124942

The principal study concerned an attempt to establish a DDT-resistant strain of Anopheles quadrimaculatus and to develop adequate techniques for the assessment of the degradation of DDT by these insects. The remaining lines of research included the detection of DDT resistance in a strain of Aedes aegyptic from Trinidad, British West Indies, and the screening of pesticides against this resistant strain; the evaluation of the biological effectiveness of dieldrin-urea-formaldehyde lacquers against house flies, mosquitoes, and roaches and toxicological studies on dieldrin-urea-formaldehyde lacquers. Contract NAonr-197-55, NR-120-328, Final report.

## Plastics and Plasticizers

Investigation of the hardness testing of plastics, by Bryce Maxwell. Princeton University. Plastics Laboratory, Princeton, N.J. Aug 1954. 36p diagr, graphs, table. Order from LC. Mi $3.00, ph $6.30. PB 126745

The indentation hardness of plastics has been studied

in an attempt to explain some of the anomalies previously noted in these measurements, and to determine what physical constants of the material are responsible for resistance to indentation. Slow speed Rockwell type tests are compared to high speed rebound type tests. These results are interpreted in terms of the rheological properties of high polymers; specifically the elastic modulus, yield point, plastic flow, elastic recovery. The time and temperature dependency of the response of the material to hardness measurements is demonstrated. Dept. of the Army project: 3-99-15-022. Signal Corps project: 32-152B. Published in Modern Plastics, vol. 32, no. 9, May 1955. Contract DA-36-039sc-42633, Report 2B. PU PL TR 34B.

Measurement of insulation conductivity, by E. F. Turner, E. L. Brancato and W. Price. U.S. Naval Research Laboratory. Feb 1958. 22p photos, drawings, diagrs, graphs, tables. Order from OTS. 75 cents. PB 131420

All methods of measuring conductivity require the determination of the volume conductance and, for low conductance, an instrument capable of measuring minute currents. The Wheatstone bridge and a modification of the direct-deflection method were chosen for investigation. Both methods have been developed to measure conductance in the $10^{-12}$ to $10^{-16}$ mho range; the direct-deflection method has the advantage of providing a continuous record. Using this method, the conductance of polyethylene, Vinylite, Teflon, and 3 Mylar samples were measured as a function of time. Several additional factors, important in the measurement of low conductances, were brought out in this study. NRL R 5060.

Synthesis and characterization of new vinyl polymers, by Lester E. Coleman, Jr. and William S. Durrell. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, O. Jan 1958. 27p tables. Order from OTS. 75 cents. PB 131669

This report describes research to determine the polymerization characteristics of four classes of experimental monomers and preliminary evaluation of the potential of the resulting polymeric products as thermally stable, solvent resistant plastics and elastomers. The perfluoroalkyl propenyl ketones were found to copolymerize with a variety of comonomers such as vinyl acetate, styrene and butadiene to give products ranging from powders to elastomers. The 1-alkyl-1-hydroperfluoroalkyl acrylates copolymerized readily and formed tough rubbery homopolymers which exhibited good thermal stability and low swell in diester-type lubricants. trans-Cinnamoyl ferrocene formed copolymers with a variety of comonomers but low conversions, copolymers or copolymers containing small amounts of cinnamoyl ferrocene were obtained. Reactivity ratio determinations of two trifluoromethyl-substituted styrenes indicated that substitution of the trifluoromethyl group on styrene increased its polymerization reactivity. AD 142296. Project 7340, Task 73404. AF WADC TR 58-3.

## Paints, Varnishes and Lacquers

Development and evaluation of insulating type ceramic coatings. Part I: Development and small scale testing, by S. Sklarew, C. A. Hauck and A. V. Levy. Marquardt Aircraft Co., Van Nuys, Calif. Feb 1958. 107p photos, diagr, graphs, tables (part fold). Order from OTS. $2.50. PB 131752

Eight systems of metal reinforced refractory coatings were investigated. These systems were based on sodium silicate, frit, aluminum phosphate, and L-389, binders with refractory grain fillers and they were designed to insulate aircraft structural members operating in the thermal range of 2000° to 3000°F. Thermal drops of as high as 10°F per thousandth inch of coating thickness at equilibrium were observed with lag times up to 60 seconds to attain equilibrium under laboratory test conditions. AD 150957. Project 7350, Task 73500. Covers work from 15 May 1956-15 Jun 1957. For earlier report see PB 121759. Contract AF 33(616)-2957. AF WADC TR 57-577, Part I.

Development of a coating formulation and method of application for use in nylon double fabric, by Ernest H. Pagliaro. Connecticut Hard Rubber Co., New Haven, Conn. Nov 1957. 33p diagr, tables. Order from OTS. $1.00. PB 131657

A two ply modified plain weave nylon fabric has been successfully coated on both sides using conventional knife over roll rubber spreading equipment. Blocking between the plies was prevented by closely controlling the solids concentration and the amount of compound deposited per pass. Butyl rubber was selected over the other elastomers evaluated because it was the most flexible when tested at -65°F according to requirements of the contract. Specimens coated with Butyl rubber have also met the other necessary requirements including adhesion, weight, and air retention. AD 142094. Project 7320, Task 73200. Covers work from Dec 1956 - Jul 1957. Contract AF 33(616)-3901. AF WADC TR 57-416.

Development of electroplating processes to eliminate hydrogen embrittlement in high-strength steel, by J. E. Chilton. Stanford Research Institute, Menlo Park, Calif. Jan 1958. 85p photos, graphs, tables. Order from OTS. $2.25. PB 131721

It has been found that cadmium plating from a sulfamate, a perchlorate, or a fluoborate bath with addition agents can be accomplished without embrittling the steel, but that the quality and adherence of the cadmium plate emerging from these baths, as compared with the cadmium plate from a cyanide bath, indicates the need for further evaluation before use. In order to evaluate the effects of various

degrees of hydrogen embrittlement on the steel, a sensitive mechanical test method was required. In this program, the bend test, torsion test, and static sustained load beam test were investigated. A static sustained load beam test, using a 9- x 1/4- x 1/2-inch specimen with the grain transverse to the length was adopted. The SAE 4340 specimens were heat treated to 280,000 to 300,000 pounds per square inch tensile strength and the fracture time under a given stress was taken as a measure of the degree of hydrogen embrittlement. AD 142316. Project 7312, Task 73120. Covers work from Feb 1956-May 1957. Contract AF 33(616)-3429. AF WADC TR 57-514.

Phosphating treatments: Patent literature survey, by Ervin C. Tinsley. U.S. Arsenal, Rock Island, land, Ill. Apr 1957. 147p. Order from OTS. $3.75. PB 131356

A systematic compilation of the patent data on the phosphating process concerned with the equipment production, and maintenance of this surface treatment process. Phosphate coatings are used today as (1) a base for paint-bonding to iron, zinc, cadmium, aluminum and their alloys; (2) corrosion-proofing of iron, steel and aluminum that is to be left unpainted; (3) to improve the wear resistance of ferrous metal; and (4) to improve in quality and/or economy the cold mechanical deformation of steel (cold drawing, cold extrusion, die stamping cold forming). Ordnance project TB 4-302D, Report 21. D.A. project 593-14-006. RIAL R 57-1022.

Stress annealing in vacuum deposited copper films, by H. S. Story. Case Institute of Technology. Dept. of Physics, Cleveland, O. Mar 1956. 43p diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126854

An apparatus has been built for the measurement of mechanical stress in vacuum deposited films. A study of the stress changes during pulse annealing has been made with copper films deposited at several substrate temperatures between -150°C and 75°C. The annealing spectrum shows a prominent peak centering near room temperature which matches a resistance annealing peak in similar films and also in cold worked copper. The fall of tensile stress in this region suggests a vacancy mechanism. The theory of Murbach and Wilman for the behavior of initial stress with temperature is not supported by these results. Contract N6ori-27303, NR 017-611. ONR TR 17.

Test methods for magnesium surface treatments, by Frank W. Pfohl and Howard T. Francis. Armour Research Foundation, Chicago, Ill. Nov 1957. 63p diagrs, graphs, tables. Order from OTS. $1.75. PB 131600

A study was made of test methods whereby the quality of magnesium surface treatments could be determined. Methods which measured the corrosion-inhibiting power of the coating were found unsatisfactory. A method based on measurement of paint adherence after exposure to a corrosive environment, however, was found quite promising. The latter approach evolved the "Gauze-Peel Test," in which a gauze strip is embedded in the organic coating. After exposure to accelerated corrosion, the gauze is peeled from the surface. Both quantitative (peel strength) and qualitative (visual examination of the stripped area) evaluations are easily made. AD 142146. Project 7312, Task 73120. Covers work from 1 Feb 1955-1 Jul 1956 under Contract AF 33 (616)-2855. AF WADC TR 57-195.

## Inorganic Chemicals

Characterization of the aluminum oxides and of diatomic aluminum, by K. Keith Innes. Oklahoma. University. Research Institute, Norman, Okla. May 1956. 3p. Order from LC. Mi $1.80, ph $1.80. PB 126396

The object of the research was "to determine the conditions under which diatomic aluminum as well as oxides of aluminum such as AlO, $Al_2O$ and $AlO^+$ exist and exhibit electronic spectra." Diatomic aluminum nitride and carbide are also of interest. Of this group, only AlO (green bands and a few ultraviolet bands) had been observed previously. Contract Nonr-982(03), NR 019-135, Final report.

Chemical properties of sodium triethylhydroborate and sodium triisopropoxyhydroborate, by R. K. Pearson and L. J. Edwards. Callery Chemical Co., Callery, Pa. Dec 1956. 14p table. Order from LC. Mi $2.40, ph $3.30. PB 128381

Sodium hydride and triethylborane react to form sodium triethylhydroborate ($NaBH(C_2H_5)_3$. This compound was found to be soluble in hexane and mineral oil. A study was made of the thermal decomposition of sodium triethylhydroborate and its behavior toward boron trifluoride, boron trichloride, methyl borate, carbon dioxide, silane, and ethylene. Sodium triisopropoxhydroborate, $NaBH(OC_3H_7)_3$ was prepared and also found to be soluble in hexane and mineral oil. The reactions of this compound with methyl borate, triethylborane, silicon tetrachloride, and boron trichloride were investigated. CCC-1024-TR-213.

Chemistry of partially substituted silanes. Annual report under Contract Nonr-908 (02), NR 356-321, by William H. Nebergall and John S. Peake. Indiana. University. Dept. of Chemistry, Bloomington, Ind. Oct 1955. 23p tables. Order from LC. Mi $2.70, ph $4.80. PB 124848

In accordance with the original objective of this investigation the bromine derivatives of monosilane which contain one or two bromine atoms per molecule have been prepared in quantity, and studies have been made of their molecular structure and of

their organic derivatives. Though certain of the organic derivatives synthesized to date could have been made by more conventional means, it has been necessary to test out the method of introducing the silyl group ($-SiH_3$) by the reaction of monbromosilane with appropriate Grignard reagents to give compounds of the type $R-SiH_3$. Now that this method is well established work has begun on preparing compounds containing the silyl group which could not be synthesized using conventional methods. One such compound is disilylacetylene which is discussed in a subsequent section. A preliminary study of the infrared spectra of monobromosilane and dibromosilane was made during this investigation.

Decomposition of hydrogen peroxide vapor, by C. N. Satterfield and T. W. Stein. Massachusetts Institute of Technology. Dept. of Chemical Engineering, Cambridge, Mass. Feb 1956. 54p diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 126855

One of the purposes of this work was to obtain a clearer picture of the important factors which affect the surface decomposition rate. A second objective was to ascertain under what conditions homogeneous decomposition becomes appreciable. Aside from these more theoretical reasons, there is an engineering need for determining those materials which will cause the minimum decomposition on contact with hydrogen peroxide vapor. In the present work substantially greater $H_2O_2$ vapor concentrations than previously were studied, as well as a much greater variety of surfaces. DIC project 6552. Contract N5 ori-07819, NR 092-008, Report no. 49.

Electrochemical mechanisms of noble metal hydrogen systems. Part I: Platinum, by S. Schuldiner. U.S. Naval Research Laboratory. Mar 1958. 38p diagrs, graphs. Order from OTS. $1.00. PB 131526

This report is the first of a series reviewing the experimental and theoretical findings of the electrochemical mechanisms of noble-metal/hydrogen systems. The kinetic equations of hydrogen-producing reactions are derived; experimental techniques are discussed, including the use of an electronic current interrupter developed at this Laboratory; and results from studies of the electrode mechanisms of platinum are reported. NRL R 5091.

Experimental manufacture of sodium hydride. Ethyl Corporation. Chemical Research Laboratory, San Bernardino, Calif. Order separate reports described below from LC, giving PB number of each part ordered.

LTD 42-76, by E. J. Johnson. Nov 1942. 9p table. Mi $1.80, ph $1.80. PB 124987

The purpose was: (1) To manufacture sodium hydride for use in hydrogen generating tests. (2) To determine the effect of (a) cottonseed oil and (b) aluminum added to the autoclave charge, in continuation of the work reported.

LTD 42-47, by L. R. Krieg. Aug 1942. 23p diagrs, graphs, tables. Mi $2.70, ph $4.80. PB 124986

The purpose was: (1) To investigate the possibility of manufacturing sodium hydride in available TEL (tetraethyllead) manufacturing equipment. (2) To determine the effect of various non-reacting materials added to the autoclave charge. (3) To test the suitability of Baton Rouge plant raw materials for the reaction.

Extraction of sodium borohydride, by Harold A. Beatty and William R. Wilkinson. Ethyl Corporation. Chemical Research Laboratory, San Bernardino, Calif. Apr 1944. 14p fold diagr, tables. Order from LC. Mi $2.40, ph $3.30. PB 124979

The purpose of this research was: (1) To develop a solvent extraction method of separating sodium borohydride from the sodium methylate and other by-products formed in the manufacture of the borohydride. (2) To carry out the process on a pilot-plant scale, using IPA (isopropylamine) as the solvent. LTD 44-22.

High field conductance research, by Andrew Patterson, Jr. Yale University. Sterling Chemistry Laboratory, New Haven, Conn. May 1956. 150p diagrs, graph, tables. Order from LC. Mi $7.20, ph $22.80. PB 126423

In this report, work on solutions of sodium in liquid amonia, polyelectrolytes in water and methanol solutions; and on aqueous solutions is discussed in detail. Includes "The true ionization constant of carbonic acid in aqueous solution from 5 to 45°", by Kurt F. Wissbrun, Douglas M. French and Andrew Patterson, Jr. Reprinted from the Journal of Physical Chemistry, Vol. 58, 693, 1954. Contract Nonr-215(00), NR 051-249, Technical report no. 3.

Isotopic exchange between deuterium and hydrocarbons on nickel-silica catalysts, by Robert L. Burwell, Jr. and Richard H. Tuxworth. Northwestern University, Evanston, Ill. Nov 1955. 24p diagr, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 124831

The effect of temperature, of the ratio of deuterium to hydrocarbon, and of nickel crystallite size upon the isotopic exchange reaction between hydrocarbon and deuterium is reported for nickel-silica catalysts which have been characterized by the magnetic method of Selwood. Cyclohexane and, to a lesser extent,

heptane, cyclopentane and (+)3-methylhexane have been employed as test hydrocarbons. Technical report no. 8. Contract N7onr-54006, NR 055-199.

Lattice vibrations in sodium chloride type structures, by Paul Mazur. Maryland. University. Physics Dept., College Park, Md. n.d. 96p graphs. Order from LC. Mi $5.40, ph $15.30. PB 126504

Three problems in the theory of lattice vibrations in sodium chloride type lattices are investigated and quantitative treatments are carried out in detail. Firstly, assuming only nearest neighbor interactions with central and non-central forces, the frequency spectrum (i.e., the number of normal modes of vibration between $\omega^2$ and $\omega^2 + \Delta\omega^2$) is obtained exactly. The effect of 2nd nearest neighbor interactions on the spectrum is then treated as a small perturbation. Secondly, assuming only nearest neighbor interactions, the distribution function of the position of a typical atom around its equilibrium position is worked out. Thirdly, the effect of defects on the lattice vibration is investigated. AD 126438. Date is 1956 or later. Contract AF 18 (600)-1015. AF OSR TN 57-149. UM TR 65.

Magnetic susceptibilities of ortho and meta vanadates of neodymium and praseodymium, by Ardys Klann and R.C. Vickery. Horizons, Inc. Chemistry Dept., Cleveland, O. Mar 1957. 4p table. Order from LC. Mi $1.80, ph $1.80. PB 126594

AD 120-478. Technical note no. 2.
1. Earths, Rare - Magnetochemical properties
2. Neodymium vanadates - Magnetic properties
3. Praseodymium vandates - Magnetic properties
4. Contract AF 18(600)-96 5. AF OSR TN 57-123

Measurement of the dielectric constant of single-crystal $BaTiO_3$ at microwave frequencies, by Edwin T. Jaynes and Vernon Varenhorst. Stanford University. W.W. Hansen Laboratories of Physics. Microwave Laboratory, Stanford, Calif. May 1956. 56p photos, diagrs, graphs. Order from LC. Mi $3.60, ph $9.30. PB 126524

High-frequency dielectric measurements on $BaTiO_3$ single crystals were undertaken in order to obtain data on impedances necessary in design of electro-optical cells and to estimate the bandwidth over which good coupling between an external circuit and the crystal could be achieved. The measurements were obtained with a single crystal. Contract Nonr-225(18), NR 017-428. SU ML R 287.

Photochemical sysnthesis of endothermic compounds, by Harry E. Gunning. Illinois Institute of Technology. Dept. of Chemistry, Chicago, Ill. May 1956. 10p. Order from LC. Mi $1.80, ph $1.80. PB 126490

Under the present contract, emphasis has been placed on the synthesis of endothermic metallic halides from the photolysis of volatile metallic halides. Our efforts to date have been devoted to the study of the photolysis of $TiCl_4$ both in the vapor and liquid phases, and also in the presence of organic acceptor solvents. A study has also been initiated on photolysis of $SnCl_4$ under similar conditions. Apparatus is being constructed for the study of the photolysis of anhydrous $AlCl_3$ and $BCl_3$. Studies have begun on surface-photoactivated reactions, wherein there is a high possibility of isolating endothermic products. Contract N7 onr-32915, NR 052-351.

Preparation and properties of sodium hydride, by W.R. Wilkinson and H.A. Beatty. Ethyl Corporation. Chemical Research Laboratory, San Bernardino, Calif. Mar 1944. 9p table. Order from LC. Mi $1.80, ph $1.80. PB 124983

This report summarizes the development work on the preparation of sodium hydride as related to the manufacture of sodium borohydride. LTD 44-19.

Preparation of sodium borohydride-boric oxide tablets, by H.A. Beatty. Ethyl Corporation. Chemical Research Laboratory, San Bernardino, Calif. Apr 1944. 7p graphs. Order from LC. Mi $1.80, ph $1.80. PB 124982

The purpose was to prepare tablets from powdered sodium borohydride-boric oxide mixture, for use in hydrogen generators. LTD 44-23.

Processing of brine through Hooker cells and evaluation of operation, by T.S. Dewoody, Jr. and John H. Oliver. Diamond Alkali Co. Research Dept., Pinesville, O. May 1956. 60p photos, diagrs, graphs, tables (1 fold). Order from LC. Mi $3.60, ph $9.30. PB 126402

Two Hooker cells located in the government-owned plant at Pine Bluff Arsenal, leased to the Diamond Alkali Co., were test-operated on a brine produced from the GB plant off-gas, which was saturated and filtered before passing into the cells. Includes results of tests, brine treatment, cell operating procedures, analytical procedures, procedure for liquefying chlorine gas for analysis, and calculations of material balance and carbon loss. Covers period 31 May-24 Aug 1956 under Contract DA 05-021-401-CML-10,091.

Quarterly periodic status report under Contract Nonr-1841(00), by Ralph L. Wentworth. Massachusetts Institute of Technology. Hydrogen Peroxide Laboratories, Mar 1956. 11p photo, diagr, graphs, table. Order from LC. Mi $2.40, ph $3.30. PB 124914

Summarizes work for the period on stability measurements on "special" 99% hydrogen peroxide

(Becco manufacture), optimum conditions of stabilization, stannate stabilization in aluminum containers, cyclical barium processes, and flame velocities in hydrogen peroxide vapor. DIC 5-7476.

Research on the electrochemical behavior of polycristalline silver, by Guido Poli. Politecnico di Milano. Laboratorio di Elettrochemica, Chimica Fisica e Metallurgia, Milan, Italy. Dec 1956. 17p diagrs, graph. Order from LC. Mi $2.40, ph $3.30. PB 126739

The anodic and cathodic behavior of silver in perchlorate, nitrate and sulphamate solutions has been investigated by means of oscillographic recordings of the voltage-time curves for very short rectangular current pulses. The influence of the anion, of the silver salt concentration and of the free acid content on the "maxima" and on the initial polarization capacities has been investigated and discussed. The activating influence of the sulphamate, nitrate and hydrogen ions has been confirmed. The silver overvoltage is explained as depending on cristallization processes. AD 115083. Technical note no. 9. Contract AF 61(514)-733C. AF OSR TN 57-45.

Sodium methylate from the sodium borohydride reaction, by W. R. Wilkinson. Ethyl Corporation. Chemical Research Laboratory, San Bernardino, Calif. Apr 1944. 4p table. Order from LC. Mi $1.80, ph $1.80. PB 124981

The purpose was: (1) To determine the purity of the sodium methylate obtained as a by-product in the manufacture of sodium borohydride. (2) To purify 1 lb. of the material (filter cake) by extraction with methanol and subsequent evaporation of the solvent. LTD 44-24.

Stereochemistry of subgroup $VI_b$ of the periodic table, by S. C. Abrahams. Massachusetts Institute of Technology. Laboratory for Insulation Research, Cambridge, Mass. Apr 1956. 73p diagrs, graphs, tables. Order from LC. Mi $4.50, ph $12.30. PB 126479

The properties of the elements in subgroup $VI_b$ of the periodic table, oxygen, sulfur, selenium, tellurium and polonium, undergo striking transitions as the group is ascended. The chemical behavior of the group passes from that of the typical nonmetals oxygen and sulfur, to the typical metal polonium. Also systematic change is found in the structure of the elements, from diatomic molecules, through ring and chain molecules, to a simple lattice composed of polonium atoms. A corresponding transition in electrical properties accompanies the structural evolution. Within this subgroup, chemical bonds to one, two, three, four and six other atoms are known, and this complexity in bond formation has attracted sustained interest over many years. The present review is an attempt to bring together the most important information, at present scattered throughout the literature, concerning the geometrical and electronic configuration of these atoms in their different bonded states. Includes a bibliography of 269 references. Contract N5 ori-07801, NR 017-421. MIT LIR TR 104.

Ternary compounds. Fifth technical report for the period 1 Jun 1955 to 31 May 1956 under Contract Nonr-367(00), NR 052-268, by Roland W. Ward, Lewis Katz and others. Connecticut. University. Dept. of Chemistry, Storrs, Conn. Jun 1956. 65p diagr, graphs, tables. Order from LC. Mi $3.90, ph $10.80. PB 126395

Covers the following oxide systems: strontium-tantalum-oxygen, barium-tantalum oxygen, strontium-iridium-oxygen, calcium-iridium oxygen, lead-iridium-oxygen, calcium-ruthenium-oxygen, strontium-ruthenium-oxygen, strontium-platinum-oxygen, alkaline earth-molybdenum-oxygen, lanthanum-molybdenum-oxygen, cadmium-molybdenum-oxygen; also anion-deficient phases in titanium and in vanadium compounds, preparation of $Zn_4Mo_6O_{16}$, and determination of the structure of $Zn_4Mo_6O_{16}$ and $Mg_4Mo_6O_{16}$. Contract Nonr-367(00), NR 052-268, Technical report no. 5.

Tin-hydrogen bond distance, by George R. Wilkinson and M. Kent Wilson. Harvard University. Mallinckrodt Chemical Laboratory, Cambridge, Mass. Aug 1956. 2p. Order from LC. Mi $1.80, ph $1.80. PB 126483

Reports results of an analysis of the Sn-H stretching vibration of $SnHD_3$. AD 95801. Chem 30-13. Contract AF 18(600)-590. AF OSR TN 56-365.

X-ray diffraction study of crystalline silanes, by W. L. Baun. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, O. Oct 1957. 16p tables. Order from OTS. 50 cents. PB 131551

X-ray diffraction patterns for nineteen crystalline silanes are presented. These compounds are of interest because of their high thermal stability and low vapor pressure. They are particularly well suited for X-ray diffraction analysis because of their crystalline nature and the individualistic patterns obtained. AD 142066. Project 7360, Task 73601. Covers work from Jul 1956-Mar 1957. AF WADC TN 57-114.

## Analytical Chemistry

Analytical applications of far infrared spectra. I: Historical review, apparatus and techniques, by Freeman F. Bentley, Eugene F. Wolfarth, Nora E. Srp and Wilbert R. Powell. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base,

Dayton, O. Sep 1957. 63p photos, graphs, tables. Order from OTS. $1.75. PB 131514

A review of the work accomplished to date in the far infrared region is presented in this paper, and most of the available literature is cited. A double beam double pass spectrophotometer equipped with cesium bromide optics is described. This instrument extends the useful spectral range to 35 microns. The general features of the instrument's construction and its performance capabilities are discussed. The advantages of far infrared spectra, and some of the special techniques of obtaining infrared spectra in the cesium bromide region, are also discussed. AD 142010. Project 7360. Covers work from Sep 1954 to Dec 1956. AF WADC TR 57-359.

Colorimetric estimation of hemoglobin in the presence of myoglobin, by Anton Tamas. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Aero Medical Laboratory, Wright-Patterson Air Force Base, Dayton, O. Feb 1958. 9p table. Order from OTS. 50 cents. PB 131744

Determination of hemoglobin in the presence of myoglobin requires spectrophotometric estimation of both pigments. Instrumentation becomes complicated and cumbersome. A simple technique is presented for the estimation of tissue hemoglobin , where the interference from myoglobin is eliminated by differential solubilities. Converting the pigments to acid hematin renders the technique colorimetric. Through suitable simplification, the method is applicable to body fluids. AD 142347. Project 7159, Task 71803. Covers work from Jun-Aug 1957. AF WADC TR 58-55.

Development of a universal method for grease analysis, by M. T. Fisher. U.S. Arsenal, Rock Island, Ill. Jan 1957. 15p tables. Order from OTS. 50 cents. PB 131354

The purpose of this work is to develop a more adaptable and less time consuming method for determining the thickener and fluid content of greases, particularly those which are very difficult or impossible to analyze by ASTM method D128-47. Ordnance project TB 5-4010A, Report no. 17. D. A. project 593-21-053. RIAL R 57-99.

Fluorometric determination of HCN; application to analysis of Ga vapor (U), by Jacob S. Hanker, Robert M. Gamson and Harold Klapper. U.S. Chemical Corps. Chemical and Radiological Laboratories, Army Chemical Center, Md. Apr 1956. 19p graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 126805

A new fluorometric method for the determination of microquantities of cyanide has been developed. This method can be used for the estimation of HCN in GA and is accurate in the range of 0.3 to 6.0 mmg. of cyanide. Project 4-08-06-030-01. CC CRL R 459.

Infrared spectra of $GeCl_4$, $GeHCl_3$, and $GeDCl_3$, by Louis P. Lindeman and M. Kent Wilson. Harvard University. Mallinckrodt Chemical Laboratory, Cambridge, Mass. Oct 1956. 6p graphs, tables. Order from LC. Mi $1.80, ph $1.80. PB 126481

The infrared spectrum of $GeCl_4$, $GeHCl_3$, and $GeDCl_3$ was investigated from 300 to 4000 $cm^{-1}$. The results for $GeCl_4$ and $GeHCl_3$ are in agreement with the previously published Raman data. AD 110306. Contract AF 18(600)-590. AF OSR TN 56-492.

Infrared studies of crystals II. Final report for the period 15 May 1954-30 Mar 1956 under Contract DA 36-039-sc-56736, by G. B. B. M. Sutherland. Michigan. University. Engineering Research Institute, Ann Arbor, Mich. Apr 1956. 59p diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 126767

The general purpose of this research was to complete certain phases of the investigations started in May 1951 under Contract DA 36-039-sc-5581 on the infra- red spectra and crystal structure of barium titanate, brucite, mica, diamond and gypsum. Most of the factual data have already been reported in the 7 quarterly reports on this contract or in Technical Report No. 3 (dated June 1955) by Marvin Hass. Signal Corps project no. 152B. Dept. of the Army project no. 3-99-15-022. Contract DA 36-039-sc-56736, Final report. MU ERI Proj 2235-9-F.

Interferometric measurement of the infrared dispersion of liquids, by R. E. Kagarise and J. W. Mayfield. U.S. Naval Research Laboratory. Mar 1958. 21p diagrs, graphs, tables. Order from OTS. 75 cents. PB 131522

Through the use of high-purity germanium it is possible to construct interferometers which are capable of moderately accurate refractive index measurements. Using the interferometric method, the refractive indices of carbon disulfide, carbon tetrachloride, chloroform, cyclohexane, and perfluoro-1, 3, 5-trimethyl cyclohexane have been measured with an accuracy of $\pm 0.003$ or better. By taking advantage of the anomalous dispersion encountered in the neighborhood of absorption bands, it has been possible to verify the theoretical predictions of Polo and Wilson regarding the effects of refractive index on the intensity of infrared bands. NRL R 5088.

Modified Scholander apparatus for accurate estimation of carbon dioxide in small samples of expired air, by Lester M. Levy. U.S. Army. Medical Nutrition Laboratory, Fitzsimons Army Hospital, Denver, Colo. Aug 1956. 9p drawing,

diagr, table. Order from LC. Mi $1.80, ph $1.80. PB 128720

The original Scholander apparatus for estimation of carbon dioxide in expired air has been substantially modified to eliminate many of the difficulties encountered with the original. The changes have been made possible because oxygen is more readily determined with the Beckman oxygen analyzer. Hence, the reservoir arm containing oxygen absorbent could be eliminated. This also made possible the conversion of the carbon dioxide absorbent reservoir into an outpouching from the reaction chamber. This has eliminated sources of leakage and resulting errors. Additionally, simpler technics for sampling the gas with oiled syringes are described. Project 6-60-11-020. AMNL R 189.

Nuclear magnetic resonance as a method for detecting relaxation phenomena of molecules adsorbed on surfaces, by J. G. Aston and N. Fuschillo. Pennsylvania State University. Cryogenic Laboratory, University Park, Pa. Mar 1956. 6p graphs. Order from LC. Mi $1.80, ph $1.80. PB 126569

As a result of an attempt to detect nuclear magnetic resonance absorbtion of water and methane adsorbed on $TiO_2$ the nuclear resonance lines have been obtained. The trace of the derivative line for water at an estimated coverage of 0.1 monolayer at room temperature is shown. Contribution no. 87. Contract N6 onr-269, T.O. III.

Power spectrum analysis of atmospheric ozone, by Arthur Adel and Edward S. Epstein. Arizona State College, Flagstaff, Ariz. Sep 1956. 72p graphs. Order from LC. Mi $4.50, ph $12.30. PB 126511

Scientific report HA-8. 1. Ozone - Spectrographic analysis 2. Atmosphere - Ozone - Determination 3. Solar radiation 4. Contract AF 19(122)-198 5. AF CRC TN 56-861

Study of molecular compound formation between electron donors and acceptors, by S. Winstein. California. University. Dept. of Chemistry, Los Angeles, Calif. Jun 1956. 14p tables. Order from LC. Mi $2.40, ph $3.30. PB 126378

The general task was a study of the interaction between electrondonors and acceptors; the report can be subdivided into two divisions: A. Complexes between hydrocarbons and trinitrobenzene, chloranil and maleic anydride; B. Carbonium ions. Contract N6 onr-275(II), NR 055-042, Final report.

X-ray emission lines and 2θ values for lithium fluoride analyzing crystal, by W. L. Baun and R. E. Brocklehurst. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, O. Sep 1957. 58p table. Order from OTS. $1.50. PB 131440

A complete table of x-ray emission lines and 2θ values, using a lithium fluoride analyzing crystal, is presented. This table includes all the lines of the K, L, and M series, order 1 to order 9. AD 131063. Project 7360, Task 73600. Covers work from Feb 1956-Mar 1957. AF WADC TR 57-212.

## Miscellaneous Chemicals

Application of the theory of stochastic processes to chemical kinetics, by Elliott W. Montroll and Kurt E. Shuler. Maryland. University. Institute for Fluid Dynamics and Applied Mathematics, College Park, Md. Feb 1957. 54p graphs. Order from LC. Mi $3.60, ph $9.30. PB 126967

This is a review of the theory of the conditions for validity of the use of equilibrium theories in the analysis of chemical kinetics. The work of Hinshelwood, Prigonine, Kramers, Eyring, and others is discussed. A truncated harmonic oscillator model is presented and analyzed in great detail. Conditions are found under which equilibrium theory is appropriate, as well as those under which equilibrium rates are either too slow or too fast. A general theory of reaction kinetics as a stochastic first passage time problem is developed. AD 120416. Contract AF 19(600)-1315. UM BN 94. AF OSR TN 57-73.

Investigation of the rheologic properties of mastic asphalt, of the development of cracks in mastic asphalt roofs, and of the progressive opening of the cracks, by J. M. Kirk. 1956. 20p diagrs, graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 126220

The rheologic properties of mastic asphalt have been determined by experiments where the deflection curves of mastic asphalt bars have been measured. Furthermore, the variation of the rheologic properties with the variations of temperature has been established by these experiments. On the basis of the results found, an equation has been deducted which allows an approximate calculation of the tensile stresses arising in mastic asphalt when cooled. The results found have been confirmed by a number of experiments by which an alternating cooling and heating process made contractions develop in mastic asphalt bars. Civil engineering and building construction series, vol. 3, no. 4. Acta polytechnica 193.

Pseudo-stationary state approximation in chemical kinetics, by Joseph O. Hirschfelder. Wisconsin. University. Naval Research Laboratory. Dept. of Chemistry, Madison, Wis. Apr 1956. 8p. Order from LC. Mi $1.80, ph $1.80. PB 126948

In chemical kinetics it is customary to determine the concentrations of each of the free radicals and chemically unstable intermediates by assuming that these intermediates are in pseudo-stationary equilibrium with the principal chemical components. The mathematical nature of the pseudo-stationary approximation is examined and a method is developed for testing its validity or improving its accuracy in specific cases. Contract N7 onr-28511. WIS ONR 21.

Studies in non-equilibrium chemical kinetics. I: Relaxation of a system of harmonic oscillators, by Elliott W. Montroll and Kurt E. Shuler. Maryland. University. Institute for Fluid Dynamics and Applied Mathematics, College Park, Md. and U.S. National Bureau of Standards. Mar 1956. 39p graphs. Order from LC. Mi $3.00, ph $6.30. PB 126545

As part of an investigation of non-equilibrium phenomena in chemical kinetics a theoretical study has been made of the collisional and radiative relaxation of a system of harmonic oscillators contained in a constant temperature heat bath and prepared initially in a vibrational non-equilibrium distribution. An exact solution has been obtained for the general relaxation equation applicable to this system and expressions have been derived for the relaxation of initial Boltzmann distributions, Poisson distributions and $\delta$-function distributions as well as for the relaxation of the moments of the distributions. Using the latter result, explicit expressions are given for the relaxation of the internal energy of the system of oscillators and for the time dependence of the dispersion of the distributions. Being submitted for publication in the "Journal of Chemical Physics". AD 82504. Contract AF 18 (600)-1315. AF OSR TN 56-108. UM BN 70.

## ELECTRICAL MACHINERY

### Electronics

Automatic or semiautomatic production of electronic packaged subassemblies, by A. Arnold Lawson. Melpar, Inc., Falls Church, Va. Apr 1956. 57p photos, diagr, graphs, tables. Order from OTS. $1.50. PB 131337

This report is primarily concerned with the results of the test production run of subassemblies, the economics of short-run automatic production, the modifications made since the last interim report, the conclusions to be drawn from the research conducted under this contract, and recommendations for future research. The MINI-MECH system as it now exists fulfills the requirements of the contract. It has proved the feasibility and practicality of introducing automation into short-run production of electronic subassemblies. Its usefulness could be greatly increased by modifying the system to take a greater variety of board sizes and configurations, as is recommended at the end of this report. Contract NObs-5235, Addendum 2, Final report.

Balloon-borne high-frequency radio beacon, by Edwin R. Bindseil, George A. Long and Richard F. Tecca. U.S. Air Force. Air Research and Development Command. Rome Air Development Center, Griffiss Air Force Base, N.Y. Jan 1956. 77p photos, diagrs, graphs. Order from LC. Mi $4.50, ph $12.30. PB 126765

The beacon was designed to operate at 40,000 feet with an outside temperature of -67 degrees Fahrenheit for a period of 72 hours. A description is presented of the design and fabrication characteristics, the development procedures, test results, and recommendations for future versions of the beacon. The contents of the report are divided into three groups: electronic, mechanical, and materials engineering aspects. Included are diagrams of the housing; photographs of components; applicable formulas and equations; circuit diagrams; and ancillary data pertinent to the design and development of the beacon. AF RADC TR 56-4.

Cocci insertion loss design of electric filters, by D.J.H. Maclean. Stanford University. Electronics Laboratories, Stanford, Calif. Jun 1956. 267p diagrs, graphs, tables. Order from LC. Mi $11.10, ph $40.80. PB 126781

A design method for LC filters meeting prescribed insertion amplitude-frequency characteristics is described. The theoretical basis and the consequent practical design procedures were developed by Professor Giovanni Cocci (1907-1942) of Italy, and were published in the technical journal, "Alta Frequenza." A free translation of the articles form the body of this work, which is in three divisions corresponding to the original articles, namely: A. "Filters with the Minimum Number of Elements" ("Alta Frequenza," Vol. XI, 11-12, Nov.-Dec., 1942). B. "Transmission Functions of Purely Reactive Quardripoles Inserted between Two Resistors" ("Alta Frequenza," Vol. II, 12, Dec., 1938). C. "Design of Quadripoles of Pure Reactance with Given Transmission Functions" ("Alta Frequenza," Vol. X, 8-9, Aug.-Sept., 1941). Each of these divisions contains the summary, introduction, text and appendices of the original, plus added material. Contract Nonr-225(24), NR 373-360, Technical report no. 2.

Co-location of TACAN and VOR/DME, by R.M. Brooks. U.S. Air Force. Air Research and Development Command. Rome Air Development Center, Griffiss Air Force Base, Rome, N.Y. Jan 1956. 51p photos, diagrs, tables. Order from LC. Mi $3.60, ph $9.30. PB 126768

This test program was conducted to resolve the optimum configuration for operating the TACAN and

VOR ground facilities within close proximity while causing a minimum of degradation to the performance of either. Analysis of flight test data indicated that the best results are obtained when both electronic equipments are located in the same shelter with the TACAN antenna mounted coaxially above the VOR antenna assembly. AF RADC TR 56-3.

Comparison of silicon and germanium low power audio alloy transistors, by Joseph Mandelkorn. U.S. Signal Corps Engineering Laboratories, Fort Monmouth, N.J. Aug 1956. 21p diagr, graphs, table. Order from OTS. 75 cents. PB 131364

This study was undertaken to compare one of the best available germanium alloy transistors in production with the best available developmental samples of silicon alloy transistors. This report deals with the change in electrical characteristics and performance with temperature. The devices discussed are a new silicon alloy transistor and representative germanium alloy transistors. The temperature range chosen for germanium is -55° C to +70°C, while that for silicon is -55°C to +150°C. Characteristics vs. temperature were measured at various spot temperatures throughout the selected ranges. Signal Corps project nr. 323A. Dept. of the Army project nr. 3-19-03-031. SCEL TM M 1823.

Coupling of optic and acoustic modes of vibration in crystals, by Ernest Bauer. New York University. Institute of Mathematical Sciences. Division of Electromagnetic Research, New York, N.Y. Sep 1956. 23p diagrs, table. Order from LC. Mi $2.70, ph $4.80. PB 126838

The transition probability for transfer of energy from one optic to two or three acoustic modes of vibration has been calculated for NaCl, and found to be of the order $10^{12}$ per sec at low temperatures. AD 110229. Contract AF 19(604)-1705. AF CRC TN 56-869. NYU RR CX 28.

Effect of emergencies and communications availability with differing entry rates, a study in human engineering aspects of radar air traffic control, by John Versace. Ohio State University. Laboratory of Aviation Psychology, and Ohio State University Research Foundation, Columbus, O. Dec 1956. 81p photos, graphs, tables. Order from OTS. $2.25. PB 131266

This experiment is the fifth in a series using the OSU electronic air traffic control simulator and conducted for the purpose of determining the capacities of human controllers for performing different control functions. The problem studied was that of two controllers in moving a group of 32 jet bombers and fighters through the terminal zone which extended for a radius of 50 mi. from the GCA gate. The three variables evaluated in the experiment were (a) presence vs. absence of direct, face-to-face communication between controllers, (b) presence vs. absence of emergencies, and (c) traffic load-average separation of 45, 60, and 90 sec. per aircraft. A summary of these results and their implications are given in Section I; a more complete report is contained in Section II. AD 118320. Project 7192, Task 71596. For Parts 1-4, 6 see PB 121524, 121773, 121799 and 131270. Contract AF 33(616)-3612. AF WADC TR 56-70.

Electronic equipment pressurization systems study, by Charles L. Watson and James E. O'Neil. Research, Inc., Dallas, Tex. Jan 1958. 302p photos, diagrs, graphs, tables. Order from OTS. $5.00. PB 131713

This report is concerned with a study and evaluation of various pressurization systems which might be employed to pressurize the sealed containers and replenish the air lost from the containers by leakage through mechanical seals. Four basic pressurizing air sources are considered, namely, turbojet compressor bleed, auxiliary compressors, ground charged high pressure storage containers, and the pneumatic systems installed in the aircraft. Complete pressurization systems which incorporate the air sources alone or in various combinations are designed and evaluated in the report. The system designs are based on design and performance data established on the various components that comprise the systems and on the range of environmental conditions under which the systems must operate. AD 142270. Project 6146. Contract AF 33(616)-3304. AF WADC TR 56-661.

Errors in altitude triangulation caused by variation in index of refraction, by R.M. Page and S.F. George. U.S. Naval Research Laboratory. Jun 1951. 9p graphs, tables. Order from LC. Mi $1.80, ph $1.80. PB 126451

A theoretical analysis is presented of the effect of a variation in the atmospheric index of refraction on the elevation angle and range as measured by a radar system. Formulas are developed which express the errors in angle and range as functions of the actual target altitude and range, and the index of refraction. Altitude error curves for both angle and range triangulation are presented by the use of two assumed functions to fit empirical index of refraction data. These curves show that for long-range low-flying targets range triangulation can at times produce greater errors in altitude than angle triangulation. The relatively large errors revealed by this study point to the need for a good method of measuring accurately the refractive index gradient. Unclassified 15 Dec 1953. NRL R 3844.

Industrial preparedness study for diffused semiconductor device no. 23. Final feasibility report, by William C. Brower, Joseph M. Brown, Charles V. Comman, David L. Milam and Will Parmer. Texas Instruments, Inc. Semiconductor-Components Division, Dallas, Tex. May 1957. 81p

photos, diagrs, graphs, tables. Order from LC. Mi $4.80, ph $13.80. PB 126255

A detailed analysis of the design, fabrication, and performance of the grown-diffused silicon tetrode transistor for Device No. 23 objective requirements is presented in this report, which covers the Phase I feasibility study of the subject contract. The grown-diffused crystal growing and cutting techniques developed are shown to yield transistor bars in large quantities with reproducible characteristics suitable for device fabrication. Contract DA 36-039-sc-72703.

Investigation of atmospheric radio noise. Scientific report no. 11 for the period 1 Jan-31 Mar 1956 under Contract AF 19(604)-876, by A. W. Sullivan, R. F. Brown and P. J. Nawrocki. Florida. Engineering and Industrial Experiment Station. Dept. of Electrical Engineering, Gainesville, Fla. Apr 1956. 88p diagrs, (1 fold), graphs, tables. Order from LC. Mi $4.80, ph $13.80. PB 126841

This report contains a complete account of the work done in evaluating the usefulness of the first probability distribution function of atmospheric noise in estimating the performance of a manual radiotelegraph system. Very good correlation between the measure of noise and the performance of the system was obtained. Preliminary work toward an investigation of the polarization of the ground wave of a single atmospheric pulse is described. Marked differences between the vertical and horizontal components of the Sferic pulse are noted in both the ground and ionospherically reflected waves. For reports 1-10, 12-13 see PB 113559, 113764, 116122, 116123, 116501, 116979, 117733, 119364, 119807, 123165, 125147 and 126602. AF CRC TN 56-353.

Investigation of noise generated by electrical slip rings, by George A. Forster. Armour Research Foundation, Chicago, Ill. Apr 1954. 88p photos, drawing, diagrs, graphs, tables. Order from LC. Mi $4.80, ph $13.80. PB 128058

Strain gage recording of propeller strains was limited by electrical noise produced by the slip rings and contacts. The sources of slip ring noise were found to be thermoelectric effects, variable contact resistance, and loss of contact or brush bounce. Very small deviations of the slip ring surface from a true cylinder were shown to be sufficient to cause brush bounce. An effective means of nullifying the causes of bounce is a brush of metal wool which absorbs and damps out mechanical shocks. Of the materials tested, the best combination was a brush of molybdenum wool rubbing on a silver slip ring. The brush operates at a pressure of five pounds per square inch and was tested at speeds to 20,000 feet per minute at 40,000 feet equivalent altitude. AD 51055. Covers work from 21 May 1952-1 Apr 1954 under Contract AF 33(616)-137. AF WADC TR 54-125.

Investigations of rhenium for electron tube applications. First quarterly progress report for the period 1 Jul - 30 Sep 1956 under Contract AF 19(604)-1741, by C. T. Sims, E. F. Adkins, W. E. Nexsen, D. M. Rosenbaum, G. B. Gaines, R. J. Jaffee, C. S. Peet and I. E. Cambell. Battelle Memorial Institute, Columbus, O. Oct 1956. 15p photos, diagr, tables. Order from LC. Mi $2.40, ph $3.30. PB 126759

Chemical preparation of rhenium metal powder and consolidation of rhenium metal, and Mo-Re and W-Re alloys is discussed. Fabrication of W-30Re alloy has been studied. The stability of a thoriated rhenium filament, exposed at a high temperature for an extended period of time, was evaluated by mechanical and metallographic techniques. Thermionic emission measurements of thoriated rhenium are under way, and construction of a guard-ring diode for this purpose is discussed. Behavior of tungsten and rhenium in mechanical shock and thermal cycling tests also is discussed. AD 110199. Task no. 46310. Contract AF 19(604)-1741. AF CRC TN 56-995.

Life test estimation procedures, by Benjamin Epstein. Wayne University. Dept. of Mathematics, Detroit, Mich. Jul 1954. 26p. Order from LC. Mi $2.70, ph $4.80. PB 126386

1. Tubes, Electron - Life tests 2. Tubes, Electron - Failure - Theory 3. Contract DA 20-018-ord-13272, Technical report no. 2

Linear arrays with arbitrarily distributed elements, by H. Unz. California. University. Division of Electrical Engineering. Electronics Research Laboratory. Antenna Group, Berkeley, Calif. Nov 1956. 60p diagr, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 126254

A linear array with general arbitrarily distributed elements is discussed. Two examples are given for linear arrays which produce a prescribed pattern. Comparison between an array with equispaced elements and an array with arbitrarily distributed elements shows that the latter requires fewer elements and gives better performance. Contract N7 onr-29529, Report no. 56. UC IER Series 60, Issue no. 168.

Measurement of thermal diffusivity of various materials by means of the high intensity electric arc technique, by Charles Sheer, Lawrence H. Mead, Donald L. Rothacker and Leonard H. Johnson. Vitro Corporation of America. Vitro Laboratories, West Orange, N. J. Nov 1957. 61p photos, diagrs, graphs, tables. Order from OTS. $1.75. PB 131601

Studies have been made of the tail flame of a high-intensity electric arc to determine its suitability as a medium for testing materials under sustained high-temperature gaseous flow. The first year ef-

fort reported herein centered on the establishment of an electrode geometry for stable operation, measurements of the temperature and velocity distribution in the tail flame at varying ambient pressures, and qualitative observations of the electrodynamic, magnetic and thermodynamic properties of the tail flame. The axial temperature distribution in the tail flame was measured by spectral line reversal technique for temperatures below 3200°K, and by spectral band analysis above this temperature. Flame velocity was measured by a modification of Rohloff's method, involving a temporary interruption of the arc and observation of the downstream propagation of the resulting disturbance by high-speed cinematography. Surface heat flux rates were measured at 1.0 and 0.1 atmospheres on copper bodies in thermal equilibrium. Finally, diffusivity measurements were made in the tail flame on OFHC copper and graphite plates. AD 142093. Project 7360, Task 73603. Covers work from Apr 1956-Mar 1957. Contract AF 33(616)-3669. AF WADC TR 57-226.

Nonmetallic ferromagnetic materials: Part VI: Ferrite measurements program, by Robert E. Shultz, and Harold W. Katz. General Electric Company. Electronics Div., Syracuse, N.Y. Dec 1955. 102p photos, diagrs, graphs. Order from OTS. $2.75. PB 131039

In this report techniques for determining B-H relationships are discussed. and a practical hysteresigraph is described. Large signal data for a number of commerical ferrites are presented. These data include: (1) reactive and real power, over a frequency range of 50 to 500 kc and a temperature range from room temperature to a point near the Curie temperature; (2) normal magnetization curves of several selected materials over a temperature interval of -70°C to the Curie temperature; (3) saturation flux density as a function of temperature for several selected materials. Low signal measurements of permeability, μ, quality factor, Q, and μ Q product are reported for a variety of materials. AD 110615. Project 4155, Task 41640. Covers work from Apr 1, 1943 - Oct 31, 1955 under Contract AF 33(616)-2009. For Parts 1-5, 7-8 see PB 121858, 121861, 121868 - 121869, 121874, 131052-131053. AF WADC TR 56-274, Part 6.

Operational tests of miniature microphones and receivers, by Henry M. Moser and John J. Dreher. Ohio State University Research Foundation, Columbus, O. Oct 1956. 13p tables. Order from LC. Mi $2.40, ph $3.30. PB 126761

Report of transmission and reception tests on an experimental model of a Telex # 3776 binaural headset and a modified M-32 microphone, which would offer relief from the weight and discomfort of standard sets. AD 98819. Project no. 7681. Contract AF 19(604)-1577, Technical report no. 36. OSURF Proj 664. AF CRC TN 56-57.

P-n junctions and their photoelectric properties. Final report for the period 15 Jun 1954 to 14 Jun 1955, under Contract DA 36-039-sc-6444, by Kurt Lehovec and John Oberly. Sprague Electric Company, North Adams, Mass. Jul 1955. 134p photos, diagrs, graphs, tables. Order from LC. Mi $6.90, ph $21.30. PB 126794

The work has been principally concerned with graded junctions prepared by melting and regrowing low-Si alloys on a Ge base. Polycrystalline alloy ingots have been used for this purpose. It has been shown that graded junctions having differences in Si content up to several percent can be prepared free of cracks. The following four experimental and theoretical problems have also been investigated in the course of this contract: (a) Electrical properties of grown germanium P-N junctions, by R. Zuleeg and H. Jackson. (b) Recombination radiation from germanium and silicon. (c) Theory of the magnetic rectifier. (d) Current-voltage characteristic and hole-injection factor of point-contract rectifiers in the forward direction.

QRC T-21 interference locator, by Edward Malowicki. U.S. Air Force. Air Research and Development Command. Rome Air Development Center, Griffiss Air Force Base, Rome, N.Y. Feb 1956. 52p photos, diagrs (part fold). Order from LC. Mi $3.60, ph $9.30. PB 126796

1 Radio interference - Locators 2. AF RADC TR 56-2.

Quadruped antenna, by H. Lottrup Knudsen. Denmark. Royal Technical University. Laboratory of Electromagnetic Theory, Copenhagen, Denmark. 1956. 34p diagrs, graphs. Order from LC. Mi $3.00, ph $6.30. PB 126212

This paper describes a circle-shaped antenna system composed of infinitely many, infinitely short antennas, a so-called ring quasi-array, which radiates such a field that the voltage induced in a linear antenna placed at a right angle to the direction to the antenna system will only to a small degree be dependent upon the direction to and the orientation of the linear antenna, when, in each case, the phase rotation of the currents in the ring quasi-array is so chosen (positive or negative) that the induced voltage will be as large as possible. Electrical Engineering Series, vol. 7, no. 4. Acta polytechnica 200.

Quarterly progress report no. 12, 1 Nov 1955 - 1 Feb 1956, under Contract no. AF 18(600)-497. Duke University. Dept. of Physics. Microwave Laboratory, Durham, N.C. Feb 1956. 50p diagrs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126461

AD 91509. Project no. R-357-10-6. For reports no. 8 - 11, 13 - 14 under this Contract see PB 116802, 118093, 118465, 120152, 122956 and 123417. Includes Technical reports: 1. Millimeter and sub-

millimeter wave spectroscopy, by Charles A. Burrus and Walter Gordy (AF OSR TN 56-74. AD 81526). - 2. Zeeman effect of some linear and symmetric-top molecules, by John T. Cox and Walter Gordy. - 3. Bolometer detection of nuclear quadrupole resonance, by Hugh G. Robinson. AF OSR TN 56-74.

Quarterly scientific report no. 13 covering period 1 Jul 1956 - 1 Oct 1956 under Contract AF 19 (604)-786. Harvard University. Cruft Laboratory, Cambridge, Mass. Oct 1956. 5p. Order from LC. Mi $1.80, ph $1.80. PB 126298

Reports on: Pulse R-F back-scattering measurements, by C. Tang. - Investigation of high-frequency current distribution on conducting obstacles, by L. Wetzel. - Theory of antennas coupled to two-wire line, by S. R. Seshadri. AD 110126. For quarterly reports 7 - 12 see PB 117771, 118497, 122355, 125191, 123464 and 125152. AF CRC TN 56-787.

Reflection from and transmission through two parallel wire grids, by M. G. Andreason. Denmark. Royal Technical University. Laboratory of Electromagnetic Theory, Copenhagen, Denmark. 1956. 33p diagrs, graphs. Order from LC. Mi $3.00, ph $6.30. PB 126218

A plane reflector consisting of two parallel wire grids for transforming a linearly polarized wave into a circularly polarized wave is considered. A general investigation is made first of the transmission and reflection of a plane, linearly polarized wave which is arbitrarily incident upon two parallel wire grids, the angle between the wires of the grids being arbitrary. As a result of this investigation the wire grids are found to reflect the incident wave totally for special values of the angle between the grid wires, these values being dependent on the direction of propagation of the incident wave. Finally, the wave reflected from a totally reflecting pair of grids is found to be circularly polarized for special values of the distance between the grid planes and as well as of the orientation of the grid wires with respect to the plane of incidence, these values being dependent on the direction of propagation and the direction of polarization of the incident wave. Numerical calculations have been made. A few examples are given to illustrate the application of the numerical results obtained. Electrical engineering series vol. 7, no. 2. Acta polytechnica 192.

Semiconductor research. Quarterly report no. 13, Jan to Mar 1956 under Contract N6onr-24914, by Milton Gottlieb, Guy Calvert Bell, Jr. and John R. Johnson. Pennsylvania. University. Dept. of Physics, Philadelphia, Pa. Mar 1956. 62p photos, drawing, diagrs, graphs. Order from LC. Mi $3.90, ph $10.80. PB 126429

Contents: Lifetime of minority carriers in magnesium stannide, by Milton Gottlieb. - Dielectric measurements of packed powders, by Guy Calvert Bell, Jr. - Reflection coefficients for homogeneous crystals, by John R. Johnson. - Design and construction of an electromagnet for magneto-resistance and Hall effect measurements in semiconductors, by Harold Roth and George Swartz. For quarterly reports no. 10 and no. 11/12 under this contract see PB 119805 and 124172.

Solid-state commutating and pulse-width encoding circuit, by W. H. Lucke. U.S. Naval Research Laboratory. Mar 1958. 21p photos, diagrs. Order from OTS. 75 cents. PB 131486

A commutating and pulse-width encoding circuit which uses only solid-state devices (i. e, square-loop cores, transistors, and rectifiers) has been developed. The voltages, or resistances, of a number of input sources may be simultaneously sampled with this system, the information from each source being stored in a separate core as a flux change. This information is subsequently "read out" of the cores in a fixed time sequence, the information in each core being presented as a rectangular pulse of constant height but variable width. The circuit is capable of considerable power gain and may be compactly assembled and potted, thereby combining great ruggedness with inherent reliability. NRL R 5082.

Spark gap switches for low-jitter radar service.
See entry under Bibliography on page 317.
PB 126797

Study of the degradation of high K ceramic dielectrics, by W. R. Buessem, P. A. Marshall, Jr., and W. A. Weyl. Linden Laboratories, Inc., State College, Pa. Contract DA 36-039-sc-42679. Order separate parts described below from LC, giving PB number of each part ordered.

Second quarterly report. Sep 1953. 55p diagr, graphs, tables. Mi $3.60, ph $9.30. PB 126587

The composition and method of preparation of experimental bodies in the systems: $TiO_2$, $TiO_2$ - $Fe_2O_3$, $TiO_2$ - $Cr_2O_3$, and $TiO_2$ - $Fe_2O_3$ - $UO_3$, are described and the results of DC-conductivity, DC-degradation-stability, and AC-dissipation measurements on these bodies are reported and discussed.

Sixth quarterly report. Sep 1954. 67p graphs, tables. Mi $3.90, ph $10.80. PB 126585

This report contains measurements of $TiO_2$ blanks and $TiO_2$ with $Fe_2O_3$- additions. The aging rate was studied up to 4400 hours. The time dependence found experimentally agrees with a theoretical function derived on the assumption that the aging rate is governed by oxygen diffusion.

Ninth quarterly report. Jun 1955. 43p graphs, tables. Mi $3.30, ph $7.80. PB 126573

Samples were subjected to DC stresses of 30 volts/mil and 60 volts/mil for periods of 1200 hrs. and 600 hrs. respectively. The report covers experiments on $TiO_2$ bodies with $Al_2O_3$ additions. It has been tentatively concluded that the solubility of $Al_2O_3$ in $TiO_2$ at low temperatures, is limited to very small percentages, probably in the order of .06 Mol %.

Tenth quarterly report. Sep 1955. 53p diagr, graphs, tables. Mi $3.60, ph $9.30. PB 126588

Aging in $TiO_2$ bodies is caused by oxygen diffusion. A new interpretation of the diffusion process is offered which leads to more plausible values for the diffusion coefficient and explains the erratic results on individual samples.

Eleventh quarterly report. Dec 1955. 77p graphs, tables. Mi $4.50, ph $12.30. PB 126586

Long-time life tests at 150°C have been completed for the $TiO_2$ bodies without additions and for the bodies with $Fe_2O_3$, $Cr_2O_3$, $Al_2O_3$, $Fe_2O_3 + UO_3$ and $UO_3$ additions. $Fe_2O_3$ in larger concentrations is very detrimental, $Cr_2O_3$ is slightly beneficial, especially in intermediate concentrations. $Al_2O_3$ leads to rather stable dielectrics. However, $UO_3$ improves the life time by two orders of magnitude as compared with these $Al_2O_3$ bodies. The tests on these bodies had to be interrupted after about 300,000 minutes because of excessive silver creep, not because of bulk breakdown.

Twelfth and final report. Mar 1956. 59p graphs, tables. Mi $3.60, ph $9.30. PB 126570

Experimental results are presented on the effect of small additions of $Li_2O$, $Ta_2O_5$ and $Nb_2O_5$ on the dielectric properties of $TiO_2$ bodies. The additions of the five-valent ions $Ta^{5+}$ and $Nb^{5+}$ produce dielectrically excellent bodies, with very low losses, comparable with the losses of bodies containing six-valent ions. Life tests have been performed on bodies containing uranium additions, at 200°C and 60 volt/mil.

Switching time in p-n junction diodes with built-in drift field, by N.I. Meyer. 1957. 37p diagrs, graphs, table. Order from LC. Mi $3.00, ph $6.30. PB 126215

The theory is given of a p-n junction diode with an exponential impurity distribution in the base layer between the junction and the ohmic contact. This diode type is called a drift diode in contrast to the traditional junction diode of the Shockley type which may be called a diffusion diode. When the diffusion diode is suddenly switched from the forward to the reverse direction, a spike current arising from the hole storage in the base layer is created. This spike current may be troublesome due to the fact its time constant is rather long. The transient response of the drift diode is studied and analytical and numerical results for the hole storage current as a function of time are obtained by suitable approximations. These results are compared with the results for diffusion diodes with the same base width. An estimation of the influence of the capacitive current is made for the drift diode, which shows that in typical cases the total switching time may be reduced by more than a factor of four as compared to the corresponding diffusion diode. Finally a drift diode with an inverse built-in field is considered. Physics including nucleonic series, vol. 3, no. 9. Published by the Denmark Academy of Technical Sciences, Copenhagen, (ATV). Acta polytechnica 210.

## Generators, Motors, Transmission

Dynamic operation of magnetic amplifiers for feedback control systems. Scientific report no. 3, for period 1 Sep-30 Nov 1956 under Contract AF 19(604)-1813, by H.C. Bourne, Jr., T.T. Kadota and D. Nitzan. California. University. Division of Electrical Engineering. Electronics Research Laboratory, Berkeley, Calif. Nov 1956. 27p diagrs. Order from LC. Mi $2.70, ph $4.80. PB 126762

The analysis of the dynamic operation of the alternating-output self-saturated magnetic amplifier is generalized to include multiple control windings containing frequency-sensitive networks. The corresponding block diagram representation of the component is developed for used in system design and analysis. AD 110282. UC IER Series no. 60, Issue no. 170. AF CRC TN 57-151.

Ground station frequency standard per GA-52879. Interim report no. 102-B, for period 1 Feb-30 Apr 1955 under Contract AF 30(602)-13, by F.G. Merrill and others. Bell Telephone Laboratories, Inc., New York, N.Y. Jun 1955. 29p diagrs (1 fold), graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 126582

The Air Force long-distance ground-based radio navigation system called Navardo requires highly precise frequency standard oscillators. 2.5 mc cyrstal frequency was set as standard. This report includes the particular objective, design status, results obtained, and describes work completed during this period. AD 71292. For other quarterly reports under this contract see PB 116119-116121. AF RADC TN 55-334.

Investigation on the effects of local energization of the boundary layer in curved diffusers, by R.C. Binder. Purdue University. School of Mechanical Engineering, Lafayette, Ind. Jan 1958. 35p diagrs, graphs. Order from OTS. $1.00. PB 131748

An experimental study was made of transonic flow in a curved diffuser with and without a vortex generator. The vortex generator, consisting of a flat piece of sheet metal with triangular projections, was mounted on the convex wall of the diffuser. Results were organized in terms of pressure coefficient. In the particular model channel tested, the optimum position of the vortex generator, as judged by the largest pressure coefficient over the widest Mach number range, was found to be about 33% of the chord. AD 150995. Project 7063, Task 70151. Contract AF 33(616)-3827. AF WADC TR 58-23.

Negative-impedance converter design, by A.I. Larky. Stanford University. Electronics Laboratories, Stanford, Calif. Oct 1956. 55p diagrs, tables. Order from LC. Mi $3.60, ph $9.30. PB 129489

This work describes the external or circuit properties of the ideal negative-impedance converter and relates them to certain ideal amplifier combinations. The predicted behavior of these circuits is checked experimentally. Contract Nonr 225(24), NR 373-360. SU ERL TR 11.

Phase and gain matched three-channel intermediate-frequency amplifier, by T.R. O'Meara. Illinois. Engineering Experiment Station. Electrical Engineering Research Laboratory, Urbana, Ill. Feb 1956. 39p photos, diagrs (1 fold), graphs, tables. Order from LC. Mi $3.00, ph $6.30. PB 126795

A three-channel IF amplifier, which is matched in gain and phase, is described. Some of the features described are: (1) a staggered triplet section with 10 kc bandwidth for use in receiving 100 microsecond pulses. (2) large tuning capacitances to reduce detuning effects due to small capacitance changes, (3) a miniature relay band switching scheme, (4) resin potted coils, (5) gain trim and disable switches, (6) output amplifiers at video frequencies, and (7) AOG circuits. Several design problems encountered are discussed. Data is given on several of the subcircuits of the amplifier. Contract N6 ori-71, T.O. XV, NR 076-161. ILU EES TR 23.

Research and development of high temperature, radiation resistant, fixed resistors, by Willard E. Hauth, Jr. and Robert E. Vanderhaar. International Resistance Company. Research Dept., Philadelphia, Pa. Nov 1957. 35p photos, graphs, tables. Order from OTS. $1.00. PB 131655

Several commercially available ceramics have high enough resistivity at 500°C to be used as resistor substrates. Fired on gold-palladium films with lead diluent shows good stability under load at 500°C for low range units. Vacuum deposited "carbon alloy" films hermetically sealed show good stability under load at 500°C for middle and high range units. Vacuum deposited noble metal alloys are stable at intermediate temperatures in an oxidizing atmosphere. Hermetic seals and soldered terminations which function satisfactorily at 500°C were devised. AD 142257. Project 4155, Task 41557. Contract AF 33(616)-3633. AF WADC TR 57-363.

### Miscellaneous

Effect of corrosion and growth on the life of cycling-lead-acid cells, by J.J. Lander, A.C. Simon and E.L. Jones. U.S. Naval Research Laboratory. Mar 1958. 18p photos, graphs, table. Order from OTS. 50 cents. PB 131588

Tests were made on automobile-type batteries, and the results showed that although the corrosion properties of Pb-Ca-Sn alloys were good, the growth characteristics and life were poor in comparison with a standard alloy containing 8% Sb and 0.25% Sn and with an alloy containing 4% Sb, 0.2% Sn, 0.5% As, and 0.25% Ag. NRL R 5106.

Foundational research projects. Annual report Jul 1954-Jun 1955. U.S. Naval Ordnance Laboratory, Corona, Calif. Jan 1956. 75p drawings, graphs. Order from LC. Mi $4.50, ph $12.30. PB 126488

Contents: Ferromagnetic resonance, by R.L. Conger and F.C. Essig. - DC-FM converter, by J.M. Sacks. - Infrared sources, by C.J. Humphreys. - Small antenna study, by A.W. Walters, G.A. Scharp, E.W. Seeleys, A.O. Sondrup, H.A. Bulgerin, J.G. Hoffman, and J. Arnold. - Perfluoroorganic derivatives, by W.G. Gehman. - Infrared atomic spectra, by C.J. Humphreys. Previous work on the continued projects has been published in NOLC 135, 184, and 211. NOLC R 304. NAVORD 4566.

## FOOD AND KINDRED PRODUCTS

Caloric intake and energy expenditure of eleven men in a desert environment, by B.E. Welch and P.F. Iampietro. U.S. Army. Medical Nutrition Laboratory, Fitzsimons Army Hospital, Denver, Colo. Aug 1956. 26p graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 128769

Caloric intake and expenditure were studied in eleven men receiving 5-in-I Army rations in the hot-dry environment found at Yuma, Arizona. The mean ambient temperature was 33°C. (91°F.) and the mean relative humidity was 35%. The maximum

requirement was 3311 calories/day, based on food consumption and the caloric equivalent of the body weight loss as determined by skinfold thickness data. AMNL R 190. Also issued as QMC EP TR 40 by the Quartermaster Research and Development Center, Natick, Mass. (PB 126578). Project: 6-60-11-020.

Composition of concentrate by-product feeding stuffs. National Research Council. Agricultural Board. Committee on Feed Composition. Jun 1956. 134p tables. Order as Publication 449 from NAS-NRC Publications Office, 2101 Constitution Ave., N.W., Washington 25, D.C. $3.00. PB 126792

Selection of data for inclusion in the tables was determined by (1) adequate identification of the sample and the specific nutrients and (2) adequate information on the basis of analysis. The composition of concentrate by-product feeding stuffs has been tabulated in terms of 58 nutrients. A system for compiling data on feed composition with tabulation on International Business Machine cards was selected as the most appropriate for purpose of this study. NRC 449.

Nutrition surveys at five Army camps in various areas of the United States, by C. Frank Consolazio, Jean M. Hawkins, Ogden C. Johnson, Robert Ryer, III, James E. Farley, Frederick Sauer and Theodore E. Friedemann. U.S. Army. Medical Nutrition Laboratory, Fitzsimons Army Hospital, Denver, Colo. Aug 1956. 67p tables. Order from LC. Mi $3.60, ph $9.30. PB 128500

During the past four years, five nutrition surveys were performed at various Army messes. The food consumption from the Army mess of troops in training averaged 3510 calories per man per day. while the food intake for a sedentary group averaged 2868 calories. The food consumed from sources outside the mess averaged 727 calories. The total edible food losses averaged 788 calories per man per day. Project: 6-60-11-020. AMNL R 187.

## FUELS AND LUBRICANTS

Accelerated storage stability of aviation fuels, by R.W. Sneed, O.M. Ballentine and J.H. Winterhaulter. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, O. Mar 1957. 36p graphs, tables. Order from OTS. $1.00. PB 131369

This work is a study of aviation fuels of various base stocks, containing varying percentages of oxidation inhibitor stored under high temperature (130°F) conditions in two types of containers. One set of containers had copper vents and the other set had steel vents in contact with the fuel vapor. The purpose was to obtain data on the deterioration which may be expected during the storage of aviation fuels at desert temperature. AD 118109. Project no. 3048, Task 73300. Covers period of work from Oct 1951 to Jun 1955. AF WADC TR 55-138.

Appraisal of the hazards of friction-spark ignition of aircraft crash fires, by John A. Campbell. U.S. National Advisory Committee for Aeronautics. May 1957. 23p photos, tables. Order as Technical note 4024 from National Advisory Committee for Aeronautics, 1512 "H" Street, N.W., Washington 25, D.C. PB 126096

A study was made to determine if common aircraft metals produce friction sparks capable of igniting combustibles that might be spilled in an airplane crash. Samples of aluminum, titanium, magnesium, chrome-molybdenum steel, and stainless steel were dragged over both concrete and asphalt runways while a combustible mixture of gasoline, JP-4 fuel, kerosene, or preheated oil was sprayed around the sample. No ignitions occurred from the sliding aluminum; but the titanium, magnesium, chrome-molybdenum steel, and stainless steel produced friction sparks that ignited the combustibles. NACA TN 4024.

Basic factors in the formation and stability of non-soap greases. Sixth quarterly report under Contract AF 33(616)-2440 covering work from 15 Oct 1955-15 Jan 1956, by J.J. Chessick, A.C. Zettlemoyer and C. Dodd. Lehigh University. Surface Chemistry Laboratory, Bethlehem, Pa. Jan 1956. 31p diagr, graphs, tables. Order from LC. Mi $3.00, ph $6.30. PB 129318

The polar solids Aerosil, Santocel, and Hi Sil, and rutile, and the homopolar solids, Estersil, Carbolae Z and Mogul, were investigated as thickeners in nonpolar grease vehicles. That the polar grease forming solids range in area from 80 to about 150 m.2/g. while the nonpolar solids have areas above 300 m.2/g. is significant. These materials are shown to be effective thickeners in both polar and nonpolar liquids. A possible mechanism to explain the flocculation of these solids is based on reduction in free surface energy by the fluocculation. The study of the influence of the straight chain, heptyl derivatives on the consistency of various non-soap grease systems has been continued. The mechanism of additive action has been explained at least qualitatively, in terms of the mechanism of flocculation of these solids in the simpler grease systems. AD 84149. Pt. 2 not approved for release. For Part 3 see PB 131233. Monthly report no. 19 is included. AF WADC TR 55-240.

Development of a water displacing and water stable low temperature lubricating preservative oil, by Linden H. Wagner. U.S. Arsenal, Rock Island,

Ill. Mar 1957. 20p photos, tables. Order from OTS. 50 cents. PB 131355

Qualified oils supplied under military specification were investigated for their water displacement, water stability, and low temperature viscosity. This was done to develop a new type preservative. Four of the qualified and four newly formulated water displacing oils were tested for comparative protection in the Army-Navy Humidity Cabinet. Ordnance project TB 5-6010D, Report no. 8. D.A. project 593-21-055. RIAL R 57-663.

Effects of additives on flame propagation in acetylene, IV, by Gene Morrow, M.B.S. Munson, F.V. Wolford and R.C. Anderson. Texas. University. Dept. of Chemistry, Austin, Tex. Nov 1956. 7p tables. Order from LC. Mi $1.80, ph $1.80. PB 126480

The methods used earlier for testing the effects of additives on the velocities of decomposition flames in acetylene have been applied to a number of other compounds. These include certain ether-substituted and halogen-substituted acetylenes and certain types of hydrocarbons which are of potential interest because of the roles they might play as intermediates in carbon formation. Phenoxyacetylene and ferrocene were found to increase the flame velocity. Toluene and 3-ethoxyl-1-bromo-1-propyne were rather striking in their inhibitory effects on flame propagation. AD 115025. AF OSR Chem 50-1. Technical note 34. Contract AF 18(600)-430. AF OSR TN 56-598.

Investigation of premixed jet fuel-red fuming nitric acid rocket propellant system, by Loren E. Bollinger and Rudolph Edse. Ohio State University. Dept. of Aeronautical Engineering. Rocket Laboratory, Columbus, O. Oct 1957. 31p photos, drawings, diagrs. Order from OTS. $1.00. PB 131568

An experimental investigation of premixing jet fuel and red fuming nitric acid was conducted on a nominal 25-pound thrust scale at a design chamber pressure of 300 psia. In 30 experiments, it was not possible to reach desired operating conditions because of the poor combustion characteristics of the propellant in the engine configurations employed. AD 142108. Project 7-(2-3058), Task 70175. Contract AF 33(616)-2078. AF WADC TR 57-407.

Kinetics and thermodynamics of combustion, by George Richard Hill. Utah. University. Institute for the Study of Rate Processes, Salt Lake City, Utah. Sep 1956. 29p graphs, table. Order from LC. Mi $2.70, ph $4.80. PB 126413

This report summarizes the research on homogeneous combustion processes. AD 110336. AF OSR Chem 50-2. For other reports under this contract see PB 121131, 121450, 122204 and 122205. Contract AF 33(038)-20838, Final report. AF OSR TR 56-52.

Mock-up evaluation of MLO-8200 high temperature hydraulic fluid, by Bruce Celler and Sorro Prete. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Aircraft Laboratory, Wright-Patterson Air Force Base, Dayton, O. Jul 1954. 21p drawing, tables (1 fold). Order from LC. Mi $2.70, ph $4.80. PB 126592

Project no. 1371-73313.
1. Hydraulic fluids, High temperature - Development 2. Hydraulic fluids, High temperature - Tests 3. AF WADC TN WCLS 54-42

Probings into cool flames. Part II: Dynamic studies at short residence times, by K.G. Williams, F.J. Woods, J.E. Johnson and H.W. Carhart. U.S. Naval Research Laboratory. Mar 1956. 21p diagrs, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 118566

An exploratory program has been directed toward evaluation of a technique which it was hoped would provide a sufficient measure of "mechanical" restraint on the cool-flame reactions to permit a more detailed study of these. The experimental apparatus was designed to mix an oxygen and a fuel-bearing nitrogen stream after the two had been preheated separately to temperatures of 200° to 550°C. The extent of reaction was followed by measuring the oxygen and hydrocarbon levels in the exhaust. The effects of the various oxygen and hydrocarbon levels, residence time, and surface-volume ratios were studied. Results of these studies indicate that the chain-branching reaction normally associated with cool flames is followed by surface-controlled reaction, the extent of which is a linear function of specific surface and residence time under the conditions studied. Interim report. For Part I see PB 111311. NRL R 4651.

Study of corrosion inhibitors and antioxidants for glycol-ethers, by Charles B. Jordan. U.S. Aberdeen Proving Ground. Coating and Chemical Laboratory. May 1957. 27p tables. Order from OTS. 75 cents. PB 131398

An investigation was made of the effectiveness of different commercially available chemicals as corrosion inhibitors and antioxidants for glycol-ethers. Corrosion tests were run using the procedure outlined in Federal Specification VV-F-451a. Combinations of chemicals were found which satisfactorily inhibited each of the three types of glycol-ethers which were studied. Ordnance project no. TB 5-5010F. DA project no. 593-21-054. APG CCL R 23.

# INSTRUMENTS

Application of the photoelectric plethysmograph to the nasal septum, by Alrick B. Hertzman and Darrell L. Davis. U.S. Air Force. Arctic Aeromedical Laboratory, Ladd Air Force Base, Alaska and St. Louis University. School of Medicine. Dept. of Physiology, St. Louis, Mo. Nov 1955. 19p photos, diagr, graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 126478

Description of apparatus and method, analysis of results, and recommendations are given. Contract AF 18(600)-1043. AF AAL Proj 8-7951, Report no. 5.

Data smoothing technique programmed for high speed digital computers, by Ralph K. Weller. U.S. Air Force. Air Research and Development Command. Rome Air Development Center, Griffiss Air Force Base, Rome, N.Y. Jan 1956. 18p tables. Order from LC. Mi $2.40, ph $3.30. PB 126766

A discussion is presented on the use of a data smoothing technique programmed for high speed digital computers. A method of conserving storage space is suggested when the technique is employed. The matrix notation is used to simplify the computations. Project no. UN-12. AF RADC TN 56-3.

Double inhibit magnetic matrix switch, by LeRoy F. Silva. U.S. Aberdeen Proving Ground. Ballistic Research Laboratory, Aberdeen, Md. Jul 1956. 16p diagrs, graph. Order from OTS. 50 cents. PB 131353

A circuit for a magnetic switch is given which selects its output core by removing an inhibit current from each coordinate selecting line. The switch is compared with two other types of magnetic switches and the advantages of the switch are listed. Experimental data from the operation of the double inhibit switch are given. AD 111407. Dept. of the Army project 5B306002. Ordnance Research and Development project TB 3-0007. APG BRL TN 1084.

Electric probe drop counter: Measurement of drop size distribution and liquid water content in natural clouds, by D.P. Keiley. Massachusetts Institute of Technology. Dept. of Meteorology, Cambridge, Mass. Dec 1956. 42p photos, map, drawing, diagrs, graphs (1 fold), tables. Order from LC. Mi $3.30, ph $7.80. PB 126837

Cloud drop size distributions were observed on the ground at Mt. Washington, N.H., by both cloud camera and electric drop counter. Individual distributions in a few yards of air were found to vary enormously in both size and count. Distributions selected for similarity in peak frequency and maximum size were averaged and showed some slight consistency with respect to time and cloud trajectory. Contract 19(604)-1287. MIT Met SR 2. AF CRC TN 56-884.

Extended angular range direct reading phasemeter, by S. Bigelow and J. Wuorinen, Jr. Columbia University. Dept. of Electrical Engineering. Electronics Research Laboratories, New York, N.Y. Sep 1956. 26p diagrs (part fold), graphs. Order from LC. Mi $2.70, ph $4.80. PB 126869

This paper describes a direct reading pulse position comparison instrument with an inherent range of from $720^{\circ}$ lagging to $720^{\circ}$ leading. The design is such that this range may be further extended, theoretically without limit. AD 110389. CU 27-56-AF 677-EE. Contract AF 18(600)-677, R 357-50-3. CUN ERL TR T-17/B. AF OSR TN 56-568.

Handbook of instructions for testing aircraft sandwich parts with the Forest Products Laboratory proof tester, by Bruce G. Heebink, Edward W. Kuenzi and F.J. Champion. U.S. Forest Products Laboratory, Madison, Wis. and U.S. Air Material Command, Wright-Patterson Air Force Base, Dayton, O. Aug 1957. 29p photos, diagrs. Order from LC. Mi $2.70, ph $4.80. PB 132492

The purpose of this handbook is to provide instructions for the operation of the proof tester developed at the U.S. Forest Products Laboratory. This handbook also contains instructions for the fabrication of the parts which make up the proof tester. Use of the proof tester will cause poor bonds anywhere on a production part to fail. Controlled use of the tester, however, will not cause properly bonded parts to fail. Although poor bonds can readily be detected by means of the proof tester, stresses applied during the test may not be of the same type as those applied when the parts are in service. AD 146607. AMC project 149088. Contract AF 33(600)-53-4042, Change order no. 2.

High resolution, low field nuclear magnetic resonance spectrometer, by R.W. Mitchell and M. Eisner. Texas. Agricultural and Mechanical College. Dept. of Physics, College Station, Tex. Nov 1956. 14p diagrs, graph. Order from LC. Mi $2.40, ph $3.30. PB 126521

A nuclear magnetic resonance spectrometer has been constructed and its performance at 12 and 43 gauss is discussed. The magnetic field is obtained with an end corrected solenoid powered by batteries. The best resolution obtained is 10 microgauss at 12 gauss and 20 microgauss at 43 gauss over a 30 $cm^3$ sample. A twin-T bridge and synchronous detector are employed for the nuclear resonance detection. Some of the measurements for which this instrument is suited are described and the results of relaxation time measurements for Ethanol-water mixtures are presented. AD 115008. Contract AF 18(600)-1300. AF OSR TN 56-584.

Improvement and simplification of the scanvocoder and its connection to a correlation pulse code system, by Frederich Vilbig. U.S. Air Force. Air Research and Development Command. Cambridge Research Center. Electronics Research Directorate. Communications Laboratory, Bedford, Mass. Jun 1956. 12p diagr. Order from LC. Mi $2.40, ph $3.30. PB 126713

AD 98786. 1. Scanvocoders - Design 2. Speech - Compression and expansion 3. Speech - Analysis 4. AF CRC TR 56-113

Machine shop simulation using SWAC. California. University, Los Angeles, Calif. Order separate parts described below from LC, giving PB number of each part ordered.

Part I of a proposal, by James R. Jackson. Mar 1956. 11p diagr. Mi $2.40, ph $3.30. PB 126539

Machine shop simulation using SWAC (Standard Western Automatic Computer) is based upon production problems of plants which manufacture goods to customer order or specification, frequently called "machine shops" or "job shops." Discussion paper no. 57.

Part II of a proposal, by Roger L. Sisson. May 1956. 16p diagrs. Mi $2.40, ph $3.30.

Part II: Scheduling and use of flow charts and coding. Discussion paper no. 58.

Performance check and the first field measurements with the Wiegmann slope differential instrument, by Gregory P. Tschebotarioff, Edward R. Ward, Elmo DiBiagio and Jack Watkins. Princeton University. Dept. of Civil Engineering, Princeton, N.J. Apr 1955. 62p photos, drawings, diagrs, graphs, tables. Order from LC. Mi $3.90, ph $10.80. PB 126840

The Wiegmann Slope Differential Instrument, designed in Germany by Dr.-Ing. Wiegmann, is described, as well as a satisfactory performance check at Princeton, New Jersey of this instrument. A 32-foot long H-Pile was placed in a vertical position under Palmer Stadium at Princeton University for that purpose and was loaded laterally. Several slope measurements were then made along that pile by means of the Wiegmann instrument. For later report see PB 127891. Contract Nonr-1009(00), NR 081-117.

Rotatable-magent permeameter, by R.K. Tenzer and M.A. Bohlmann. Indiana Steel Products Company. Magnetics Research Laboratory, Valparaiso, Ind. Jul 1956. 11p photo, diagr, graphs. Order from OTS. 50 cents. PB 131352

The common permeameter employs an electric current to supply a magnetic field for measuring the magnetic properties of a specimen. The advantages of a permeameter which derives its varying magnetic field from the rotation of a permanent magnet are listed, and two working models are described, AD 110478. Project 7080, Task 70650. Contract AF 33(616)-267, Supplemental agreement S2(54-297). AF WADC TN 56-274.

Scintillation counters with naphthalene, by Martin Deutsch. Massachusetts Institute of Technology. Laboratory for Nuclear Science and Engineering, Cambridge, Mass. Dec 1947. 12p graphs. Order from LC. Mi $2.40, ph $3.30. PB 126575

1. Detectors, Scintillation 2. Naphthalene - Uses 3. Contract N5 ori-78, T.O. 16 4. MIT LNS TR 3

Simple P/T aerometer, by Clarke C. Minter. U.S. Naval Research Laboratory. Feb 1958. 9p diagrs, tables. Order from OTS. 50 cents. PB 131527

By application of the gas laws a commercial diaphragm-type absolute pressure indicator can be converted into an instrument giving a direct indication of air density. This can be done by simply filling the normally evacuated chamber with dry air and sealing it under conditions such that the pointer indicates the density of ambient air at the time of sealing. The principles were put into practice using a commercial instrument, and the converted instrument gives accurate, reproducible results with a response time comparable to that of a mercury-in-glass thermometer. NRL R 5093.

State of development of thermal radiometer, by Arnold Pfenninger, Harold E. Henry, Maurice Godet and Conrad A. Wogrin. Quantum, Inc., Mount Carmel, Conn. Mar 1958. 58p photos, diagrs, graphs, tables. Order from OTS. $1.50. PB 131746

This report describes the progress made to date on the design and manufacture of the components of the instrument and includes mathematical analyses of both the heat transfer and control system problems where these were necessary and feasible. It also includes a discussion of the specifications as originally outlined and revisions suggested on the basis of analytical and experimental work performed on this contract. AD 151060. Project 7360, Task 73610. Covers work from Apr 1956 - Apr 1957 under Contract AF 33(616)-3628. AF WADC TR 57-512.

Study of the peripheral pump, by Siegfried Hasinger. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Aeronautical Research Laboratory, Wright-Patterson Air Force Base, Dayton, O. May 1957. 69p photos, drawings, graphs. Order from OTS. $1.75. PB 131363

The principle requirements for an effective pump design are evaluated and areas of possible improvements are pointed out. The orderly circulatory flow superimposed on the through flow is considered an effective means for increasing the specific drag of the impeller blading and is treated in detail. For optimized circulatory flow conditions, the behavior of the pump in respect to Reynolds number, specific speed and cavitation is investigated. The general possibilities of the peripheral pump principle are examined. This pump is adaptable to a wide variety of pumping requirements some out of reach of the centrifugal pump. In all cases of application, however, the pump efficienty is inherently low and is not likely to exceed much a value of 50% even with exhausting all practical possibilities of improvements. AD 130845. Project 3084, Task 70145. AF WADC TR 57-333.

Three-terminal dielectric cell with micrometer electrodes, by Richard N. Work. Princeton University. Plastics Laboratory, Princeton, N.J. May 1955. 19p diagrs, graph. Order from LC. Mi $2.40, ph $3.30. PB 126729

A new dielectric cell has been developed for measurements of the dielectric constant and loss factor of polymeric materials from dc to 1 mcps, and from room temperature to 200°C. The new cell was found necessary for making the precise measurements over the wide ranges of temperature and frequency that are required in studies of dielectric relaxation spectra, the effective dipole moments of dipolar groups in model polymer chains, the temperature dependence of these quantities, and the relation of these quantities to the micro-structure and engineering properties of the polymers. Dept. of the Army project no. 3-99-15-022. Signal Corps project no. 32-152B. Published in Review of Scientific Instruments, vol. 26, p. 1171, 1955. Contract DA 36-039-sc-42633, Report 5b. PU PL TR 37B.

Use of thermistors in precision thermometry, by G.W. Benson. National Research Council of Canada. Division of Mechanical Engineering. Fuels and Lubricants Laboratory, Ottawa, Canada. Oct 1956. 15p drawings, diagrs, tables (1 fold). Order from LC. Mi $2.40, ph $3.30. PB 126459

Experiments have been performed indicating that present manufacturing techniques will produce thermistors which are capable of being used as precision thermometers. They will allow temperatures to be measured with an accuracy approaching 0.001°C., and appear to be stable over long periods of time. More sensitive instruments may well show that higher orders of precision are possible. NRCC MI-817.

Visual sensitometer. Psychological Research Associates Corp., New York, N.Y. Apr 1955. 15p diagrs, (part fold). Order from LC. Mi $2.40, ph $3.30. PB 126835

A description is afforded of a visual sensitometer designed to provide an increment luminous test stimulus in the center of a circular field. AD67046. Contract AF 30(602)-1236, Final engineering report. AF RADC TR 55-41.

## MACHINERY

Component testing of a cooled radial-flow turbine: Development of equipment and instrumentation and performance calculation procedures, by D.W. Craft, E.N. Petrick and R.D. Smith. Purdue University. Purdue Research Foundation. Gas Turbine Laboratory, Lafayette, Ind. Apr 1955. 164p photos, drawings, diagrs, graphs (part fold), tables. Order from LC. Mi $7.80, ph $25.80. PB 126843

The experimental equipment described in this report was designed for the purpose of testing the turbine component of small gas-turbine power plants. The equipment was designed in particular to test the inward-flow radial turbine, or centripetal turbine, and incorporated provisions for cooling the turbine rotor during operation. During the operation of the turbine, all adjustments were made with controls located outside of the test cell. Contract N7 onr-39415. PUR RM 55-1.

Development of a standard operating procedure for a six and one-half ton basic-electric steel furnace using optimum conditions of desulphurization and dephosphorization, by John Zotos. U.S. Arsenal, Watertown, Mass. Rodman Laboratory. Oct 1956. 44p graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126491

The investigation started with an established practice used for producing standard grades of steel. Using the results of a literature survey, systematic procedure changes were adopted to investigate the factors which influenced the steel's sulphur and phosphorus content. The developed standard operating procedure was used to produce high nickel 4325, 4330, and 4140 steels with sulphur contents ranging from 0.005 to 0.013 percent and phosphorous contents averaging 0.010 percent. WAL RPL 10/7.

Distribution of the surface pressure over the friction lining of brakes with rigid shoes and drums, and efficiency of such brakes, by H. Schrøder. 1956. 45p photos, diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126217

Mechanical engineering series vol. 3, no. 8.
1. Brakes - Linings - Tests - Denmark 2. Brakes - Linings - Pressure distribution - Denmark 3. Acta polytechnica 188

Heat transfer in a cooled radial flow turbine with an aluminum rotor, by R.D. Smith. Purdue Univer-

sity. Purdue Research Foundation. Gas Turbine Laboratory, Lafayette, Ind. Feb 1956. 88p photo, diagrs, graphs, tables. Order from LC. Mi $4.80, ph $13.80. PB 126798

An air cooled radial flow gas turbine having an aluminum rotor of 12 inch diameter was operated with turbine inlet gas temperatures of 500 F to 600 F, pressure ratios of 1.8 and 2.5, and tip speeds of 854 ft/sec. and 964 ft/sec.; the cooling air was at ambient temperatures and flowed over the rear face of the turbine rotor. The local heat transfer coefficients for the heat transfer from the rear face of the turbine rotor to the cooling air by forced convection in the turbulent region were measured and correlated by three equations. Report I-56-1. Contract N7 onr-39415.

On the ratio of consecutive eigenvalues, by L. E. Payne, G. Pólya and H. F. Weinberger. Stanford University. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Sep 1955. 22p. Order from LC. Mi $2.70, ph $4.80. PB 126516

1. Eigenvalues 2. Contract Nonr 225(11), NR 041-086 3. SU AMSL TR 41

Operational analysis of the rough-terrain fork lift truck, by William S. Wolf. U.S. Army. Quartermaster Research and Development Command. Environmental Protection Research Division, Quartermaster Research and Development Center, Natick, Mass. Jan 1957. 34p photos, table. Order from LC. Mi $3.00, ph $6.30. PB 126889

This study analyzes the factors that help the rough-terrain fork lift truck operator do his job with speed, high quality of performance, comfort, health and safety. Its purpose is to inform human engineering research personnel and equipment designers about the difficulties the users are having with various rough-terrain fork lift trucks. Project reference 7-83-01-004B. QMC EP TR 42.

## MATHEMATICS AND STATISTICAL ANALYSIS

Algorithm for the minimum units required to maintain a fixed schedule, by T. E. Bartlett. Purdue University. School of Industrial Engineering and Management, Lafayette, Ind. May 1956. 21p diagr, graphs, table. Order from LC. Mi $2.70, ph $4.80. PB 126393

This paper is the first in a series on various aspects of transportation systems planning and control. Although the concrete focus of these studies currently is rail transportation, results applicable also to other modes of transportation will be presented in covering generality wherever possible. Thus, a method is developed in this paper for evaluating the minimum number of "transport units" required to maintain a fixed schedule. The proof that this algorithm is valid embodies additionally a theorem of more general interest on finite ordered sequences of numbers. Transportation systems research I. Contract Nonr-1100(05), NR 047-016, Research report no. 1. ONR RM 4.

Application of the p-transform method to analysis of multiple sampler systems (open-loop), by G. Farmanfarma. California. University. Division of Electrical Engineering. Electronics Research Laboratory, Berkeley, Calif. Jan 1957. 44p graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126088

The p-transform method has been extended to the analysis of multiple sampler open loop systems. The technique outlined is general, no restrictions being imposed on the number or the periodicity of the samplers present. It is shown that by a combination of a few fundamental steps, it is possible to treat any open loop multiple sampler system. These steps have been outlined and simple examples given to demonstrate their applications. AD 120419. For other reports under this Contract see PB 122230 and 122417. Contract AF 18(600)-1521. UC IER Series 60, Issue no. 174. AF OSR TN 57-76.

Application of the variational method to transient heat conduction problems, by K. Washizu. Massachusetts Institute of Technology. Aeroelastic and Structures Research Laboratory, Cambridge, Mass. Mar 1955. 23p graphs. Order from LC. Mi $2.70, ph $4.80. PB 126498

A variational procedure is applied to the problem of determining approximate transient temperature distributions. A simple example is given, and the agreement with the rigorous solution is fairly good. AD 59951. Contract N5 ori-07833, NR 064-259. MIT ASRL TR 25-17.

Arithmetic genera and the theorem of Riemann-Roch for algebraic varieties, by Friedrich Hirzebruch. Princeton University. Institute for Advanced Study, Princeton, N.J. Dec 1953. 11p. Order from LC. Mi $2.40, ph $3.30. PB 126494

1. Mathematical functions 2. Riemann-Roch theorem 3. Contract DA 36-034-ORD-639

Boundedness and periodicity of solutions of the generalized Liénard equation, by W. R. Utz. Missouri. University, Columbia, Mo. Jun 1956. 32p. Order from LC. Mi $3.00, ph $6.30. PB 124859

This paper considers the non-linear differential equation $x'' + f(x, x')x' + g(x) = e(t)$ wherein $x' = dx/dt$. It discusses the behavior of solutions of

this equation for large t and in the existence of periodic solutions. Section 2 is devoted to boundedness theorems for certain important special cases of this equation. Section 3 gives theorems concerning the behavior of solutions for large values of t in cases where boundedness cannot be inferred. The final section gives sufficient conditions for the existence of an infinity of periodic solutions when e(t) = 0. AD 89492. MoU MRG Technical note no. 6. Contract AF 18(600)-1108. AF OSR TN 56-282.

Educational program in numerical analysis of the Dept. of Mathematics, U.C.L.A., by George E. Forsythe. California. University. Dept. of Mathematics. Numerical Analysis Research, Los Angeles, Calif.. Aug 1955. 10p. Order from LC. Mi $1.80, ph $1.80. PB 126942

Project NR 044-144. Ord project no. TB 2-0001 (1210). 1. Mathematical research

Integration of a differential form on an analytic complex subvariety, by Pierre Lelong. Princeton University. Institute for Advanced Study, Princeton, N.J. Dec 1956. 7p. Order from LC. Mi $1.80, ph $1.80. PB 125108

AD 115054. Project 47500. 1. Mathematical equations and solutions 2. Integration, Numerical 3. Contract AF 18(600)-1109, Supplemental agreement 4, (56-339) 4. AF OSR TN 57-20

Irreversible Gibbsian ensembles, by Joel L. Lebowitz and Peter G. Bergmann. Syracuse. University, Syracuse, N.Y. Nov 1956. 45p. Order from LC. Mi $3.30, ph $7.80. PB 125106

This paper continues the investigation of a model for the description of irreversible processes which were proposed in Phys. Rev. 99, 578 (1955). This model permits the construction of Gibbs-type ensembles for open systems not in equilibrium. The internal dynamics of the system that is engaged in a nonequilibrium process is assumed to be described fully by its Hamiltonian. Its interaction with its surroundings, i.e. the driving reservoirs, is described in terms of impulsive interactions (collisions). Technical note P-8. Thesis, by Joel L. Lebowitz, Syracuse University. Project no. R-357-40-10. Contract AF 19(600)-459. AF OSR TN 56-566.

Large sample theory, parametric case, by Herman Chernoff. Stanford University. Dept. of Statistics, Stanford, Calif. Jun 1955. 54p. Order from LC. Mi $3.60, ph $9.30. PB 124944

This paper is divided into two parts. In the first, several techniques and results are summarized which are useful tools in the study of large sample theory. In the second part some results are considered in inference in the large sample parametric case. Contract N6onr-251, T.O. III, NR 042-993, Report no. 29. SU DS TR 29.

Monte Carlo study of estimates of simultaneous linear structural equations, by Harvey M. Wagner. Stanford University. Dept. of Economics, Stanford, Calif. May 1954. 58p tables. Order from LC. Mi $3.60, ph $9.30. PB 126824

This paper examines certain small sample properties of "limited information--single equation" maximum likelihood estimates for two models by a Monte Carlo approach; i.e., sets of observations are generated from the models and then with these observations and the L.I.S.E. method, estimates of the models' parameters are obtained. Contract N6 onr-251 (33), NR 047-004. SU DE TR 12.

New method of solving the primitive prognostic equations, by G. Hollmann. Germany. Wetterdienst, Frankfurt am Main, Germany. 1956. 10p. Order from LC. Mi $1.80, ph $1.80. PB 125116

A new method of solving the prognostic equations for a baroclinic atmosphere is discussed. This procedure uses the primitive hydro- and thermodynamic equations and as a filter for noise effects the condition that the divergence of horizontal motion, averaged over a whole air column from the top to the bottom of the atmosphere, has to vanish. With only this model assumption the integration of the vorticity equation, the divergence equation and the adiabatic equation requires only quadratures and solutions of two-dimensional Poisson equations. Research on objective weather forecasting. Technical note 4. Contract AF 61(514)-735-C. AF CRC TN 56-292.

Note on estimating the statistical significance of mutuality, by Leo Katz. Michigan State University, East Lansing, Mich. Oct 1955. 13p table. Order from LC. Mi $2.40, ph $3.30. PB 124836

When a group of persons are asked to express their preferences for one another in a sociometric test, they are likely to generate a number of mutual choices whether they perform the task selectively or like robots. The question then may arise of estimating the probability of encountering, by chance, a level of reciprocation as large or larger than that observed. This probability is commonly estimated either by the normal approximation to the binomial distribution or by the exactly equivalent chi-square test. SRC MSU RM 18. Contract N5ori-0760. Contract Nonr-785(00).

On the equations of the theory of plasticity, by V.V. Sokolovsky. Brown University. Division of Applied Mathematics, Providence, R.I. Jan 1956. 26p. Order from LC. Mi $2.70, ph $4.80. PB 126499

This paper deals with the formulation of the basic relationship between the components of the stress and the velocity strain for yield conditions of a gen-

eral form, and does not involve the usual assumption of incompressibility of the material. A detailed investigation of the equations of plane plastic equilibrium is given, and different methods of transforming these equations are indicated. A comparatively simple method of solving these equations in the form of trigonometric series is presented. Certain forms of the yield condition are considered, for which the equations of plane plastic equilibrium have particularly simple coefficients. Translated by J. R. M. Radok from Briklanaya Matematika i Mechanika, Vol. XIX, no. 1, 1955, p. 41-54. Contract Nonr-562(10), NR 064-406. GDAM C 11-7. BU AM TR 7.

Probability distributions of random variables associated with a structure of the sample space of sociometric investigations, by Leo Katz and James H. Powell. Michigan State University, East Lansing, Mich. May 1956. 14p. Order from LC. Mi $2.40, ph $3.30. PB 126426

This paper considers a disjoint decomposition, at three levels, of the total sample space for n-person, one-dimensional sociometric investigations. Methods developed here have application in the theory of communication networks and in the study of any network situations which may be represented by either of the two models employed in the paper. SRC-MSU-RM-20. For earlier report under this Contract see PB 125591. Contract Nonr 785(00). Contract N5 ori-0760.

Some conditional probability distribution functions, by Glen Baxter. Minnesota. University, Minneapolis, Minn. Oct 1956. 18p. Order from LC. Mi $2.40, ph $3.30. PB 126433

AD 97367. 1. Probability - Theory 2. Random functions 3. Variance - Analysis 4. Stochastic methods 5. Contract AF 18(603)-30, NR 47-500, Technical report no. 1 6. AF OSR TN 56-483

Tables of Mathieu eigenvalues and eigenfunctions for special boundary conditions, by Ralph Kilb. Harvard University. Dept. of Chemistry, Cambridge, Mass. Jun 1955. 23p tables. Order from LC. Mi $2.70, ph $4.80. PB 124873

In connection with the solution of certain problems involving internal torsional motions in molecules, it was found necessary to calculate the solutions of the Mathieu differential equations for boundary conditions different from the usual ones. The solutions periodic in $\pi$ were required for molecules having a three-fold potential barrier. These were not available in the literature and were therefore calculated for certain ranges of the parameters. Also required were the matrix elements of the o operator - $\frac{1}{i}\frac{d}{dx}$. Some of these were likewise calculated. Contract N5 ori 76, T.O. V.

Theoretical approach to the problem of critical whirling speeds of shaft-disk systems, by Norman H. Jasper. U.S. David W. Taylor Model Basin, Washington, D.C. Dec 1954. 36p diagrs, graphs, table. Order from LC. Mi $3.00, ph $6.30. PB 126385

In this report a number of theoretical methods are derived for computing the natural frequencies of whirling vibration of shaft-disk systems including the consideration of rotatory inertia, gyroscopic precession, and flexibility of shaft supports, as well as lumped and distributed masses. Special emphasis is laid on the determination of the natural frequency as a function of the ratio of spin to whirl velocity. Natural frequencies are also expressed in terms of the spin velocity of the shaft. Particular attention is given to methods suitable for numerical evaluation. The methods given here are of special interest in applications to propeller-shaft systems of ships. NS 712-100. DWTMB 827.

## MEDICAL RESEARCH AND PRACTICE

Acute toxicity of an aniline-furfuryl alcohol-hydrazine vapor mixture (U), by Keith H. Jacobson, William E. Rinehart, Henry J. Wheelwright, Jr., Robert C. Daly and William A. Groff. U.S. Chemical Corps. Chemical Warfare Laboratories, Army Chemical Center, Md. Jun 1956. 22p diagr, tables. Order from LC. Mi $2.70, ph $4.80. PB 127415

Aniline-furfuryl alcohol-hydrazine vapor mixtures, produced from the liquid mixture in a partial vaporization apparatus to simulate partial vaporization from surfaces, cause effects similar to those of aniline; viz., methemoglobinemia, reduced oxygen saturation of the blood, anoxemia, and sequelae. The vapor mixture is less toxic than furfuryl alcohol vapors. The toxicity of the mixture is greater when the proportion of furfuryl alcohol is higher. Both volatility and toxicity being considered, the mixture has a low vapor hazard, about that of furfuryl alcohol or aniline, and lower than hydrazine. The odor of the material mimics that of aniline; the mixture and its components are all detected at levels of about 4-10 p.p.m. Project 4-61-14-002. CC CWL R2040.

Protection afforded by the GMD ammonia and the combat M11 canister against unsymmetrical dimethylhydrazine, by William A. Peters, John C. Goshorn and Saul A. Zelkind. U.S. Chemical Corps. Chemical and Radiological Laboratories, Army Chemical Center, Md. May 1956. 12p table. Order from LC. Mi $2.40, ph $3.30. PB 126533

Review of physical and toxic properties of compound. Methods of analyzing vapor concentration. Protection afforded by GMD and M11 canisters against compound. Effect of relative humidity on

protection. Project: 4-80-030-04. CC CRL R 638.

Trichloroisocyanuric acid (decontaminant 40) evaluation as a decontaminant for H and $HN_3$. U.S. Chemical Warfare Service. Technical Division. Oct 1946. 60p drawings, tables. Order from LC. Mi $3.60, ph $9.30. PB 126427

Trichloroisocyanuric acid was evaluated as a decontaminant for mustard and nitrogen mustard by comparison with bleach and RH-195 under similar conditions. These tests were conducted only at room temperature. Project D4.3a-2. Unclassified 29 Nov 1955. CWS TDM R 1272.

## METALS AND METAL PRODUCTS

Basic study of corrosion of magnesium, by Richard R. Addiss, Mitchell S. Cohen, Robert I. Frank, Herbert Hollister, Henri S. Sack and Karl Scharf. Cornell University. Dept. of Engineering Physics, Ithaca, N.Y. Dec 1957. 58p photos, diagrs, graphs. Order from OTS. $1.50. PB 131662

This report constitutes the final report of the work done under the present contract. Attempts to obtain a perfectly clean surface of magnesium are described. Due to limitations in time no definite results on the oxidation of Mg were obtained; however, some preliminary results on the patterns obtained from pure Mg in a field emission microscope, and the oxidation at low temperatures are reported. AD 142209. Project 7351, Task 73514. Covers work from Feb 1956-May 1957 under Contract AF 33(616)-3032. AF WADC TR 57-576.

Crystallographic structure and orientation of the Y' phase in four commercial nickel-base alloys, by J.A. Amy and W.C. Bigelow. Michigan. University. Engineering Research Institute, Ann Arbor, Mich. Jul 1957. 18p photos, diagrs, tables. Order from OTS. 50 cents. PB 131518

Selected area electron diffraction patterns have been obtained from matrix precipitate particles isolated by the extraction-replica technique from aged specimens of four commercial nickel-base alloys, Inconel-X, Waspalloy, M-252, and Udimet, which contain titanium and aluminum as hardening agents. From these patterns the matrix particles have been conclusively identified as the $\gamma'$ phase. It has also been shown that the ordered, or superlattice, structure reported for this phase in simpler alloy systems occurs also in these complex alloys, and that the particles develop with a high degree of preferred crystallographic orientation relative to the matrix lattice. Variations in the size, shape, and distribution of the particles in specimens of the four alloys aged 100 hours at 1400°F are also evident, and appear to be related to the titanium and aluminum content of the alloys. AD 130834. Project 2447, originally 7-(8-7351), Task 70646; changed to Project 7021, Task 70662. Contract AF 33(616)-3250. AF WADC TN 57-247.

Determination of the effect of heat treatment on the elevated temperature stress-stability of titanium alloys, by G.A. Lenning, M.L. Greenlee, W.M. Parris and H.D. Kessler. Titanium Metals Corporation of America. Feb 1958. 88p photos, drawings, graphs, tables. Order from OTS. $2.25. PB 131724

The effect of duplex solution and age type heat treatments on the properties of one commercial heat each of the Ti-140A (Ti-2Fe-2Cr-2Mo), Ti-155A (Ti-5Al-1.5Fe-1.5Cr-1.5Mo) and Ti-6Al-4V alloys were investigated. The properties studied included tensile, notch tensile, notch-bend impact and elevated temperature stress-stability. AD 151000. Project 7351, Task 73510. Covers work from May 1956-May 1957 under Contract AF 33(616)-3638. AF WADC TR 57-630.

Development of improved titanium alloys for application at elevated temperatures, by Bernard S. Lement. Manufacturing Laboratories, Inc. Physical Metallurgy Division, Cambridge, Mass. Mar 1958. 74p photos, graphs, tables. Order from OTS. $2.00. PB 131749

A metallurgical investigation of the embrittling reaction that occurs in binary Ti-Al alloys was carried out in the range of 6 to 12 wt. pct. aluminum. Changes in bend ductility, hardness, precision length, electrical resistance, lattice parameters, and in microstructure that occur on solutionizing and aging were determined. The observed changes in properties are best explained on the basis that these striations represent the formation of aluminum-rich segregations. Evidence was found that cracking in a bend test occurs more readily along rather than across these striations. AD 151029. Project 7351, Task 73510. Covers work from Feb 1 - Dec 31, 1957 under Contract AF 33(616)-3986. AF WADC TR 58-20.

Development of oxidation and liquid sodium resistant brazing alloys, by Domenic A. Canonico and Harry Schwartzbart. Armour Research Foundation. Metals Research Dept., Chicago, Ill. Mar 1958. 47p photos, diagrs, tables. Order from OTS. $1.25. PB 131745

Three metals--iron, chromium, and nickel--were selected, from oxidation and sodium resistance considerations, as the base metals from which to develop acceptable brazing alloys. From a study of all the available pertinent phase diagrams 91 alloys were devised, of which 16 satisfied the flow temperature and flowability requirements of the program. The flow temperature was between 1750°F and

1900°F. Minimum flowability was three inches length along a six inch T-specimen. T-specimens brazed with these 16 alloys were subjected to an oxidizing atmosphere for 500 hours at 1650°F. Four alloys successfully withstood oxidation to a depth of less than 0.003 inch. A test for ductility of brazed joints, based on the premise that the load necessary to cause cracking in the fillet of a braze is a measure of the ductility of the brazing alloy, has been developed. AD 151013. Project 3105, Task 73022. Covers work from Jul 15, 1956 -Jul 15, 1957 under Contract AF 33(600)-33406. AF WADC TR 57-648.

Development of practices for commercial production of titanium and titanium alloy wire. Driver-Harris Co., Harrison, N.J. Jun 1955. 34p photos, graphs, tables. Order from LC. Mi $3.00, ph $6.30. PB 126530

O.O. project no. TB 415. Covers period 1 Aug 1952 - 20 Jun 1955. 1. Wire, Titanium - Manufacture 2. Contract DA 30-069-ORD-870, Report no. 1 3. WAL R 401/150-10

Evaluation of crack susceptibility tests, by S. Weiss, J.N. Ramsey, C.M. Adams, H. Udin and J. Wulff. Massachusetts Institute of Technology. Division of Industrial Cooperation, Cambridge, Mass. Sep 1955. 48p photos, drawings, diagrs, graphs, tables. Order from OTS. $1.25. PB 131348

The cooling rates at 1000°F and 572°F in the heat-affected zones of three crack susceptibility tests, which differ in restraint, have been determined and found to be approximately equivalent. Tests were performed on two heats of armor plate, using low-hydrogen electrodes and three different testing arrangements. The results obtained using these tests and materials indicate that the degree of restraint plays a more important role than cooling rate in causing hard-zone cracks. Project 7261. Contract DA 19-020-ORD-3452. WAL R 640/222.

Factors responsible for notch embrittlement of high-strength steels, by V. Weiss and E.P. Klier. Syracuse University Research Institute. Metallurgical Research Laboratories, Syracuse, N.Y. Dec 1955. 45p photos, graphs, table. Order from LC. Mi $3.30, ph $7.80. PB 126571

Hardenability studies have been made for various heat treatments on 4340 steel with a Jominy-type specimen having a diameter of 2.5 inches and a length of 8 inches. The two-step and 12 hr. austenitizing treatments were found to yield the best hardenability of the treatments investigated. Notch tensile tests have been performed at room temperature on 1.1 and 1.5 in. diam 4340 steel specimens. The three treatments investigated listed in sequence of increasing merit by these tests are: conventional, Lockheed, two-step. Studies of the fracture process were conducted on 4340 steel and two aluminum alloys for qualitative comparison. For bi-monthly progress report no. 2 see PB 124091. Contract NOas 55-377-c, Final report no. 2.

High temperature oxidation of iron-nickel alloys, by M.J. Brabers and C.E. Birchenall. Princeton University. James Forrestal Research Center, Princeton, N.J. Mar 1957. 23p photos, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 126520

The iron-rich corner of the phase diagram for Fe-Fe-Ni-O has been determined at 1050°C. Great care was taken to assure equilibration which was not completely achieved in an earlier study. The mechanism of oxidation of iron-nickel alloys is discussed and a protective mechanism is described which differs somewhat from those suggested for other alloys. AD 126439. Contract AF 18(600)-967. PU FRC MR 12. AF OSR TN 57-150.

Intermediate phases in the iron-tungsten and cobalt-tungsten binary systems, by Edward C. Van Reuth. U.S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, O. Dec 1957. 29p photos, diagrs, graphs, tables. Order from OTS. 75 cents. PB 131627

Fifty-three alloys have been examined in the Fe-W and Co-W alloy systems in an attempt to verify the finding of sigma phases in these systems as reported by Goldschmidt. Selected regions of both binary equilibrium diagrams were investigated by examining alloys metallographically and by X-ray diffraction techniques. It was also found that some portions of the existing equilibrium diagrams should be changed. AD 142258. Project 7351, Task 73512. Covers work from 1 Dec 1955-1 Dec 1957. AF WADC TR 57-717.

Lubrication of titanium, by Richard O. Lee and Nicholas Fatica. Clevite Corporation. Clevite Research Center, Cleveland, O. Dec 1957. 52p photos, diagrs, graphs, tables. Order from OTS. $1.50. PB 131650

This investigation sought to explain the role of the oxide film on titanium, to obtain some information about the frictional properties of modified titanium coatings, and to make a direct comparison of the wear resistance of the best surface treatment in the presence of various lubricants using equipment generally acceptable for wear tests under conditions of boundary lubrication. AD 142187. Project 7351, Task 73510. Covers work from Mar 14, 1956-Feb 14, 1957 under Contract AF 33(616)-3350. AF WADC TR 57-61, Part I.

Research and development on investigation of galling and friction characteristics of metallic materials and surface treated materials, by Eber W. Gay-

lord. Carnegie Institute of Technology. Dept. of Mechanical Engineering, Pittsburgh, Pa. Jul 1956. 64p photos, drawing, diagrs, graphs, table. Order from OTS. $1.75. PB 131347

This work is composed of three parts, (1) A theoretical analysis of a dynamic thermocouple formed by the junction of two metals sliding over each other. (2) A report on an experimental investigation of the dynamic thermocouple. (3) The results of friction and galling tests are given for, titanium rubbing on steel, titanium on titanium, surface coated titanium on steel, surface coated titanium on uncoated titanium and surface coated titanium on surface coated titanium. AD 108966. Ordnance project TRI-1031. D/A project 501-01-002. WAL R 401/65-38.

Research on kinetics and mechanism in metal refining systems, by C. L. McCabe and Joseph Morgan. Carnegie Institute of Technology. Metals Research Laboratory, Pittsburgh, Pa. Feb 1957. 12p graphs, table. Order from LC. Mi $2.40, ph $3.30. PB 126526

This project has been directed toward investigating first, the mechanism for the oxidation of metallic sulfides to oxides and/or sulfates; second, the mechanism for the reduction of metallic oxides to the corresponding metal or metal carbide. This technical report is intended to summarize the findings of the investigation. AD 120402. Includes Mechanism of sulfate formation during the roasting of cuprous sulfide, by C. L. McCabe and J. A. Morgan, reprinted from Journal of Metals, Jun 1956. Contract AF 18(600)-1147, Final report. AF OSR TR 57-9.

Research on liquid metals as power transmission fluids, by Richard H. Blackmer. General Electric Co. Light Military Electronic Equipment Dept., Syracuse, N.Y. Feb 1958. 101p photos, diagrs, graphs, tables. Order from OTS. $2.50. PB 131743

The eutectic alloy of sodium (23 weight-percent) and potassium, (77 weight-percent), known as NaK 77, has been determined from a technical survey of liquid metals and salts as the most feasible liquid known for 10°F to 1000°F hydraulic system applications. A single cylinder test pump in an inert atmosphere glove-box has pumped NaK-77 up to 3600 psi at 100°F and up to 2000 psi at 1000°F. A total of about 100,000 cycles at 1 cycle per second and an average pressure of 1500 psi have been accumulated. Results of literature survey, consultation, and laboratory tests are included in this report. AD 151001. Project 7331, Task 73313. Summarizes work from May 1956 - May 1957 under Contract AF 33(616)-3698. AF WADC TR 57-294.

Thermal properties of high temperature materials, by I. B. Fieldhouse, J. C. Hedge, J. I. Lang and T. E. Waterman. Armour Research Foundation. Fluid Mechanics Research Dept. Heat Transfer Section, Chicago, Ill. Feb 1958. 88p diagrs, graphs, tables. Order from OTS. $2.25. PB 131718

The objective of this program was the measurement of the high temperature thermal properties of materials. The materials investigated were Hastelloy B, Hastelloy C, Satellite 21, stainless steel type 17-7 P.H., stainless steel type 446, silicon carbide, 60-15 Cr (AST M B 83-46), and beryllium. The thermal conductivity, specific heat, and linear coefficient of thermal expansion were from 1000°F to 3000°F, or the melting point of the material, whichever was lower. Both the experimental measurements and the results of the conversion of these measurements to the desired physical properties are given. AD 15094. Project 3104, Task 73021. Covers work from 1 Jun 1956-30 Jun 1957 under Contract AF 33-(616)-3704. AF WADC TR 57-487.

Transformation in disordered gold copper alloys, by G. C. Kuczynski, M. Doyama and M. E. Fine. Northwestern University, Evanston, Ill. Mar 1956. 21p graphs, table. Order from LC. Mi $2.70, ph $4.80. PB 126302

By measurement of the specific heat, temperature coefficient of expansion, Young's modulus and yield point in $Cu_3Au$ alloys, it has been established that this alloy undergoes a phase transition between 550° and 600°C and possibly another one near 850°C. The temperature of the 550-600°C transition decreases sharply as the composition of the alloy deviates from $Cu_3Au$. AD 81058. Contract AF 18 (600)-1468. AF OSR TN 56-66.

## METEOROLOGY AND CLIMATOLOGY

Absorption of vapors by liquid aerosols, by V. Alexander Gordieyeff. U.S. Chemical Corps. Chemical Warfare Laboratories. Directorate of Medical Research, Army Chemical Center, Md. Aug 1956. 54p drawings, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 126450

The report presents results of the second part of the study on interaction of vapors and aerosols, i.e., absorption of vapors by airborne droplets. The absorption mechanism by airborne droplets does not differ significantly from that by the stationary bulk of absorbent. The pecularities of the aerosol state are responsible for extremely fast rates of absorption and desorption, differential sorbate transfer between particles of different sizes, differential growth of particles of different sizes, and cloud effects interfering frequently with the process of absorption. Airborne droplets may generally be regarded as poor carriers of volatile toxic vapors. Subproject no. 4-08-02-016-1. Covers period 1 Mar 1953-1 Apr 1955. CC CWL R 2052.

Beta radiation from the atmosphere, by H. A. Miranda, Jr. Fordham University. Dept. of Physics, New York, N.Y. Sep 1956. 25p table. Order from LC. Mi $2.70, ph $4.80.
PB 126806

Measurements of the ionization due to beta radiation from the air, employing two thin-walled ionization chambers in a differential arrangement, are described. Two-thirds of all the measurements fall within a range extending over one order of magnitude. Also, the weighted mean of all the measurements is 0.671. This is roughly ten times the expected value, computed from radon and thoron concentrations measured at this locality. All the mechanisms coming to mind which might account for the excess ionization observed over that expected, are discussed, and rejected on various grounds. By process of elimination, the possibility of the existence of a "very soft" cosmic ray component is suggested. AD 110202. Contract AF 19(122)-409. AF CRC TN 56-699. FU DP SR 6.

Effects of non-primary cosmic radiation on the number-energy relation and geomagnetic correlations near the top of the atmosphere, by Kinsey A. Anderson. Minnesota. University. Dept. of Physics, Minneapolis, Minn. Jan 1955. 103p photos, diagr, graphs, tables. Order from LC. Mi $5.70, ph $16.80. PB 126778

It is the object of these experiments to measure as much of the non-primary flux occurring at balloon altitudes as possible. It is the purpose of the analysis to use data on the flux of upward moving particles (the splash albedo flux) and the flux of particles occurring at balloon altitudes whose velocity is below the predicted geomagnetic cutoff, to calculate the expected azimuthal effects and to compare them with the observations of Winckler. A calculation of the total energy involved in the primary cosmic radiation using fluxes based on the revised flux suggested by the present experiments is made and compared to the ionization estimates made by Neher. Cosmic Ray Project. Contract N6 onr-246.

Flight series in Minnesota, by C.R. Stearns. Winzen Research Inc., Minneapolis, Minn. 1955. 128p photos, maps, drawing, diagrs, graphs (1 fold), tables. Order from LC. Mi $6.30, ph $19.80. PB 126719

This report presents the time pressure data and horizontal trajectories for each of the flights conducted in Minnesota during the summer of 1955 for the U.S. Air Force Aero-Medical Field Laboratory. Included is a discussion of the procedure used in evaluating the measurements and a summary of the performance of the plastic balloons and factors related to this performance. The purpose of this flight series was to expose tissue and living animals to cosmic rays at high altitudes. Report no. 1163-R. Contract AF 29(600)-632, Final report, vol. II.

Generalized isentropic inertial motion with applications to cyclogenesis. Part I, by Joseph B. Knox. California. University. Dept. of Meteorology, Los Angeles, Calif. Mar 1957. 31p map, diagr, graphs, table. Order from LC. Mi $3.00, ph $6.30. PB 126089

AD 117115. For reports 1 - 4 under this Contract see PB 120145, 120153, 122379 and 124838.
1. Weather forecasting - Mathematical analysis
2. Cyclones - Development - Mathematical analysis
3. Equations of motion 4. Contract AF 19(604)-1286, Scientific report no. 6 5. AF CRC TN 57-272

Infra-red spectrum of the lower stratosphere and its importance in the heat balance, by Lewis D. Kaplan. Princeton University. Institute for Advanced Study, Princeton, N.J. Sep 1954. 10p graphs. Order from LC. Mi $1.80, ph $1.80.
PB 126264

Characteristics of the infra-red spectra of ozone, water vapour and carbon dioxide under stratospheric conditions are discussed from the point of view of the role of these gases in the heat balance of the lower stratosphere. The relative spectral distribution of positions of the principal absorption bands is of great importance because of the marked differences in variation with height of the concentrations of the principal absorbants, and is probably the major factor in the maintenance of the tropopause. Reprinted from the Scientific proceedings of the International Association of Meteorology, tenth general assembly, Rome, Sep 1954. Contract Nonr-1358(01). PU IAS TR 3.

Ionosphere propagation studies. Scientific report no. 1-6 for period 1 Sep 1955-30 Nov 1956 under Contract AF 19(604)-1413, by Leonard C. Edwards. Raytheon Manufacturing Company, Waltham, Mass. Dec 1956. 67p graphs, tables. Order from LC. Mi $3.10, ph $10.80.
PB 126856

During the first two weeks of October, a special test was conducted to obtain the diurnal variation in total transmission time required for scatter mode signals. Special attention was given to the sunrise period so that observation of possible multiple reflecting strata could be made. Although a great increase in meteoric activity was observed during this period, there was no evidence of the persistent coexistence of two reflecting strata. Continuous recording of the field strength of CW signals from the Greencastle site was initiated at South Dartmouth early in September. Diurnal variations in the transmission loss or k factor for the scatter signal have been obtained from these measurements. The background noise level was also recorded at regular intervals throughout the period and this level is also presented. Measurements were made of the directivity patterns of the Greencastle rhombic antenna at 15.715, 22.280, and 29.90 mc. AD 110195. For reports no. 1-1, 1-2 and 1-5 see PB 122350, 123408

and 125937. Contract AF 19(604)-1413. AF WADC TN 56-994.

On the changing size spectrum of particle clouds undergoing evaporation, combustion or acceleration, by Ascher H. Shapiro and Alve J. Erickson. Massachusetts Institute of Technology. Dept. of Mechanical Engineering. Gas Turbine Laboratory, Cambridge, Mass. Apr 1956. 42p graphs. Order from LC. Mi $3.30, ph $7.80. PB 126408

A theoretical treatment is given showing how the size distribution of a cloud of particles changes as the result of evaporation, combustion, or acceleration. The general differential equation governing the concentration of particles as a function of size, position and time is formulated for one-dimensional duct-type flows. Solutions to the differential equation are then obtained for a number of special problems of interest to evaporation and combustion. Aerothermopressor project. DIC-5-6985. Contract N5 ori-07878.

On the heat balance and maintenance of circulation in the trades, by Herbert Riehl and Joanne S. Malkus. Chicago. University. Dept. of Meteorology, Chicago, Ill. and Woods Hole Oceanographic Institution, Woods Hole, Mass. May 1956. 19p graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 126555

The heat balance is calculated for the Pacific northeast trade during summer and it is shown that the trade exports sensible as well as latent heat. The sensible heat gain is related to the surface pressure distribution; it is found that the low-level circulation in the region considered is self-driving. Contract N6 ori-02036, NR 082-120. Contract Nonr-1721 (00), NR 082-021.

Present state of knowledge concerning the lower ionosphere, by A.H. Waynick. Pennsylvania State University. Ionosphere Research Laboratory, University Park, Pa. Feb 1957. 37p table. Order from LC. Mi $3.00, ph $6.30. PB 126763

An attempt is made to summarize the current state of knowledge concerning the lower ionosphere. This includes at D and lower E region heights: electron density as functions of height and time, dissipative processes, the possible atmosheric constituents involved and their distributions, physical parameters to be considered, and solar radiations and other factors relevant in the formation of this portion of the ionosphere. Where possible, comparisons between theory and experiment are made. AD 117156. Contract AF 19(604)-1304. PSC IRL SR 90. AF CRC TN 57-273.

Radar-synoptic analysis of an intense winter storm, by Edwin Kessler, III. U.S. Air Force. Air Research and Development Command. Cambridge Research Center. Geophysics Research Directorate. Aerosol Physics Laboratory, Bedford, Mass. Oct 1957. 241p photos, maps, diagrs, graphs, tables. Order from OTS. $3.50. PB 131741

A theory is developed relating radar weather echoes to dynamics of steady and horizontally uniform precipitation. This theory is qualitatively extended in discussions of influences of convection and other non-steady processes. Concepts developed are applied to quantitative 3-dimensional radar weather maps derived from data collected during the severe New England storm, 16 Mar 56. Also, the radar information is integrated with conventional synoptic data and techniques. Many of the results are combined in a summary figure illustrating distribution in height and time of large scale vertical airspeeds, radar echoes and precipitation rates over Blue Hill, Mass. AD 133824. Appendix 1: Calibration of RHI photographs. AF GRD P 56. AF CRC TR 57-227.

Research and data reports on solar activity. Final report prepared under Contract Nonr-393, T.O. 3, NR 046-736, by Robert J. Low. Colorado. University. High Altitude Observatory, Boulder, Colo. Nov 1955. 9p. Order from LC. Mi $1.80, ph $1.80. PB 126454

Observations of the corona at the solar limb at all possible angles on each clear day with measurements of coronal line emission. Contract Nonr-393, T.O. 3, NR 046-736, Final report.

Scientific report no. 6 for the period 1 Oct 1956-31 Dec 1956 under Contract AF 19(604)-1491, by James W. Warwick and Harold Zirin. Colorado. University. High Altitude Observatory, Boulder, Colo. Apr 1957. 9p graphs. Order from LC. Mi $1.80, ph $1.80. PB 126519

Summarizes data obtained with the SCNA (sudden cosmic noise absorption) recorder, which continuously records the intensity of cosmic noise (at 18 Mc/s) vertically incident through the ionosphere. From these data may be derived the march of electron density as a function of time of day and height in the D-region. AD 117054. For reports no. 1-4 under this contract see PB 122221, 122220, 122819 and 124776. AF CRC TN 57-360.

Specification of pressure fields and flow patterns in polar regions; theories and techniques, by F.K. Hare, W.L. Godson, M.A. MacFarlane and C.V. Wilson. McGill University. Arctic Meteorology Research Group, Montreal, Canada. Jan 1957. 110p diagrs, graphs, tables. Order from LC. Mi $5.70, ph $16.80. PB 126518

The report consists of three papers. The first discusses the mathematical techniques of quantitative specification of pressure fields, with particular reference to the north polar area. The second paper

discusses a combination of functions that are particularly applicable to the polar regions. Fourier expansions are used round selected colatitude circles, with the coefficients being functions of the colatitude. The third paper gives computational details of the two specification systems, with examples of actual cases. The methods described are in both cases best suited to desk calculation and limited number of examples. AD 110271. Arctic Meteorology Research Group Publication in Meteorology no. 5. Contract AF 19(604)-1141, Scientific report no. 3. AF CRC TN 56-460.

VODARO results for 1955 at the Atmospheric Research Observatory, Flagstaff, Arizona, by Edward S. Epstein and Arthur Adel. Arizona State College, Flagstaff, Ariz. Sep 1956. 36p tables. Order from LC. Mi $3.00, ph $6.30. PB 126512

Vertical ozone distributions above the Atmospheric Research Observatory at Flagstaff, Arizona, have been determined for a total of 196 days in 1955. The results are presented in tabular form. Scientific report HA-9 under Contract AF 19(122)-198. AF CRC TN 56-862.

## MINERALS AND MINERAL PRODUCTS

Effect of the polarization of the constituent ions on the photoelastic birefringence of the glass, by Megumi Tashiro. Pennsylvania State University. College of Mineral Industries, University Park, Pa. Mar 1956. 17p diagrs, tables. Order from LC. Mi $2.40, ph $3.30. PB 126568

The present study was carried out to obtain a more detailed picture of the effects of the properties of constituent ions on the photoelastic birefringence of the glass. The effects of lead ions on the birefringence have already been investigated in the extensive studies of F. Pockels and others. However, because of the complicated compositions of the glasses they used, it was not possible to ascertain the effects of constituents other than lead oxide. Contract N6 onr-269, T.O. 8, NR 032-264. ONR TR 68.

Investigations and measurements of properties of single-crystal silicon. Scientific report no. 1: Resistivity, mobility, and carrier concentration determinations, by J.J. Duga, R.K. Willardson and A.C. Beer. Battelle Memorial Institute, Columbus, O. Apr 1957. 27p photos, fold drawings, graphs, diagrs. Order from LC. Mi $2.70, ph $4.80. PB 128751

Studies of the more common methods of measuring the electrical properties of semiconductors were carried out, and appropriate modifications were made on those which appeared to be most feasible and applicable for obtaining profile measurements along single-crystal specimens of silicon. For the measurement of resistivity, electroforming and plating techniques were used in conjunction with standard 2- and 4-probe methods to overcome difficulties arising from rectifying contacts and surface oxides. The profiling of the Hall mobility was accomplished by the use of four probes arranged in a diamond array, using methods similar to those adopted for the resistivity probes to eliminate contacting difficulties. Other methods of determining resistivity are evaluated. Performance graphs indicate the degree of reliability of the methods and numerous drawings and photographs provide details of the design and construction of the apparatus. AD 117071. Contract AF 19(604)-1852, Scientific report no. 1. AF CRC TN 57-369.

Strength of glass, by J.A. Kies. U.S. Naval Research Laboratory. Apr 1958. 29p photos, graphs, tables. Order from OTS. 75 cents. PB 131532

A new statistical model is proposed for representing the effect of flaws on the breaking strength of specimens in which an upper strength limit exists. Strengths at chosen levels of probability for failure are emphasized rather than average strengths. Statistical and simple experimental models are proposed for use in studying the relation between the strength of fibers and the strength of laminates made from them. NRL R 5098.

Studies of optimum methods for quartz synthesis. Final report under Contract no. DA 36-039-sc-64589, for the period 1 Mar 1955 to 29 Feb 1956, by Jacob M. Jost. Clevite Corporation. Clevite Research Center, Cleveland, O. Mar 1956. 57p photos, drawing, diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 127661

A total of 39 quartz-growing experiments were made during the contract year in three types of autoclaves, (1) the two chamber, rocking, (2) the single chamber, vertical, stationary, and (3) the single chamber, vertical, oscillating; with sizes ranging from 0.08-liter to 55.2-liter capacities. Evaluation and comparison of these equipments showed that the single chamber vertical stationary autoclave, in which design of the baffle between the dissolving and crystallizing section has a very significant part, is the best type for continued research and eventual production. Various conditions for growth were investigated; in particular, at medium temperatures (about 350°C) and medium pressures (about 8000 psi) using 0.83 M $Na_2CO_3$ as the initial solution, and low temperatures (about 300°C) and low pressures (about 1500 psi) using 1M $Na_2CO_3$ -1/16M $NaHCO_3$. Project 80109-G. Dept. of the Army project no. 3-99-11-022. Signal Corps project no. 142B.

Study of graded cermet components for high temperature turbine applications, by Henry W. Lawendel

and Claus G. Goerzel. Sintercast Corporation of America, Yonkers, N.Y. Aug 1957. 48p photos, diagr, graphs, tables. Order from OTS. $1.25. PB 131434

This investigation is a preliminary study of graded cermet turbine components designed to improve the ductility and toughness of the root and airfoil tip sections. Ballistic impact tests at low and high temperature, before and after heat shock cycling, were performed on a wedge-like simulated turbine bucket shape divided into three general areas representing the root, airfoil tip, and airfoil body sections of the turbine bucket. For the cermet core of the bodies, a cermet was selected on the basis of preliminary tests which consisted of titanium carbide infiltrated with molten Inconel-X; for the metal-rich layers applied to the root and airfoil tip sections, an alloy was selected consisting of Inconel-X enriched with titanium carbide. The test results indicate a substantial improvement to be gained in ballistic impact strength by providing metal-enriched areas at the edges and tip of the airfoil. An oxidation-resistant ductile alloy layer deposited as a cladding on the entire surface of the simulated turbine component resulted in an equally important improvement of the thermal shock resistance of the titanium carbide cermet bodies. AD 131031. Project 7350, Task 73500. Covers work from May 1, 1956-Feb 28, 1957 under Contract AF 33(616)-3670. AF WADC TR 57-135.

## PHOTOGRAPHIC AND OPTICAL GOODS

Investigation of homogeneous light weight low loss artificial dielectrics for use in microwave lenses, by William R. Cuming and Donald J. Newman. Emerson and Cuming, Inc., Canton, Mass. Sep 1956. 55p photos, diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 126432

Formulations, procedures and properties of a variety of artificial dielectric foams are presented. These materials are intended for use in light weight electromagnetic lenses. A manufacturing method for a light weight Luneberg lens is given, as well as operational data. AD 110149. Contract AF 19 (604)-1424, Final report. AF CRC TR 56-178.

Optical system for automatic synthesis of constant-altitude radar maps, by M.P. Langleben and W. Denis Gaherty. McGill University. MacDonald Physics Laboratory. "Stormy Weather" Research Group, Montreal, Canada. Jan 1957. 22p photos, diagrs, graph. Order from LC. Mi $2.70, ph $4.80. PB 126740

The theory leading to the technique of generating constant-altitude radar maps from a series of PPI photographs taken at successively increasing elevation angle is outlined. This is along the lines already described in MW-24, PB 122247. The design of an optical system to achieve such syntheses is then described and followed by a discussion of the components of the synthesizer in use at the present time, their functions and modifications that are foreseen. The system produces good pictures and has been fairly trouble-free in operation. AD 110273. Contract AF 19(122)-217. MWT-3. AF CRC TN 57-258.

Photo interpretation techniques. See entry under Bibliography on page 317. PB 126834

Variable frequency microsecond flash sources, by W.M. Kendrick, L.A. Watermeier and H. Newman. U.S. Aberdeen Proving Ground. Ballistic Research Laboratories, Aberdeen, Md. Oct 1956. 20p photos, diagrs, graphs. Order from LC. Mi $2.40, ph $3.30. PB 126867

A circuit for repetitively flashing a BH-6 mercury vapor lamp is described. The unit produces one to forty flashes at a repetition rate variable from 100 to 3,000 per second. The duration of each flash is about 3 microseconds and the total number of flashes is determined by an electronic gate which is variable from 5 to 120 milliseconds. The time interval between flashes is constant to within one percent. The unit described here is being used in a schlieren photographic system for making flame velocity measurements. D/A project 5B302001. Ordnance Research and Development project TB 3-0110. APG BRL M 1041.

## PHYSICS

### General

Diffusion effects in a binary isothermal boundary layer, by E.R.G. Eckert and P.J. Schneider. Minnesota. University. Institute of Technology. Dept. of Mechanical Engineering, Minneapolis, Minn. Nov 1955. 18p diagr, graphs, table. Order from LC. Mi $2.40, ph $3.30. PB 126883

Recent studies suggest that the effects of aerodynamic heating can be substantially reduced by injection of a properly selected gas from the surface into the high-speed boundary-layer air. The present study is directed towards a quantitative evaluation of this mass-transfer cooling method. Heat transfer laboratory. Technical report no. 5. Contract AF 18 (600)-1226, Technical report no. 5. AF OSR TN 55-258.

Experiments at liquid helium temperatures. Final report for period 29 Dec 1952 to 28 Dec 1955, by William M. Fairbank. Duke University. Dept.

of Physics, Durham, N.C. Jan 1956. 16p. Order from LC. $2.40, ph $3.30. PB 126495

This report lists publications resulting from work under this contract, and summarizes experiments on nuclear resonance in liquid $He^3$, measurement of superconductivity at millimeter wavelengths, theoretical investigations of superconductivity, liquid helium bubble chamber, second sound experiments, dielectric constant measurements in liquid helium, and nuclear resonance experiments in solid hydrogen under high pressure. Dept. of the Army project no. 5B 99-01-004. ORD project no. TB2-0001. OOR project no. 837. Contract DA 36-034-ord-1180, Final report.

Fluid flow and heat transfer at low pressures and temperatures: Forced convection heat transfer from spheres to a rarefied gas, by D.K. Eberly. California. University. Institute of Engineering Research, Berkeley, Calif. Jul 1956. 60p photo, drawing, diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 128129

A wind tunnel study was made of the forced convection heat transfer from spheres in a supersonic, rarefied gas flow at nominal Mach numbers of four and six. This investigation was concerned with the heat transfer from spheres in the slip flow regime and in the transition regime between slip flow and free molecule flow. The experimental data were obtained by a transient cooling technique, using solid models of substantially infinite thermal conductivity. Report HE 150-140. Contract N7 onr-295, Task 3, NR 061-033. UC-IER Series 20, Issue 110.

Fluid flow and heat transfer at low pressures and temperatures: Near-free-molecule Couette flow between concentric cylinders, by J.M. Bowyer, Jr. and L. Talbot. California. University. Institute of Engineering Research, Berkeley, Calif. Jul 1956. 31p diagr, graphs, table. Order from LC. Mi $3.00, ph $6.30. PB 127697

The drag forces on a fixed outer cylinder, caused by the rotation of a concentric inner cylinder, were measured under conditions of near-free-molecule flow in the annulus. The gases tested were argon, air, helium and krypton, and the Knudsen numbers based on annulus width ranged from 0.92 to 67.0. The experimental results were compared with the Wang Chang-Uhlenbeck analysis for near-free-molecule flow between parallel plates, which is based on the solution of the linearized Boltzmann equation. Agreement was found to be fairly good. Report HE 150-139. Thesis - University of California. Contract N7 onr-295, Task 3, NR 061-003. UC IER Series 20, Issue 109.

Fluid flow and heat transfer at low pressures and temperatures: Use of a double expansion method for solution of the incompressible viscous flow over a flat plate, by J.A. Laurmann. California. University. Institute of Engineering Research, Berkeley, Calif. May 1956. 36p. Order from LC. Mi $3.00, ph $6.30. PB 126810

A double expansion method, in the form of an inner "boundary layer" series and an outer "potential flow" series, is used to study the solution of the problem of viscous incompressible flow about a semi-infinite flat plate. Validity is checked by comparison with the closed form solution in the linearized (Oseen) case, and it is found that there is agreement only if an "integrable drag" condition (or some equivalent condition) is imposed on each term of the inner series. For the Navier-Stokes equation, the same condition is required for uniqueness of the solution, but in this case the assumption cannot be justified. Report HE 150-138. Contract N7 onr-295, Task 3, NR 061-003. UC IER Series 20, Issue 108.

Heat transfer to surfaces in the neighborhood of protuberances in hypersonic flow, by Martin H. Bloom and Adrian Pallone. Polytechnic Institute of Brooklyn, Brooklyn, N.Y. Aug 1957. 40p photos, drawings, diagrs, graphs, tables. Order from OTS. $1.00. PB 131457

The tests were run on the wall of an axially symmetric, 12" diameter, Mach 6 nozzle with 600 psia stagnation pressure, stagnation temperatures between 1460 and 1600°R, test numbers per foot of 4.4 to 5.2 x $10^6$ and surface temperatures below 630°R. Protuberance dimensions were on the order of the undisturbed boundary layer thickness, which was 1.4". The results are discussed qualitatively with primary attention being given to differences on the order of 50% or more rather than to smaller effects at this time. AD 118138. Project 1366, Task 70169. Contract AF 33(616)-3265. AF WADC TN 57-95.

Kinetic model for heat transfer in helium II, by Charles A. Reynolds. Connecticut. University, Storrs, Conn. Oct 1955. 25p graph. Order from LC. Mi $2.70, ph $4.80. PB 126044

1. Atomic power - Research 2. Helium, Liquid - Thermal properties 3. Contract Nonr-127700, NR 016-418, Technical report no. 3.

Plane Couette flow at low Mach number according to the kinetic theory of gases, by Hsun-Tiao Yang and Lester Lees. California Institute of Technology. Guggenheim Aeronautical Laboratory, Pasadena, Calif. Feb 1957. 44p diagrs, graphs (1 fold), tables. Order from LC. Mi $3.30, ph $7.80. PB 126887

The thirteen-moment approximation developed by H. Grad for solving the Maxwell-Boltzmann equation is applied to the problem of the relative shearing motion between two infinite, parallel flat plates (plane Couette flow). In order to bring out the molecular effects as directly as possible the problem is

linearized by requiring that the Mach number is small compared with unity, and that the temperature difference between the two plates is small compared with ambient temperature. Army project 5B 0306004. Ordnance project TB3-0118. OOR project 1600-PE. Hypersonic research project Memorandum no. 36. Contract DA 04-495-ORD-19. CIT GAL M 36.

Quarterly progress report no. 19 under Contract N5 ori-07856, by J. C. Slater. Massachusetts Institute of Technology. Solid State and Molecular Theory Group, Cambridge, Mass. Jan 1956. 69p graphs, tables. Order from LC. Mi $3.90, ph $10.80. PB 126567

Contents: 1. Superexchange mechanism in antiferromagnetic oxides, by R.K. Nesbet. - 2. Atomic wave functions, by R.E. Watson. - 3. The lithium hydride molecule, by A.M. Karo and A.R. Olson. - 4. Electronic energy of the OH molecule, by A.J. Freeman. - 5. Doubly excited states of the hydrogen molecule, by H.A. Aghajanian. - 6. Polarization effects in the fluorine ion, by L.C. Allen. - 7. A note on wave functions for ionic crystals, by L.C. Allen. - 8. Energy bands in graphite, by F.J. Corbató. - 9. Expansion of radial functions about noncentral points, by J. Hawgood. - 10. The Coulomb hole for two electrons, by J. Hawgood. - 11. Electronic structure of the V-center in KCl, by L.P. Howland. - 12. An augmented plane wave method as applied to sodium, by M.M. Saffren. - 13. An augmented plane wave method as applied to chromium, by M.M. Saffren. - 14. An augmented plane wave method for iron, by J.H. Wood. - 15. Calculations on atomic iron, by J.H. Wood. - 16. On the mass of the polaron, by T.D. Schultz. - 17. Small oscillation theory of the polaron, by T.D. Schultz. For reports no. 7-14, 15 (ie. 16), 15, 17, 18 and 20 see PB 108689, 109399, 110729, 114383, 115851, 116915, 117476, 118133, 117612, 124677, 123732 and 125544. Contract N5 ori-07856, Quarterly progress report no. 19.

Refraction of shock waves at a gaseous interface. III. Irregular refraction, by Robert G. Jahn. Princeton University. Dept. of Physics, Princeton, N.J. Apr 1955. 77p photos, diagrs, graphs, tables. Order from LC. Mi $4.50, ph $12.30. PB 126734

This report describes the possible limiting conditions for a refraction configuration, and displays interferograms of the patterns observed when each of these limits is exceeded. Although no quantitative theory is available as yet to which the experimental results can be compared, the various observed patterns can be shown to be reasonable equilibrium configurations for the prevailing conditions. Each of these configurations is found to be composed of several separate interactions. Some of the results of this work are applicable to other complex interaction problems such as the reflection of a shock from a rigid wall, the intersection of two shocks, and the interaction of a shock and a boundary layer. Parts I-II are Technical reports II-16 and II-18. Contract N6 ori-105 (TO 2), NR 061-020. PU TR II-19.

Shock waves in elastic and elastic-plastic media, by K.B. Broberg. Sweden. Kungl. Fortifikationsförvaltningen. Befästningsbyran. Förskningsoch Försökssektionen, Stockholm. 1956. 145p photos, diagrs, graphs, tables. Order from LC. Mi $7.20, ph $22.80. PB 126210

Report no. 109:12. 1. Waves, Elastic - Propagation - Sweden 2. Shock waves - Propagation - Sweden 3. Plasticity - Theory - Sweden 4. Plastic deformation - Solids - Sweden

## Nuclear

Cloud chamber investigation of charged V particles: Properties of the charged $\Theta$ meson, by William Howard Arnold, Jr. Princeton University. Palmer Physical Laboratory, Princeton, N.J. and U.S. Naval Ordnance Laboratory. May 1955. 101p photos, drawings, diagrs, graphs, tables. Order from LC. Mi $5.70, ph $16.80. PB 126462

Part I is a description of the design and operation of the multiplate cloud chamber used in this research. The data used is from pictures obtained from Dec 6, 1953 to Dec 12, 1954. The final section summarizes data available on the properties of heavy mesons. Cosmic Ray Group Technical report. Thesis - Princeton University, 1955. For other reports under this contract see PB 117543 and 118207. Contract N6onr-270-II. PU PPL TR 17.

Final report under Contract N7 onr-455, T.O. 3, NR 021-090 covering the period Jan 1, 1948 - Feb 28, 1955, by Walter Nielsen. Duke University. Dept. of Physics, Durham, N.C. Feb 1955. 4p. Order from LC. Mi $1.80, ph $1.80. PB 126041

For Technical report no. 5 see PB 115894. 1. Cosmic radiation - Theory 2. Atomic power - Research

Model for $\Lambda^0$ - $\Theta^0$ production, by Leon F. Landovitz and Jack Leitner. Columbia University. Physics Dept. Nevis Cyclotron Laboratories, Irvington-on-Hudson, N.Y. Dec 1955. 15p diagrs, tables. Order from LC. Mi $2.40, ph $3.30. PB 126295

A calculation of the perturbation theoretic angular distributions in the reaction $\pi^- + p \rightarrow \Lambda^0 + \Theta^0$ is reported. Some general implications of the model $\pi^- + p \rightarrow$ single particle $\rightarrow \Lambda^0 + \Theta^0$ are described. CU-100-55-onr-110-1-Physics. Jointly supported by the Atomic Energy Commission and the Office of Naval Research. Contract N6 ori-110 T.O. no. 1. NEVIS 18. R-122. CU-100.

Naval Research Laboratory Research Reactor. Part IV: Control system, by M.P. Young and G. F. Wall. U.S. Naval Research Laboratory. Apr 1958. 131p photos, diagrs (part fold), graphs, tables. Order from OTS. $2.75. PB 121879

The design of the NRL Research Reactor control system was guided by the desire for extreme safety and versatility of operation. The electronic instrumentation for control includes a startup channel, a logarithmic signal channel, a linear signal channel, a gamma channel, and two safety channels. Duplicate equipment is used extensively throughout the control system. There are numerous backup devices for automatic shutdown in case of reactor runaway, extensive monitoring and warning systems to anticipate and correct unsafe conditions automatically, or to allow the operator to prevent unsafe conditions, and numerous interlocks to prevent unsafe sequences of operation which might arise from inadvertent action of the operator or failure of critical instruments. For flexibility of operation as a research tool, a choice of control instruments and interlocks is available for different modes of operation. For Parts 1-3 see PB 111859, 121050, 131303. NRL R 5077.

Properties of heavy unstable particles produced by 1.3 bev $\pi^-$ mesons, by R. Budde, M. Chretien, J. Leitner, N.P. Samios, M. Schwartz and J. Steinberger. Columbia University. Physics Dept. Nevis Cyclotron Laboratories, Irvington-on-Hudson, N.Y. May 1956. 47p diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126397

CU-113-onr-110-1-Physics. Supported jointly by the Office of Naval Research and the Atomic Energy Commission. 1. Atomic power - Research 2. Mesotrons - Decay schemes 3. Contract N6 ori-110(T.O. 1) 4. NEVIS 27 5. CU 113 6. R 135

Quarterly progress report under Contract AF 18 (600)-997, by Fay Ajzenbery-Selove. Boston University. Dept. of Physics, Boston, Mass. Order separate parts described below from LC, giving PB number of each part ordered.

No. 11. Jun 1956. 5p photo, table. Mi $1.80, ph $1.80. PB 126875

For reports 8, 12-13 see PB 119177, 124804 and 125933. 1. Atomic power - Research

No. 14. Mar 1957. 2p. Mi $1.80, ph $1.80. PB 126961

1. Atomic power - Research

Radiation protection afforded by barracks and underground shelters, by C.W. Malich and L.A. Beach. U.S. Naval Research Laboratory. Sep 1957. 48p diagrs, graphs, tables. Order from OTS. $1.25. PB 131279

The shielding properties of standard Navy enlisted men's barracks and underground shelters have been calculated for the gamma radiation associated with fallout from nuclear weapons. Also the attenuation of prompt radiation from nuclear weapons into underground structures was studied. NRL R 5017.

## PHYSIOLOGY

Annual progress report on research on the effect of ultrasound on nerve tissue, covering the period 1 Jan - 31 Dec 1955 under Contract Nonr-336(00), Report 7, by William J. Fry. Illinois. Engineering Experiment Station. Electrical Engineering Research Laboratory, Urbana, Ill. Feb 1956. 25p photos, tables (part fold). Order from LC. Mi $2.70, ph $4.80. PB 126881

Ultrasonic instrumentation has been designed and developed for the purpose of quantitatively irradiating tissue in the central nervous system. An extensive histological study of ultrasonically produced lesions in the brains of cats has furnished information concerning the time course of changes produced in various tissue components of the central nervous system by exposure to high level ultrasound. The dosage conditions for producing lesions in white matter without disturbing neighboring gray matter are now well determined (at a frequency of one megacycle). The vascular system in the area of the lesion can be left intact and functioning. By raising the ultrasonic dosage, lesions can be produced in gray matter without the disruption of the vascular system.

Estimation of sample size for energy expenditure studies and an energy cost table, by John E. Brockett, Leo V. Crowley, Gerhard J. Isaac and Eugene A. Francis. U.S. Army. Medical Nutrition Laboratory, Fitzsimons Army Hospital, Denver, Colo. Oct 1956. 11p tables. Order from LC. Mi $2.40, ph $3.30. PB 128608

The number of subjects required for estimating total daily energy expenditure and for the energy cost of specific activities was determinined using a formula that takes into account the size of the population from which the sample is drawn. The sample sizes for total energy expenditure are 34 and 52 for populations of 100 and infinity. For the energy cost of specific activities sample sizes from an infinite population ranged from 3 to 100. Project: 6-60-11-020. Subproject no. 3. AMNL R 192.

Mechanisms of natural acclimatization: Tissue pigment studies in altitude adaptation, by Donald V.

Tappan and Baltazar Reynafarje. U.S. Air Force. School of Aviation Medicine, Randolph Air Force Base, Tex. Oct 1956. 9p graph, tables. Order from LC. Mi $1.80, ph $1.80. PB 128468

Studies on the pigment content of muscle and organ tissues of sea level and altitude (14,900 feet) guinea pigs have demonstrated a significant increase in myoglobin in five of eight tissues in sea level animals kept in the altitude for an average of 75 days. The relationship of pigment levels to enzyme activities and the utility of various methods for measuring tissue pigments are discussed. AF SAM R 56-97.

Mode of action of bacterial pyrogens on central autonomic nervous mechanisms, by Ronald Grant. Stanford University, Stanford, Calif. Jul 1955. 34p graphs. Order from LC. Mi $3.00, ph $6.30. PB 124946

Covers effects of direct intra-hypothalamic injection on thermoregulatory behaviour of rabbits, effects of pyrogen fever on the electrical activity of the hypothalamus in cats and rabbits, effects of pyrogens in anemic "decerebrate" animals and in animals with brain stem transections. Covers period 1 Jan 1954-30 Jun 1955 under Contract N6 onr-25139, NR 110-039.

Quartermaster human engineering handbook series: I. Spatial dimensions of the 95th percentile Arctic soldier, by John L. Kobrick. U.S. Army. Quartermaster Research and Development Command. Environmental Protection Research Division, Quartermaster Research and Development Center, Natick, Mass. Sep 1956. 53p photos, diagr. Order from LC. Mi $3.60, ph $9.30. PB 126599

This report presents human engineering information on the body size of the soldier clothed in the full Arctic uniform. It may be used as a handbook by engineers and designers for establishing space allowances in the design and sizing of man-operated equipment. The criterion used is the 95th percentile of Army nude body size, so that the data are concerned with the upper size limit. The information is presented in pictorial form with index scales, so that dimensions can be measured on the pictures and referred to the index scale to establish actual size. Project reference 7-83-01-004. QMC EP TR 39.

Research project on ion balance of living cells and effects of ions on cells and enzyme systems. Final report under Contract Nonr-249(00) for period Feb 1951 - Sep 1955, by H.B. Steinbach. Minnesota, University, Minneapolis, Minn. Sep 1955. 22p tables. Order from LC. Mi $2.70, ph $4.80. PB 124892

Includes Technical reports: 2A. Intracellular sodium and potassium and the development of tension in the frog sartorius. - 2B. Relationship of transmembrane potentials and intracellular ion composition, by Wm. K. Stephenson and H.B. Steinbach. - 2C. Creatine phosphate, glycogen and ATP changes during active sodium extrusion, by H.B. Steinbach. - 2D. Sodium and potassium balance of marine invertebrate muscles, by H.B. Steinbach.

Review of bloat in ruminants, prepared by H.H. Cole and others. National Research Council. Agricultural Board. Committee on Animal Health. Revised 1955. 1956. 70p tables. Order as Publications Office, 2101 Constitution Ave., N.W., Washington 25, D.C. $2.00. PB 124990

1. Cattle - Physiology 2. Cattle - Feeding and nutrition 3. NRC 388.

## PSYCHOLOGY

Adaptability screening of flying personnel: Life history inquiry approach based on the personal history and background information questionnaire, by Maurice R. Seaquist, John R. Barry and S.B. Sells. U.S. Air Force. School of Aviation Medicine, Randolph Air Force Base, Tex. Jun 1956. 21p tables. Order from LC. Mi $2.70, ph $4.80. PB 126888

A 492-item, life-history questionnaire, Personal History and Background Information, was administered experimentally to 535 students entering primary pilot training at Graham Air Base, Florida. Eleven a priori predictor keys were analyzed in relation to adaptability criteria and pass-fail, and eight empirical keys were developed on an experimental sample and tested independently for validity. One 25-item a priori key, designated Aviation Interests and Attitudes, demonstrated consistent validity on three independent cadet samples and an officer sample. For the entire roster of 384 aviation cadets and 66 officers, for whom data were available, this key was found to predict success efficiently and to be generally independent of aptitude factors measured by the pilot stanine. AF SAM R 56-45.

Effect of pain on performance, by F.B. Benjamin. U.S. Naval Air Development Center. Aviation Medical Acceleration Laboratory, Johnsville, Pa. Sep 1956. 26p diagrs, tables. Order from LC. Mi $2.70, ph $4.80. PB 126786

The effect of pain on performance was studied with various types and intensities of pain stimuli and with each subject serving as his own control. It was found that simultaneous pain affected performance tests as follows: (1) memory and speed of performing mental tasks were not changed, while the number of mistakes was increased; (2) time estimates in counts per minute were increased; (3) muscular co-

ordination was impaired; (4) simple reaction time was not changed, while choice reaction time was prolonged; (5) the rate of work performance was not impaired, while the mechanical efficiency of performance was decreased. NMRI Proj. 001 103 301, Report no. 10. NADC MA 5612.

Evaluation of tests of research proficiency in chemistry and physics, by Marion F. Shaycoft and James W. Altman. American Institute for Research, Pittsburgh, Pa. Oct 1955. 33p tables. Order from LC. Mi $3.00, ph $6.30. PB 126460

The general test deals with administration of research projects, acceptance of responsibility, and also with certain aspects of report writing. The chemistry and physics tests deal with the more technical aspects of research. The tests were tried out on individuals in the fields of physics, chemistry, or engineering, who had at least a year of graduate work or of relevant job experience. Data concerning the reliability of the tests, their intercorrelations, and their correlations with other variables were obtained. An item analysis was carried out, on the basis of which a revised form of each of the three tests was prepared. Findings and conclusions are given. Ninth in a series of reports dealing with the evaluation and measurement of research performance. For reports 2 - 8 see PB 104940, 104943 - 104944, 115818, 124867 and 124941. Contract N7 onr-370(07), NR 153-146.

Factors affecting an individual's estimate of his probable success in a group situation, by Harold B. Gerard. Buffalo. University, Buffalo, N.Y. Jun 1955. 23p tables. Order from LC. Mi $2.70, ph $4.80. PB 124936

This discussion is concerned not with whether the individual is correct in his expectations but with what the expectations really are. He may be completely off base in the way he has "sized up" the situation. This may have future consequences for him and for others, but this is another problem. A measure of favorableness of set using paired comparison data was used. This method, which utilized the entire rankorder, involved the assignment of weights to the stimuli. Contract Nonr-283(10).

General review of a program of research on associative clustering, by W.A. Bousfield and B.H. Cohen. Connecticut. University, Storrs, Conn. Apr 1955. 24p graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 126548

This report describes an experimental method, summarizes the results of a research program, and outlines a theoretical rationale relating to organization in recall. The method makes use of a device for the assessment of clustering, here defined as the occurrence of sequences of related words as they appear in the recall of items presented in random order for learning. Contract Nonr-631(00), Technical report no. 11.

## RUBBER AND RUBBER PRODUCTS

Evaluation of rubber fuel drums (U). U.S. White Sands Proving Ground, N. Mex. Jun 1956. 33p photos. Order from LC. Mi $3.00, ph $6.30. PB 126566

Five rubber drums, each of fifty-five gallon capacity, have been evaluated for use in storing and transferring Corporal fuel. The use of rubber drums does not appear to offer any outstanding advantages over metal drums. Unclassified. Technical memorandum no. 353.

High temperature resistant sealant materials, by Leonard C. Boller, Gene M. Lefave, Edward O'Brien, Arthur Milner and John H. Emigh. Coast Pro-Seal and Manufacturing Co., Los Angeles, Calif. Sep 1957. 26p graph, tables. Order from OTS. 75 cents. PB 131478

A formula was developed for a sealant compound which was unaffected by JP-5 jet fuel in the 600°F to 625°F range. It retained flexibility and adhesion and withstood proof testing under flexing and pressure in the temperature range indicated. It is clear from the test data that operation in the presence of fuel vapor is possible in the neighborhood of 650°F. A thorough formulation study was made of the butadiene-acrylonitrile rubber and phenolic resin system in order to develop the optimum thermal stability potential. The effect of added antioxidants, leafing pigments, plasticizers and certain other materials was determined. Several other coating systems were briefly evaluated, such as the liquid polybutadiene modifications. AD 131091. Project 7340, Task 73405. Covers work from Jan-Jul 1956. For Part I see PB 121911. Contract AF 33(616)-2767, Supplemental agreement 51(56-773). AF WADC TR 56-155, Part 2.

Report of inspection of rubber coverings on propeller shafts of the U.S.S. Owen (DD536), U.S.S. Cowell (DD547), U.S.S Pritchett (DD561) and U.S.S. Cushing (DD797), by A.E. Barrett. U.S. Mare Island Naval Shipyard. Rubber Laboratory, Vallejo, Calif. Feb 1956. 7p. Order from LC. Mi $1.80, ph $1.80. PB 126256

Project no. NS 033-005. Report no. 56-91.
1. Shafts, Propeller - Coatings - Rubber
2. Coatings, Rubber - Evaluation

# STRUCTURAL ENGINEERING

Carrying capacity of curved beams, by P. Lange Hansen. 1956. 16p photos, diagrs, graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 126214

Civil engineering and building construction series vol. 3, no. 8.
1. Beams, Steel - Load capacity - Denmark
2. Beams, Structural - Plastic deformation - Denmark 3. Acta polytechnica 209

Circular cast-iron plates, by C. Dyrbye. 1956. 15p diagr, tables. Order from LC. Mi $2.40, ph $3.30. PB 126213

Civil engineering and building construction series vol. 3, no. 7.
1. Plates, Circular - Stress analysis - Denmark
2. Plates, Circular - Cast iron - Bending tests - Denmark 3. Acta polytechnica 208

Exact solution for cantilever plates of whichsoever trapezium planform and of variable thickness, by Luigi Broglio. Rome. Università. Scuola di Ingegneria Aeronautica. Instituto di Costruzioni Aeronautiche, Rome, Italy. May 1956. 72p diagrs, graphs, tables. Order from LC. Mi $4.50, ph $12.30. PB 126817

The subject of this technical note is the static analysis of cantilever variable thickness plates of whichsoever trapezium planform. The general partial differential equations of the problem are reduced to an infinite series of ordinary equations; the solution is obtained by a chordwise expansion in powers of deflection. All formulas providing the solution are given, and comparison is made, on numerical examples, between the various orders at which the chordwise expansion can be stopped. AD 120440. SIAR graph no. 6. Contract AF 61(514)-888, Technical note no. 1. AF OSR TN 57-92.

Loading characteristics of air blasts from detonating charges, by Sune A. Granström. Sweden. Kungl. Tekniska Högskolan, Stockholm. 1956. 94p diagrs, graphs, tables. Order from LC. Mi $5.40, ph $15.30. PB 126211

This paper deals only with blast loads, the type of explosion load that can be expected to be a determining factor in structural design. Sweden. Kungl. Tekniska Högskolan. Handlingar nr. 100.

Measurement of small holes (Izmerenie malykh otverstiyi), by I. A. Grigor'ev. Translated by Gt. Brit. Dept. of Scientific and Industrial Research. Mar 1956. 147p drawings, diagrs, graphs, tables. Available from British Information Services, 30 Rockefeller Plaza, New York 20, N.Y. $1.53. PB 126209

The National Standards of the U.S.S.R. at present prescribe tolerances for linear dimensions between 0.1 and 10,000 mm. These standards distinguish three basic groups of tolerances, namely those for sizes between 0.1 and 1 mm (exclusive), between 1 and 500 mm and between 500 and 10,000 mm. In the present work the problem is discussed of measuring holes of a nominal size covered entirely by the first and partly by the second group (up to 18mm). Translation from the Russian. S.O. code no. 47-193.

Measurements of the thermal properties of various aircraft structural materials, by Perry C. Covington, and Sabert Oglesby, Jr. Southern Research Institute, Birmingham, Ala. Aug 1957. 72p diagr, graphs, tables. Order from OTS. $2.00. PB 131432

Thermal expansion, thermal conductivity, and specific heat were determined for three honeycomb cores, one foamed-core sandwich panel, one laminated panel, and five sandwich panels with various honeycomb cores and facing materials. In addition, thermal conductivity determinations were made for two silicone-resin laminates to establish a check for data previously reported on these panels. AD 131032. Project 7340, Task 73400. Covers work from Jan 1, 1956-Dec 31, 1956 under Contract AF 33(616)-3328. AF WADC TR 57-10.

Preliminary investigation of load distribution in threaded connections, by Robert M. Gray. Purdue University. Purdue Research Foundation. Division of Engineering Sciences Laboratory, Lafayette, Ind. Jul 1954. 45p photos, diagrs, graphs. Order from LC. Mi $3.30, ph $7.80. PB 126896

In preliminary stages of this investigation, the papers of Sopwith and Stoeckley were reviewed and checked thoroughly. Some points noted in this review were submitted to Watertown Arsenal. It was found that the theoretical analysis could be extended to include many of the problems involving threaded connections not now discussed in literature. The analytic results of this study are summarized and the solutions of each independent permutation of the non-tapered connection problem have been included. Results are presented in analytic and graphic form. Unclassified 20 Aug 1954. Serial no. 1. Project no. TR 3-3027A. Contract DA-11-022-ord-17. WAL R 730/562-47.

Prov med fördelningsmätare för värme och varmvatten, by Evert Reijner and Bo Adamson. Sweden. Statens Närnnd for Byggnadsforskning, Stockholm. Nov 1956. 38p drawings, diagrs, graphs, tables. Order from LC. Mi $3.00, ph $6.30. PB 126224

Text in Swedish.
1. Houses - Heating - Sweden 2. SNB 36

Some problems of design for minimum weight, by P.G. Hodge, Jr. Polytechnic Institute of Brooklyn. Dept. of Aeronautical Engineering and Applied Mechanics, Brooklyn, N.Y. Jan 1956. 25p diagrs, graphs, table. Order from LC. Mi $2.70, ph $4.80. PB 126496

A structure of given geometrical configuration is required to carry certain prescribed loads. It is desired to proportion the members of the structure so that the total weight will be a minimum. The material of the structure is assumed to be perfectly plastic. This problem is investigated for circular cylindrical shells subjected to uniform radial pressure, with or without end load. Previous published solutions are reviewed, and some of these are showed to be incorrect. It is concluded that the problem is by no means trivial, and the solutions offered must be regarded as tentative. Contract Nonr-839(11), NR 064-416. PIB AL 342.

Verksamhetsberättelse (Report of work), 1955/56. Sweden. Statens Nämnd för Byggnadsforskning, Stockholm. Sep 1956. 48p. Order from LC. Mi $3.30, ph $7.80. PB 126225

1. Building - Research - Sweden
2. Building - Costs - Sweden

Weakening effect of initial tilt and lateral buckling of ring stiffeners on cylindrical pressure vessels, by E. Wenk, Jr. and E.H. Kennard. U.S. David W. Taylor Model Basin, Washington, D.C. Dec 1956. 25p photo, drawings, diagrs, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 126338

The lateral stability of a T-stiffening ring on a cylinder under external pressure is investigated analytically for the case of axisymmetric deformation only. Both failure by yield due to initial tilt of the T and lateral buckling of the ideal T are considered. The practical application of the results is discussed. NS 731-038. DWT MB 1073.

## TEXTILES AND TEXTILE PRODUCTS

Development of a new method for predicting the sewing efficiency of cotton thread, by Walter Zagieboylo, Edward B. Frederick and Frederick F. Balas. U.S. Army. Quartermaster Research and Development Laboratories. Textile and Leather Division. Dec 1953. 18p photos, graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 126738

This report describes the development of another technique for thread testing, using a new instrument that simulates the degradation a thread is subjected to during an actual sewing cycle. The data obtained indicate the impact strength and impact frictional characteristics of the thread. Unclassified 25 Oct 1956. QMC TSR 125.

Practical determination of strength of aircraft fabric with dope removed, by Alan L. Morse and John H. Clark. U.S. Civil Aeronautics Administration. Technical Development Center, Indianapolis, Ind. Jan 1958. 13p photos, diagrs, graphs, table. Order from OTS. 50 cents. PB 131639

A portable impact-type fabric tester was developed for use against doped aircraft fabric as an inspection aid to indicate whether or not the tensile strength of that fabric is above a predetermined value. Tests were conducted to calibrate the blow energy delivered by the tester versus tester adjustment and to determine the relationship between tester blow energy for penetration of doped fabric and the tensile strength of that fabric with the dope removed. For report of previous tests see PB 106756. CAA TDR 333.

## TRANSPORTATION EQUIPMENT

### Aeronautics

### Aircraft

Aircraft collision-avoidance system requirements, by P.J. LaRochelle and R.E. Brescia. U.S. Naval Research Laboratory. Apr 1958. 46p diagrs, graphs, tables. Order from OTS. $1.25. PB 131589

One possibility which presents itself is that of utilizing communication and computer techniques to create a cooperative collision-avoidance system that will accept data from aircraft instruments, confer with similar installations in other aircraft, and give control commands to insure safe clearance with other flights. Path dynamics have been analyzed to determine reliable parameters for prediction of minimum approach distance and time to reach the point of nearest approach. The problem was considered from the point of view of relative displacement as a function of time in order to determine appropriate escape maneuvers. The likelihood of collision may be reduced by the utilization of either a radar or external position form of position reference if proper processing of the information is utilized. There are significant differences in hazard prediction reliability when the errors of practical data gathering devices are considered. NRL R 5107.

Equipment cooling systems for aircraft, by V.H. Larson. Research, Inc., Dallas, Tex. Jan 1958. 244p diagrs, graphs, tables. Order from OTS. $3.50. PB 131747

This report contains the results of a study of equipment cooling systems for aircraft operating at flight velocities up to Mach 2.5 and at altitudes up to 70,000 feet. Surface temperatures at the equipment from 160° to 275°F are considered. Vapor cycle cooling systems using Freon-11 and systems using water are analyzed to determine the weight of various components and the power requirement for the systems. Simple and regenerative air cycle systems and a ram air cooling system combined with an expendable coolant system are also analyzed. Expandable coolant systems used singly and in combination with other cooling systems are considered for high speed dash flight of limited duration. The range of applicability and characteristics of the various systems are analyzed. The applicability of each of the systems to centralized and to individualized concepts of equipment cooling is considered. AD 142268. Project 5(6-6146), Task 61181. Contract AF 33(616)-3063. AF WADC TR 56-353.

Pre-test information for two-dimensional tests of a blowing circulation control model (ONR RM-6), by J.L. Stalter. Wichita. University. School of Engineering, Wichita, Kan. Oct 1953. 10p diagr, graphs, table. Order from LC. Mi $1.80, ph $1.80. PB 126718

The purpose of this two dimensional test program is to evaluate the aerodynamic characteristics of an airfoil with a number of types of circulation control systems. This will make available circulation-control airfoil section characteristics necessary for design studies of a circulation-control airplane. UW ER 115.

## Engines and Propellers

Retainer materials for aircraft gas turbine bearings, by Eugene J. Bucur, F. Clifton Wagner and John T. Burwell, Jr. Horizons, Inc., Cleveland, O. Mar 1955. 54p photos, drawings, diagrs, graphs, tables. Order from OTS. $1.50. PB 131349

It has been found that: 1. Several alloy compositions have been developed which have superior bearing properties to "S" Monel and iron-silicon bronze. All of the promising materials except one contain silver as a major alloying element. 2. It has been established that the addition of from 2 to 4% silicon is distinctly beneficial to the wear properties of several classes of metallic alloys. 3. It has been shown that the alloy composition can be varied considerably with respect to the strong, load supporting phase as long as silver is contained in the soft matrix. AD 74305. Project 3066, Task 73599. Contract AF 33(616)-2099. AF WADC TR 54-598.

Study of condensation products in the exhaust of a jet engine, by I.G. Poppoff. Stanford Research Institute, Menlo Park, Calif. Mar 1956. 40p photos, diagrs, graphs, tables. Order from LC. Mi $3.00, ph $6.30. PB 126842

1. Jet engines - Exhaust systems 2. Condensation, Water vapor 3. Contract AF 19(604)-1532, Final report 4. SRI Proj CU 1419, Report no. 4

Study of shrouded vs unshrouded propellers, by Arthur Stone. U.S. Bureau of Aeronautics. Research Division. Jul 1955. 14p diagrs, graphs (1 fold). Order from LC. Mi $2.40, ph $3.30. PB 132533

An analysis of the thrust characteristics of shrouded and unshrouded propellers has been conducted in order to compare experimentally determined data to that indicated by theory. The range of propellers studied cover aircraft of all types including fixed wing, airships, and helicopters. Attention is directed to the fact that the trend indicated by shrouded propeller test values is based on relatively few test points and may change when more data become available. NAVAER DR 1750.

Summary of the development of mechanical type thrust reversers, by G. Wayne Hawk. Goodyear Aircraft Corporation, Akron, O. May 1957. 59p photos, diagrs, graphs. Order from OTS. $1.50. PB 131645

A full scale unit was designed, fabricated, and tested for non-afterburning and for afterburning turbojet engines. A full blockage tailpipe cascade type thrust reverser was designed for installation on a J47-13 type non-afterburning turbojet engine, and a target-type thrust reverser was developed for installation on a J47-17 type afterburning turbojet engine on the basis of small scale and prototype tests. AD 110703. Project 3080, Task 30266. Contract AF 33(600)-28274. AF WADC TR 57-17.

Summary of the development of aerodynamic type thrust reversers, by J.F. McDermott, Jr. Goodyear Aircraft Corporation, Akron, O. May 1957. 50p photos, diagrs, graphs. Order from OTS. $1.25. PB 131378

No final conclusions have been reached on an afterburning engine thrust reverser design since only preliminary exploratory work was performed. Both small-scale and full-scale models were designed, fabricated, and tested for each part of this program. A prototype was designed and installed on a J47-13 type non-afterburning engine. AD 110704. Project no. 3080. Contract AF 33(600)-28314. AF WADC TR 57-18.

## Training and Training Devices

K-system MAC-1 trouble-shooting trainer. II: Effectiveness in an experimental training course, by Robert Stanton French, Norman A. Crowder and Joseph A. Tucker, Jr. U.S. Air Force. Air Research and Development Command. Air Force Personnel and Training Research Center. Maintenance Laboratory, Lowry Air Force Base, Colo. Oct 1956. 50p photo, diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126758

This report describes an experimental training program which was conducted to evaluate this trainer (the K-System MAC-1 Trainer) and, as a more general purpose, to investigate the feasibility of teaching systematic trouble shooting to apprentice mechanics of average aptitude. AD 098894. AF PTRC TN 56-120.

## Aerodynamics

Aerodynamic studies. See entries under Bibliography on page 316.

Effect of bluntness on transition for a cone and a hollow cylinder at Mach 3.1, by Paul F. Brinich and Norman Sands. U.S. National Advisory Committee for Aeronautics. May 1957. 42p drawings, graphs. Order as TN 3979 from National Advisory Committee for Aeronautics, 1512 "H" Street, N.W., Washington 25, D.C. PB 126081

1. Boundary layer - Transition point 2. Cones - Boundary layer - Transition point 3. Cylinders, Hollow - Boundary layer - Transition point 4. NACA TN 3979

Influence of profile thickness on ring airfoils in steady incompressible flow, by Johannes Weissinger. Karlsruhe. Technische Hochschule. Institut für Angewandte Mathematik, Karlsruhe, Germany. Jan 1957. 57p diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 126819

In order to produce profile thickness for ring airfoils, contrary to two-dimensional theory, not only a source distribution is needed, but also a vortex distribution. This vortex distribution is determined by an integral equation, the kernel of which has been tabulated. The axial velocity at a cylinder covered with sources and vortices in such a way as to produce ring airfoils is given in a form suitable for practical computation; these formulae have an explicit term and a second term, which must be calculated by numerical quadrature using tabulated kernel functions, in most cases; however, this second term can be neglected because of its smallness. The values of these integrals have been tabulated for the most interesting cases, so that for actual computations only, a superposition of explicit and tabulated terms is necessary. Finally it is shown how from these volocities at the circular cylinder, the velocity at the profile may be calculated. AD 120424. For Part I see PB 126693. Contract AF 61(514)-904. AF OSR TR 57-8, Part II.

Influence of vertical currents upon aircraft (Influence des courants verticaux sur les avions), by R. Eyraud. Translated by Bronislas de L. Jezierski. May 1956. 18p diagrs, graphs. Order from LC. Mi $2.40, ph $3.30. PB 126348

Influence of vertical currents upon aircraft with conclusion indicating limited control as it affects discomfort caused by turbulence. Translated from Journal Scientifique de la Meteorologie, (1): 23-31, 1949 for Geophysics Research Center, AF Cambridge, Research Center, by the American Meteorological Society under Contract AF 19(604)-1364.

Response of an airplane to random atmospheric disturbances, by Franklin W. Diederich. U.S. National Advisory Committee for Aeronautics. Apr 1957. 97p graphs, table. Order as TN 3910 from National Advisory Committee for Aeronautics, 1512 "H" Street, N.W., Washington 25, D.C. PB 125720

1. Gust loads - Mathematical analysis 2. Loads, Aerodynamic - Theory 3. NACA TN 3910

## Rockets and Jet Propulsion

Artificial earth satellite, by Yu. A. Pobedonostsev. Feb 1958. 24p diagr, graphs, tables. Order from OTS. 75 cents. PB 131756

Consists of "Appendix: Some basic postulates used in computing satellite". Translated from Iskusstvennyy sputnik zemli, p. 52-71, published in Moscow, 1957.

Project Vanguard report no. 25: Firing time for satellite launching vehicle from Cape Canaveral, Florida, as related to solar illumination and satellite visibility, by J.W. Siry, R.H. Wilson, Jr., M. DeNovens, M.P. Hann, and E.L. Lady. U.S. Naval Research Laboratory. Mar.1958. 71p diagrs, graphs. Order from OTS. $2.00. PB 131394

The exact theoretical relations of the time of day and day of the year to satellite conditions of (a) optical acquisition at White Sands, New Mexico, by sunlight illumination, (b) solar observing by instruments near the satellite equator, and (3) the percentage of time in sunlight are derived and explained. Numerical results, giving a complete picture of these conditions for all times and dates, are presented as curves. Two duplicate transparent figures for overlay comparison are included. NRL R 5066.

Satellite launching trajectory calculations. General description of NAREC programs for the two-dimensional case, by J. L. Hammersmith. U.S. Naval Research Laboratory. Apr 1958. 12p diagrs, table. Order from OTS. 50 cents. PB 131491

This report describes in a fairly detailed manner the common characteristics of programs used to calculate satellite launching vehicle trajectories on the Laboratory's electronic digital computer (NAREC). Equations of motion and auxiliary formulas are given along with a description of program organization. The formulations are two-dimensional ones and are largely concerned with powered flight for the first two stages. NRL R 5086.

## Land Transportation

Preliminary study of snow values related to vehicle performance, by S. J. Weiss, William L. Harrison, J. C. Abarca and M. G. Bekker. U.S. Arsenal, Detroit. Land Locomotion Research Laboratory, Detroit, Mich. Sep 1956. 30p photos, diagrs, graphs, table. Order from LC. Mi $2.70, ph $4.80. PB 126732

The results of the considerable snow research that has already been undertaken include little information which can be used in an evaluation of snow as a medium of locomotion of motor vehicles. Although the pertinent earlier investigations have indicated the possibility of representing the shearing strength of snow under vehicle loads by the Coulomb equation defining the ultimate strength of the material, they have also indicated that a more complete definition of the stress-strain relationship is required. DA LLRL TM M 02.

## Marine Transportation

Experimental studies of hydraulic breakwaters, by John B. Herbich, Jurgen Ziegler and C. E. Bowers. Minnesota. University. St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minn. Jun 1956. 108p photos, drawing, graphs, tables. Order from LC. Mi $5.70, ph $16.80. PB 126891

Experimental studies were conducted on both large and small models of hydraulic breakwaters. Data were obtained which indicated that power requirements are a function of jet area, jet submergence, attenuation, and wave characteristics. It was concluded that no serious scale effect was obtained over the 1:4.5 scale ratio of the tests. Tests of multiple-manifold systems and the effect of waves striking the breakwater at an angle were limited in scope, but data were obtained providing an indication of the effect of these variables. Covers work from Apr 1, 1954-Apr 1, 1955 under Contract Nonr-710(00), NR 062-178. Project report 51.

Field measurements with the Wiegmann inclinometer in the harbors of Galveston, Philadelphia, Baltimore and Cleveland, by Gregory P. Tschebotarioff, Edward R. Ward and others. Princeton University. Dept. of Civil Engineering, Princeton, N.J. Aug 1956. 142p photos, maps, diagrs, graphs, tables. Order from LC. Mi $7.20, ph $22.80. PB 127891

For earlier report see PB 126840.
1. Bulkheads - Bending moments 2. Clinometers 3. Soil engineering 4. Contract Nonr-1009(00), NR 081-117

# WATER SUPPLY, SANITATION AND PUBLIC HEALTH

Development of water purification equipment set, base-mounted unit, diatomite filter, 3000 gph, by George T. Goforth and Richard P. Schmitt. U.S. Army. Corps of Engineers. Engineer Research and Development Laboratories, Fort Belvoir, Va. Dec 1956. 112p photos, drawings, tables (1 fold). Order from LC. Mi $6.00, ph $18.30. PB 132674

The report covers the development, tests, and evaluation of water purification equipment suitable for use in arctic, subarctic, and temperate areas. Two water purification units were tested. AD 128602. Project 8-75-05-109 (8-75-05-009). Covers work from Jan 1951-Dec 1955. ERDL R 1470.

Selected bibliography on water pollution caused by the petroleum industry. See entry under Bibliography on page 317. PB 126852

# MISCELLANEOUS

Applied environmental research program of the Dept. of the Army. Annual report, 2d, Jun 1955-Jun 1956. U.S. Army. Quartermaster Research and Development Command, Natick, Mass. Sep 1956. 49p photos, maps, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 126597

Summarizes environmental research studies conducted during the year: 1. A workable prototype Envanal system (rapid selection of equipment for use in different environments) was constructed and field tested. 2. Initiation and active performance of microenvironmental field studies at test sites in Alaska, Arizona, and the Panama Canal Zone. 3. Preparation of climatic and terrain analogs, maps, and reports comparing each of the major D/A test sites with similar environments throughout the world. 4. Completion of a draft "World Color Regions Atlas" and accompanying analytical report. 5. Preparation of solar radiation analyses and reports.

Color regions of the world, by Jack V. Chambers and Paul C. Dalrymple. U.S. Army. Quartermaster Research and Development Command. Environmental Protection Research Division, Quartermaster Research and Development Center, Natick, Mass. Nov 1956. 61p tables. Order from LC. Mi $3.90, ph $10.80.
PB 126720

The present five Quartermaster standard colors (white, tan, green, olive green, and olive drab) approximate the natural colors of about 86 percent of the world land area. For nearly complete world coverage three additional basic colors would be required: earth red, earth brown, and forest green. Project 7-83-01-001B. QMC EP TR 37.

Comparative protein and nucleic acid analysis of strains of tobacco mosiac virus. Final report for the period 1 Apr 1954. to 1 Dec 1955 under Contract Nonr 233(23), NR 120-271, by S. G. Wildman and D. E. Atkinson. California. University, Los Angeles, Calif. 1956. 4p. Order from LC. Mi $1.80, ph $1.80. PB 124992

For annual progress report for 1954 see PB 119243.
1. Tobacco mosaic - Virus - Analysis

Installation manual for the uniterm system of coordinate indexing. Documentation, Inc., Washington, D.C. Oct 1953. 28p graphs, tables. Order from LC. Mi $2.70, ph $4.80.
PB 126671

Catalog cards issued by the Armed Services Technical Information Agency (ASTIA) will include a new kind of subject "heading" on the reverse side of the card in addition to conventional subject headings which will remain in their normal position on the front side. These "headings", known as Uniterms, are the basis of an entirely new concept of reports indexing developed after a year of research by Documentation Incorporated, Washington, D.C., under contract with ASTIA. 1. Indexes - Theory 2. Contract AF 18(600)-376.

Report of NRL progress. U.S. Naval Research Laboratory. May 1958. 69p. Order from OTS. $1.25. Also available at annual subscription rate of $10.00 a year in the U.S.A., foreign rate $13.00 a year. PB 131784

Contents: Articles: Satellite temperature control, by L. F. Drummeter and M. Schach. - Correlation of brittle fracture service failure with laboratory notch ductility tests, by P. P. Puzak and A. V. Babecki. - Scientific program: Problems accepted: Problem notes: Applications research: Evaluation of the operational and psychological effects of a broadband blue illumination system in a CIC mock-up... Operational modes of an Iatron projection indicator. - Astronomy and astrophysics: Ion composition of the Arctic ionosphere... Propagation of light signals over the horizon by atmospheric scattering. - Chemistry: Basic studies of lead-acid storage batteries. - Electricity: Thermal characteristics of electrical equipment... Circuit analysis of electrical and electromechanical equipment. - Mechanics: Dynamic response of equipment subject to shock... Improvements in the efficiency and temperature stability of the NRL pulsejet combustor for gas-turbine application. - Metallurgy and ceramics: Radiation effects in ferromagnetic metal alloy toroids... Effect of atmosphere on creep-rupture properties of a Ni-Cr-Al alloy... A high-temperature vacuum and controlled environment fatigue tester... Cast age-hardenable steels... The cracking of steel during heating with aqueous slurries of gamma-FeOOH. - Nuclear and atomic physics: Automatic tape punch for a pulse-height analyzer... Angualr correlation between particles and gamma rays emitted from $He^3$-induced nuclear reactions... On a review of nuclear gamma-ray polarization measurements... Transition levels in $Zn^{65}$ excited by the $Cu^{65}(p,n)Zn^{65}$ reaction. - Radio: Electronic computer program for fitting a curve to a set of measured data points with least square error... An air traffic control color display... Physical properties of quartz crystals... A standard video signal simulator... Experiments in deposition techniques to aid miniaturization, construction, and reliability of various active and passive solid-state electronic devices. - Solid-state physics: Radiation effects in dielectric solids... Electron probe analysis of some metallic and nonmetallic specimens. - Sound: Acoustic transient-distortion-measuring system. - Published reports. - Papers by NRL staff members. - Patents.

Preparation of ARDC technical documentary reports. U.S. Air Force. Air Research and Development Command. 34p. Available from Commander, Air Research and Development Command, Attn: RDSBT (Technical Information Division) Andrews Air Force Base, Washington 25, D.C. ARDC Manual 5-1.

# ATOMIC ENERGY COMMISSION REPORTS

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## Biology and Medicine

Semi-annual progress report. Utah. Univ., Salt Lake City. Radiobiology Lab. Sept. 1957. Contract AT(11-1)-119. 129p. Order from LC. Mi $6.30, ph $19.80. AECU-3583

Part I. Blood volume determinations with radioactive isotopes and observations on blood volume fluctuations. Part II. Index of cardiac clearance. George Washington University, Washington, D. C. Mar. 1958. Contract AT (30-1)-1820. 50p. Order from OTS. $1.00. AECU-3614

Deposition and retention of $Ru^{106}$ following administration of $Ru^{106}O_2$ to mice by inhalation and intratracheal injection, by W. J. Bair and others. Hanford Atomic Products Operation. Richland, Wash. Oct. 1957. Contract W-31-109-Eng-52. 23p. Order from OTS. 75 cents. HW-52285

Studies on the atomic bomb injuries in Hiroshima City, by Takehiko Kikuchi and others. Kyoto University. Japan. Feb. 1950. 50p. Order from OTS. $1.25. NP-6436

A summary of the Berkeley Conference on biological effects of cosmic rays and accelerated heavy ions, by Cornelius A. Tobias, Howard C. Mel, and David G. Simons. Calif. Univ., Radiation Lab. Berkeley. Mar. 1958. Contract W-7405-Eng-48. 15p. Order from OTS. 50 cents. UCRL-8201

Semianmual report for period ending December 31, 1957. University of California School of Medicine, San Francisco. Dept. of Radiology. Feb. 1958. Contract AT-11-1-GEN-10, Project No. 2. 14p. Order from OTS. 50 cents. UCSF-16

## Chemistry—General

A study of the reactions of methyl ether-boron fluoride complex with water under fractionation conditions, by E. N. Hiebert, W. L. Rittschof, and A. L. Conn. Standard Oil Co. of Indiana, Chicago. Oct. 1945. Decl. Feb. 12, 1957. Contract W-7418-Eng-41. 50p. Order from LC. Mi $ 3.60, ph $9.30. A-2363

Conversion of $UF_6$ to uranium trioxide. Final report May 3, 1946. Linde Air Products Co. Tonawanda Lab., Tonawanda, N. Y. (For Carbide and Carbon Chemicals Corp. K-25 Plant). Decl. Feb. 12, 1957. Contract W-7405-Eng-26, subcontract No. 2. 137p. Order from LC. Mi $7.80, ph $25.80. A-3936(Del.)

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Thermal cycling of bismuth, by C. D. Newnan. California Research and Development Co. Livermore, Calif. Apr. 1952. Decl. Feb. 14, 1957. 47p. Order from LC. Mi $3.60, ph $9.30. CRD-T-1-100

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Progress report on metallurgy of tuballoy (uranium) to University of Chicago, Battelle Memorial Inst., Columbus, Ohio. Oct. 1944. Decl. Feb. 19, 1957. Contract W-7405-Eng-92. 19p. Order from LC. Mi $2.70, ph $4.80. CT-2253

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Extrusion process, Hanford Engineer Works, Richland, Wash. Jan. 1945. Decl. Mar. 13, 1957 Contract W-31-109-Eng-52. 3p. Order from LC. Mi $1.80, ph $1.80. HW-3-1341

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Compatibility of materials in liquid metal; second report, by D. B. Vail. Knolls Atomic Power Lab., Schenectady, N. Y. Jan. 1954. Contract W-31-109-Eng-52. 69p. Order from LC. Mi $3.90, ph $10.80. KAPL-1021

Metallurgy report of the technical department (for) March, April, May 1956, by C. A. Bruch and W. M. Cashin. Knolls Atomic Power Lab., Schenectady, N. Y. Decl. with deletions Feb. 25, 1957 Contract W-31-109-Eng-52. 45p. Order from LC. Mi $3.30, ph $7.80. KAPL-1564(Del.)

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