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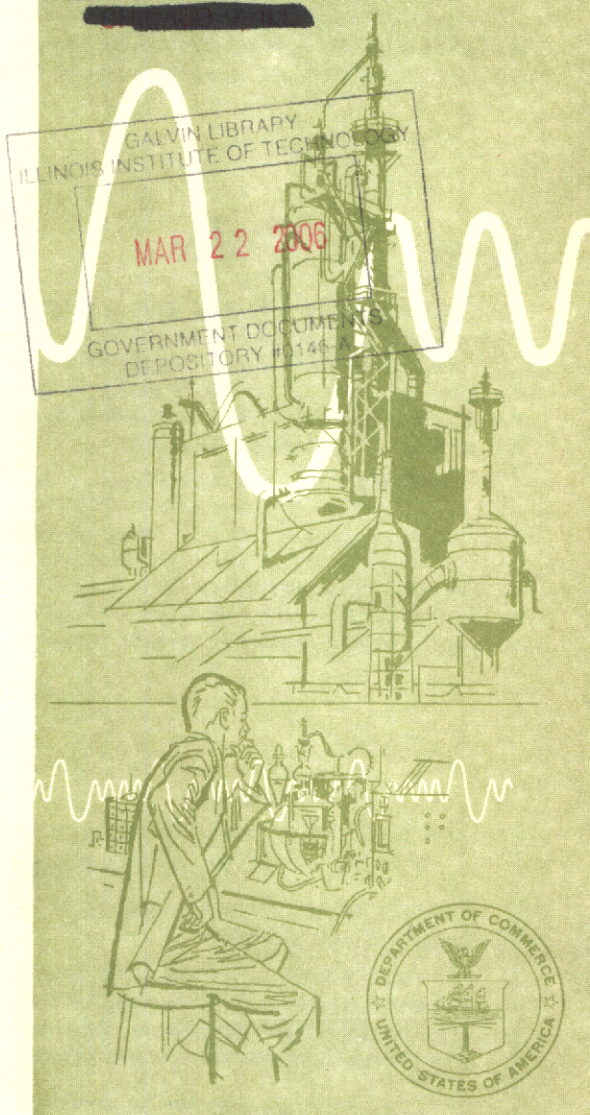
In this issue:



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OFFICE OF TECHNICAL SERVICES
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U. S. DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

Vol. 27, No. 5 May 17, 1957

Contents

Printed Reports Available from OTS Announced in This Issue

APPAREL

Effect of gloves on control operation time, by James V. Bradley. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Aero Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Nov 1956. 16p diagrs, tables. Order from OTS. 50 cents. PB 121929

Five types of control (push buttons, toggle switches, knobs, horizontally operable levers, and vertically operable levers) were operated at room temperature with the hand clothed as follows: no glove, wool glove, double glove, i.e. leather glove over wool glove. Operation time was measured. It was concluded that the effect of gloves on control

operation time depends upon the type of glove worn, the physical characteristics of the control, and the type of control operation required. AD 110565. Project 7182, Task 71514. AF WADC TR 56-532.

CHEMICALS AND ALLIED PRODUCTS

Organic Chemicals

The base-promoted dehydrohalogenation of cis- and trans-2-chlorocycloalkyl aryl sulfones, by Harlan L. Goering, Douglas I. Relyea and King L. Howe. Wisconsin. University. Dept. of Chemistry, Madison, Wis. Jun 1956. 21p tables. Order from LC. Mi $2.70, ph $4.80. PB 123963

AD 89489. HG report no. 6.
1. Sulfones, Aryl (2-chlorocyclo) alkyl - Reactions 2. Sulfones, Aryl (2-chlorocyclo) alkyl - Preparation 3. Sulfones, Aryl (2-chlorocyclo) alkyl - Physical properties 4. Contract AF 18(600)-1037 5. AF OSR TN 56-279.

Bench-scale studies of the hydrocarbon synthesis with iron and cobalt catalysts (Japan) (Report of the Kyoto Imperial University, Japan), by S. Kodoma et al. Revised and edited by J. Lecky. Kyoto. Imperial University, Kyoto, Japan. Feb 1954. 165p graphs, tables. Order from LC. Mi $7.80, ph $25.80. PB 124298

U. S. Bureau of Mines. Information circular. Translated by Technical Japanese Translation Service.
1. Hydrocarbons - Synthesis - Japan 2. Hydrocarbons - Catalysts - Japan 3. Catalysts, Iron - Japan 4. Catalysts, Cobalt - Japan 5. Carbon monoxide - Hydrogenation - Catalysts - Japan.

Chlorine and fluorine containing organic compounds for nonflammable materials, by E. T. McBee and others. Purdue University. Purdue Research Foundation, Lafayette, Ind. May 1950. 88p tables. Order from LC. Mi $4.80, ph $13.80. PB 119722s

The purpose of this work was to investigate the applicability of chloro-fluorine containing compounds as base stocks, viscosity index improvers and "snuffer" additives for use as nonflammable aircraft hydraulic fluids and lubricants. The major emphasis has been placed on the preparation and determination of physical properties of ethers, esters, heterocyclics (thiophenes), alcohols, polysiloxanes, and halohydrocarbons. Considerable data have been obtained upon which a specification for nonflammable hydraulic fluid has been based. Supplement to PB 119722. Contract W 33-038-ac-19024. AF TR 5763, Suppl. 1.

Fluorocarbon chemistry studies. First technical report under Contract Nonr-1552(00), NR 055-354, by Murray Hauptschein. Temple University. Research Institute, Philadelphia, Pa. Jun 1955. 31p tables. Order from LC. Mi $3, ph $6.30. PB 123997

The copolymerizations of perfluoropropene and trifluorochloroethylene with ethylene oxide have been effected and studied in the presence of ultraviolet light or di-t-butylperoxide (DTBP) as the initiators. Vinylidene fluoride did not copolymerize with ethylene oxide using DTBP as the initiator but the conversion to vinylidene fluoride homopolymer has been shown to be increased greatly by the presence of small or large amounts of ethylene oxide. Perfluoropropene and vinylidene fluoride in the presence of DTBP react with ethyl ether to form telomers. Contents: Part 1. Copolymerization of highly fluorinated olefins with ethylene oxide, by M. Hauptschein and J. M. Lesser. - Part II. Perfluoroalkyl aluminum complexes, by M. Hauptschein, A. J. Saggiomo and C. S. Stokes. Contract Nonr-1552(00), Technical report no. 1.

Infrared spectra of some salts of organophosphorus acids, by L. W. Daasch. U. S. Naval Research Laboratory. Mar 1957. 26p graphs, tables. Order from OTS. 75 cents. PB 121835

The infrared absorption spectra in the region from 670 to 5000 cm^{-1} are presented for thirty-three salts of five organophosphorus acids. Certain similarities are found in the spectra of the salts if observations are limited to the same type of salt (acid salt or normal salt) and to one type of acid (phosphinic or phosphonic acid). These similarities should be useful for purposes of identification according to type. In addition, there are usually sufficient differences between the spectra of the various salts to facilitate the identification of a particular pure salt. NRL R 4903.

New analytical method for calorimetric study of hydrogenation of some fluoroorganic compounds, by J. R. Lacher, A. Kianpour and J. D. Park. Colorado. University, Boulder, Colo. Oct 1955. 8p drawing, tables. Order from LC. Mi $1.80, ph $1.80. PB 125239

The weighing method used for measurement of the rate of hydrogenation of halogen free olefins was found to be unsatisfactory. A new analytical method was developed to study the rate of hydrogenation of such compounds as CF_2-CH_2. Hydrogen was used as an unlimited reactant with a constant rate flow throughout the run with the olefin as the limiting reactant. UC Technical note 3. Contract AF 18(600)-1151. AF OSR TN 55-442.

Preparation and properties of the isomers of 1, 2-difluoro-1, 2-dichloroethylene, by J. R. Lacher,

Richard Sullivan and J. D. Park. Colorado. University. Department of Chemistry, Boulder, Colo. Jun 1956. 6p graphs, table. Order from LC. Mi $1.80, ph $1.80. PB 123118

The object of the present research program was to separate the cis and trans isomers of CFCl-CFCl by means of fractional distillation, to determine their purity by means of time-temperature freezing point curves, to study their magnetic susceptibilities, and by means of the infrared spectra to make a positive assignment of configuration. AD 82501. AF OSR TN 56-107. Contract AF 18(600)-1151.

Research study of the mechanism of action in the synthesis of cellulose. Final technical report Mar 1, 1955 to Feb 29, 1956, under Contract AF 18(600)-1389, by Glenn A. Greathouse, David E. Barnes and William Borysewich. Orlando Research, Inc., Orlando, Fla. Feb 1956. 32p diagr, tables. Order from LC. Mi $3, ph $6.30. PB 122452

Experimental data is presented on C^{14}-cellulose formation by acetobacter xylinum or cell-free enzyme systems from D-glucose-1-C^{14}, D-glucose-2-C^{14}, D-glucose-6-C^{14}, and glycerol-1, 3-C^{14}. There are at least two mechanisms of cellulose synthesis indicated by these data. One, a prior cleavage of hexoses to trioses and then resynthesis to hexoses, probably hexose phosphates and the polymerization to cellulose; second, a direct polymerization of hexoses, probably through the phosphates, to cellulose. Identification was made of hexose monophosphates, diphosphates, and dihydroxyacetone phosphates as intermediates between glycerol and hexose biosynthesis of cellulose. It is planned to prepare these data for publication in the Journal of the American Chemical Society. AD 86600. Project task 77518. AF OSR TR 56-16. Contract AF 18(600)-1389, Final report.

Study of odorants for use in fire extinguishers of the carbon dioxide and methyl bromide type, by Wendell A. Landmann. U. S. Naval Research Laboratory. Oct 1945. 26p diagrs, graph, tables. Order from LC. Mi $2.70, ph $4.80. PB 123378

1. Fire extinguishers, Carbon dioxide 2. Fire extinguishers, Methyl bromide 3. NRL P 2633.

Surface tensions and parachors of pure hydrocarbons, by Osborne R. Quayle. Emory University, Emory University, Ga. Nov 1950. 27p tables. Order from LC. Mi $2.70, ph $4.80. PB 123649

Surface tension values and parachors are reported for 113 hydrocarbons. As a result of the accumulation of this data, certain generalizations, relationships, and methods of calculating parachor values have been proposed and are discussed in this report. U-16821. Final report covering the period Sep 1, 1948 to Aug 31, 1950. Contract N8 onr-525, Final report.

Wax, desensitizing. U. S. Picatinny Arsenal, Dover, N. J. Revised. Sep 1954. 8p drawings. Order from LC. Mi $1.80, ph $1.80. PB 124881

This purchase description is issued pending revision of Military Specification MIL-W-20553. 1. Waxes - Specifications 2. PA TR PD 535.

Plastics and Plasticizers

Analysis of the thermal properties of plastic laminates, cores, and sandwich panels, by Robert F. Trapp. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Jan 1957. 18p graphs. Order from OTS. 50 cents. PB 121882

The thermal properties of plastic laminates, cores, and sandwich panels are presented by grouping data from WADC Technical Reports 54-306 Parts I and II (PB 121191) into sets, arranged according to the types of resin used in their construction. Curves are presented which are representative of the resin types for each thermal property. The scatter of data about these mean curves varies from $\pm 10\%$ to $\pm 40\%$. AD 110731. Project 7340, Task 73400. Covers work from Jan-Oct 1956. For Part 2 see PB 121191. AF WADC TR 56-543.

Annual report under Contract Nonr-1129(00), Feb 1955-Jan 1956. Polytechnic Institute of Brooklyn. Polymer Research Institute, Brooklyn, N. Y. Jan 1956. 55p graphs. Order from OTS. $1.50. PB 121832

The work summarized in this report falls into three sections. In the first, problems dealing with the fundamentals of polymer surface action are treated. A short theoretical section is included which predicts the molecular weight dependence of the initial part of the adsorption isotherm. The experiments contain further studies on the adsorption and desorption of polyvinyl acetate from metal surfaces. The effect of solvent and molecular weight are investigated. Some experiments on the conductivity of diluted wash primer are compared with p-toluenesulfonic acid and phosphoric acid. The third line has been to further investigate the hydrolysis of the acetal linkages in polyvinyl butyral. This study has shown that some acetal linkages are considerably more stable than others. Contract Nonr-1129(00), NR 036-012.

Coordination polymers, by W. Conard Fernelius. Pennsylvania State University. Dept. of Chem-

istry, State University, Pa. Oct 1956. 106p diagrs, graphs, tables. Order from OTS. $2.75. PB 121867

The purpose of the work is to provide research and development on organic metal-coordination polymers, which exhibit exceptional thermal stability. The concept of producing polymers through coordination is presented, pertinent literature reviewed, and various possibilities of developing such polymers considered. Chelate polymers of bis (β - diketones) were prepared under varying conditions and their physical properties determined. Molecular weights range up to 6000. Attempts to form bis(Schiff bases) and to produce a truly inorganic polymer by the coordination of polyfunctional acids (anions) to complex cations have not yet been successful. AD 110425. Project no. 7340, Task 73404. Covers work from Dec 1, 1954 to Feb 29, 1956 under Contract AF 33(616)-2742. AF WADC TR 56-203.

G S R model: graphically simulated relief by gradient distribution of detail on layers of transparent plastic. U. S. Air Force. Aeronautical Chart and Information Center. Air Photographic and Charting Service, St. Louis, Mo. May 1955. 26p photos, drawings. Order from LC. Mi $2.70, ph $4.80. PB 124543

This report presents a method of depicting areas and objects, at predetermined scale, graphically and in three dimensions, by use of an assembly comprised of a number of layers of transparent plastic sheeting. The effectiveness of this principle of presentation has been adequately demonstrated through the construction of experimental models and prototypes. ACIC TR 67.

High strength Epon laminates, by Frank C. Hopper and D. W. Elam. Shell Development Co., Emeryville, Calif. Project 7340, Task 73400. Contract AF 33(038)-19587. Order separate parts described below from LC giving PB number of each part ordered.

Jan 1952. 51p tables. Mi $3.60, ph $9.30. PB 119613

Epoxide (EPON) resin glass fabric base laminates have been developed with high mechanical strength properties at room temperature. Initial work was conducted to determine which type of laminating resin, (some of which were liquid and some solid), what type of application procedure, and what type and amount of curing agent, would give the optimum mechanical strength properties. In general, it has been found that EPON resins are capable of producing laminates with higher strength at room temperature than other types of low pressure laminating resins, but the elevated temperature properties appear to be poorer than that of other low pressure laminates. E.O. No. 604-303 SR-7. Covers work 15 Feb-15 Dec 1951. AF WADC TR 52-5.

Mar 1954. 73p graphs, tables. Mi $4.50, ph $12.30. PB 119613s2

Mixtures of one part EPON 1001 with 2 parts Plyophen 5023, cured with dicyandiamide and using 181-Volan A glass fabric, yielded laminates with good strength at room temperature and at elevated temperature after short-time exposure. Resistance to aging at 500°F was poor, but was better than that of Plyophen 5023 alone. A laminate so made passed the mechanical strength requirements of Military Specification MIL-R-7575A, but failed to meet the requirements of weight and thickness charges on immerson in water and various chemicals. Fabric impregnated with mixtures of the two resins exhibited poor storage stability. Laminates containing EPON X-003.12.0, cured with dicyandiamide, had the highest strengths so far obtained with an EPON resin at 300°F, (64,600 psi), but failed badly at 500°F. AD 33351. AF WADC TR 52-5, Suppl. 2.

Apr 1955. 130p graphs, tables. Mi $6.30, ph $19.80. PB 119613s3

Wet and dry laminating systems are described. Wet systems based on EPON 828 yield laminates with exceptional flexural and compressive strengths at room temperature. Resistance to water and solvents is excellent. Strength retention at elevated temperatures up to 300°F is good. Dry laminating systems offer good strength from room temperature to 500°F. Laminates made from EPON X-12100 cured with Curing Agents E or F retain up to 36,000 psi flexural strength at 500°F after aging 200 hours 500°F. Even stronger after short exposure to 500°F, but less resistant to aging at that temperature, is a mixture of EPON 1001 with Plyophen 5023 (a phenolic resin) cured with dicyandiamide. AD 66441. Project 7340, Task 73400. Covers work Sep 1953-Sep 1954 and summarizes previous work dating back to Feb 1951. AF WADC TR 52-5, Suppl. 3.

Parallel plate plasticity studies on methacrylic acid copolymers, by Ruskin Longworth and Herbert Morawetz. Polytechnic Institute of Brooklyn. Institute of Polymer Research, Brooklyn, N. Y. May 1955. 27p graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 124057

The interaction of polar groups attached to polymers is well known to have a profound effect on the rheological behavior of the material. It was the purpose of the present study, to determine in a systematic manner the effect of the spacing of strongly interacting carboxyl groups on the flow properties of methacrylic acid copolymers with methyl methyl methacrylate for styrene. Contract Nonr 839(02), NR 330-029, Technical report III.

Research studies of plastic compounds for casting, encapsulating and potting. United States Testing Co., Inc. Boston Research Division, Boston, Mass. Contract DA 36-039-sc-42459. Case no. 2263. Dept. of the Army project no. 3-93-00-503. Signal Corps project no. 32-2005-D. Order separate parts described below from LC, giving PB number of each part ordered.

Second quarterly progress report for the period 15 Sep through 14 Dec 1952, by R. G. Shepherd, Jr., Alfred K. MacKenzie and Elizabeth B. Dearborn. Jan 1953. 35p photos, drawings, diagrs, graphs, tables. Mi $3, ph $6.30. PB 125263

During this period prime emphasis has continued on reaction products of acid anhydrides with epoxy resins obtained by the alkaline condensation of epichlorohydrin with polyhydric phenols. The general purpose of this approach is to gather information relative to the effects of structural variations in the anhydride and epoxy resin on heat stability, electrical properties, resistance to thermal shock and ease of fabrication. Epon 834 was evaluated with various anhydrides. Phthalic anhydride was evaluated with polyglycidyl ethers of hydroquinone, resorcinol, 1, 5-dihydroxynaphthalene, phloroglucinol, tris (4-hydroxyphenyl) methane, and mixed glycidyl ethers of 4, 4'-dihydroxydiphenyl and hydroquinone with bisphenol A.

Third quarterly progress report for the period 15 Dec 1952 through 14 Mar 1953, by R. G. Shepherd, Jr., Alfred K. MacKenzie and Elizabeth B. Dearborn. Apr 1953. 42p graphs, tables. Mi $3.30, ph $7.80. PB 125264

Emphasis has remained on the study of acid anhydride-cured epoxy resins. Constant-stress thermal yield point and 200°C weight loss data have been determined for the following systems: the polyglycidyl ether of 2, 2, 5, 5-tetrakis (4-hydroxyphenyl-) hexane vs. phthalic anhydride, Epon 834 vs. a 5-to-1 blend of phthalic anhydride with a new carboxylic dianhydride (limited stability and high melting point), and Epon 834 vs. phthalic anhydride using small amounts of tertiary amines as accelerators.

Fourth quarterly progress report for the period 15 Mar through 14 Jun 1953, by Alfred K. MacKenzie and Elizabeth B. Dearborn. Jun 1953. 45p graphs, tables. Mi $3.30, ph $7.80. PB 125265

A series of tetrafunctional epoxy resins have been prepared by condensing phenol with diacetyl, acetylactone, and acetonyl acetone, respectively. New compounds synthesized have been the intermediates: 2, 2, 3, 3-tetrakis (4-hydroxyphenyl)butane, 2, 2, 4, 4-tetrakis-(4-hydroxyphenyl)petane, 2, 2, 5, 5-tetrakis (4-hydroxyphenyl)hexane; the anhydride: anthracene-maleic anhydride adduct; and the polyglycidyl ethers of: the three phenols mentioned above, 2, 2, 4, 4-tetrakis(4-hydroxyphenyl)pentane mixed with 2, 2-Bis(4-hydroxyphenyl)propane.

Fifth quarterly progress report for the period 15 Jun through 14 Sep 1953, by Alfred K. MacKenzie and Elizabeth B. Dearborn. Oct 1953. 33p graphs, tables. Mi $3, ph $6.30. PB 125266

Studies of acid anhydride-cured epoxy resins have been continued with the gathering of data on the properties of the following systems: phthalic anhydride vs. Resin 2233, Resin 2244, Resin 2255, and Epon 828. Diethylene triamine and p, p', p"-methylidynetris-(N, N-dimethylaniline) have been studied as accelerators for Epon 828 cured with phthalic anhydride. The following amines have been used to cure Epon 828: 3-diethylaminopropylamine, N-aminopropyl morpholine, triethylene tetramine, diethylene triamine and diethylamine. Optimum proportions of Resin 224 and Resin 225 cured with phthalic anhydride have been tested for thermal shock, electrical properties, and some mechanical properties. New compounds synthesized have been the intermediates: bis-(1-cyclohexenyl)acetylene, 2, 5-diphenyl-1, 5-hexadiene-3-yne, and 2, 4, 7, 9-tetramethyl-3, 7-decadiene-5-yne and isomers.

Seventh quarterly progress report for the period 15 Dec 1954 through 14 Mar 1954, by Alfred K. MacKenzie and Elizabeth B. Dearborn. Apr 1954. 48p graphs, tables. Mi $3.30, ph $7.80. PB 125267

During this period new resin compositions have been developed which show second order transition temperatures in excess of 173°C, a gain of 20°C. Chlorendic anhydrice, 1, 4, 5, 6, 7, 7-hexachlorobicyclo-2. 1. 2)-5-heptene-2, 3-dicarboxylic anhydride, is a newcomer on the chemical market showing exceptionally high yield points with the epoxy resins tested thus far. It cures Epon 834 to a maximum yield point of 158°C, a gain of 28°C over phthalic anhydride. Batches of Resin 2255 have been prepared which give a yield point which can reach 170°C when fully cured with phthalic anhydride.

Eighth quarterly progress report for the period 15 Mar through 14 Jun 1954, by Alfred K. MacKenzie and Elizabeth B. Dearborn. Jul 1954. 38p graphs, tables. Mi $3, ph $6.30. PB 125268

The new epoxy resins which have been developed in the course of this research can replace resins previously available for

potting, casting and laminating applications, with three advantages: (a) the new resins retain mechanical strength to much higher temperatures: (b) some of the compositions are flame resistant; and (c) new raw materials are used, thus providing alternative sources of this type of resin should emergency shortages of other raw materials arise. In an effort to increase pot life, maleic anhydride has now been evaluated as condensing agent.

Shear strength at 75°F to 500°F of fourteen adhesives used to bond a glass-fabric-reinforced phenolic resin laminate to steel, by John R. Davidson. U. S. National Advisory Committee for Aeronautics. Dec 1956. 21p photos, drawing, graphs, table. Order as TN 3901 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124443

Fourteen adhesives used to bond a glass-fabric-reinforced phenolic resin laminate to steel were tested in order to determine their shear strengths at temperatures from 75° to 500°F. Fabrication methods were varied to evaluate the effect of placing cloth between the faying surfaces to maintain a uniform bond-line thickness. Strength and fabrication data are tabulated for all adhesives tested. NACA TN 3901.

Spectrophotometric characterization of light-induced changes in autopolymerizing resins, by Theodore E. Fischer, Byron G. Butt, John E. Sartore, and Bertram Eichel. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jun 1956. 9p graphs. Order from LC. Mi $1.80, ph $1.80. PB 124523

Self-curing dental filling resin materials were exposed in sunlight and in infrared, tungsten incandescent, long-wave ultraviolet, and short-wave ultraviolet light. The spectral characteristics of each resin that resulted from exposure to the various types of light emission were recorded as a function of time. Only slight differences were noted in the absorption curves for infrared and visible light, whereas long- and short-wave ultraviolet light and sunlight appeared to catalyze complex chemical reactions in these resins after polymerization. AF SAM R 56-70.

Viscoelastic properties of high polymers: Tables of stress-relaxation data, by E. Catsiff and A. V. Tobolsky. Princeton University. Frick Chemical Laboratory, Princeton, N. J. Jun 1956. 49p tables. Order from OTS. $1.25. PB 121749

The results of stress-relaxation studies of numerous polymers have been compiled. For ease of presentation, the tabulated data were read at uniform logarithmic time intervals from smooth curves drawn through the experimental points. In all other respects the tables consist of raw experimental data. No attempt has been made to express the data by any theoretical or empirical formulation. ONR Technical report RLT-19. Contract Nonr 1858(07), NR 330-023.

Weathering resistance of fungicidal vinyl coated cotton fabrics, by John C. Saylor, Jr. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Jan 1957. 40p diagr, graphs, tables. Order from OTS. $1. PB 121913

The fungicide, dehydroabietylammonium pentachlorophenoxide, formulated in experimental yellow and olive drab vinyl coatings on cotton fabric has been evaluated for resistance to weathering. A comparison has been made with copper 8-hydroxyquinoline formulated in an experimental olive drab vinyl coating and with an olive drab USAF stock vinyl coated fabric containing the same fungicide. The evaluations were based on breaking and tearing strength after outdoor weathering at the Alaska, Florida, New Mexico, and Wright Patterson AFB exposure sites and on color change after weathering. The amount of breakdown in strength of the materials evaluated in this study has been correlated with the amount of light energy received from the sun. AD 110711. Project 7312, Task 73124. Covers work from Feb 1954 - Mar 1956. AF WADC TR 56-252.

Paints, Varnishes and Lacquers

Annealing kinetics of lattice defects in vacuum deposited copper films, by N. S. Rasor. Case Institute of Technology. Dept. of Physics, Cleveland, Ohio. May 1955. 65p drawings, diagrs, graphs. Order from LC. Mi $3.90, ph $10.80. PB 124067

Copper films deposited by evaporation in high vacuum have been used in a study of the annealing kinetics of lattice defects. The electrical resistivity was used as an index of the degree of imperfection. The substrate temperature during deposition of the films ranged from - 250°C to - 25°C and was found to have a large effect on their behavior. Tempering and isothermal anneals were performed to obtain the annealing spectra and activation energies over the temperature range - 250°C to 287°C. Thesis - Case Institute of Technology. Technical report 14. Contract N6 ori-27303, NR 017-611. ONR TR 14.

Bibliography of thin films, by W. C. Zeek. U. S. Frankford Arsenal, Philadelphia, Pa. Jun 1954. 34p. Order from LC. Mi $3, ph $6.30. PB 125056

This bibliography is divided into three parts: metal films, filters, and dielectric films. It represents a part of the author's work in the study of optical films. AD 39432. Ordnance project TR5-5059Z. DA Project 513-01-003. FALR TN 1021. ORDTX 10.

Electroplating baths for ultra-high strength steels. Part I: Use of aliphatic amino acids in cadmium baths to reduce hydrogen embrittlement, by P. N. Vlannes, S. W. Strauss, and B. F. Brown. U. S. Naval Research Laboratory. Mar 1957. 15p graphs, tables. Order from OTS. 50 cents. PB 121836

Non-cyanide aqueous baths containing β-alanine or an α-amino acid (blycine, n-butyric, isobutyric, n-caproic, or isocaproic) were investigated over a wide pH range for their characteristics in plating cadmium on ultra-high-strength steel. Polarographic half-wave potentials are presented as a function of pH and of amino acid concentration. Plating evaluation included Hull cell and throwing-power tests; and embrittling characteristics were determined by the delayed-fracture test using notched bars in tension. The results of delayed-fracture tests indicate that plating from an ammoniacal cadmium bath (adjusted to the optimum pH range) containing salts of amino acids results in markedly lower hydrogen embrittlement than plating from the standard cyanide bath. NRL R 4906.

Radiometric evaluation of the water displacing efficiencies of various surfactants, by J. E. Smallwood. U. S. Arsenal, Rock Island, Ill. Oct 1952. 28p tables. Order from LC. Mi $2.70, ph $4.80. PB 124261

A procedure using a radiometric method developed at this Arsenal was utilized to evaluate the water displacing ability of a large number of commercial surfactants. These surfactants were tested at various concentrations in Stoddard Solvent to determine the minimum concentrations for effective water displacement from steel. Project TB 5-6010A, Report 19. RIAL R 52-3790.

Study of cadmium-tin and zinc-tin alloy electrodeposits, by Bennie Cohen. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Sep 1954. 44p photos, diagrs, tables. Order from OTS. $1.25. PB 121808

A study of cadmium-tin and zinc-tin alloy electrodeposits was made in an effort to find superior corrosion resistant coatings. The alloy systems evaluated were electrodeposited from fluoborate solutions. Cadmium was used as a basis of comparison throughout. The cadmium-tin alloy coating was found to have excellent resistance to salt spray, jet fuels, high temperature synthetic oils, organic acid vapors, and to have very little embrittling effect on hardened steel. AD 51052. AF WADC TR 54-240.

Inorganic Chemicals

On the anhydrous reduced halides of zirconium and hafnium, by Edwin M. Larsen and James L. Leddy. Wisconsin. University. Dept. of Chemistry, Madison, Wis. Aug 1955. 22p photos, drawing, diagrs, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 124956

A study was made of reactions of the type $M(s) + 3MX_4(g) = 4MX_3(s)$, where M refers to zirconium or hafnium, and X refers to F, Cl, Br, or I. A pseudo-equilibrium position, found by plotting the extent of reaction versus reaction time, occurred after the reaction had proceeded for 36 to 48 hours. It shifted in favor of the reaction product with increasing temperature, in the range 200° to 700°, and/or increasing pressure, in the range five to fifteen atmosphere. The ease of reduction of MX_4 increased considerably from chloride to iodide, and very slightly from hafnium to zirconium. No reaction was found to occur under the above conditions between MF_4 and M. The disproportionation reactions were followed both macroscopically and by an x-ray method. The rates of disproportionation appeared to be appreciable only at temperatures above 450°. AD 70087. Based on thesis by James L. Leddy. Presented at the Sep 1955 meeting of the American Chemical Society before the Division of Physical and Inorganic Chemistry. Contract N7 onr-28504, Technical report IX.

Plastic flow of iron oxides and the oxidation of iron, by J. D. MacKenzie and C. E. Birchenall. Princeton University. James Forrestal Research Center, Princeton, N. J. Aug 1956. 11p photos, diagr, graph. Order from LC. Mi $2.40, ph $3.30. PB 124156

The oxidation of iron in oxygen at high temperatures is accompanied by the formation of a central box-like cavity the dimensions of which are identical to those of the original iron specimen. The decrease in size of this cavity with increasing temperature and its disappearance when the formation of magnetite and hematite is excluded by a controlled oxidizing potential indicates that the plastic properties of the oxides may be an important factor. This is qualitatively confirmed by the measurement of the relative plasticity of the three oxides at 800° - 1000°C in a specially designed apparatus. Contract AF 18(600)-967. AF OSR TN 56-435. PU FRC MR 10.

Preparation, identification, and chemical properties of the niobium germanides, by John H. Carpenter and Alan W. Searcy. California. University. Institute of Engineering Research. Minerals Research Laboratory, Berkeley,

Calif. Jul 1955. 16p tables. Order from LC. Mi $2.40, ph $3.30. PB 124481

An X-ray diffraction investigation establishes the existence of the compounds Nb_3Ge_2 (or Nb_5Ge_3), Nb_2Ge, and Nb_3Ge in addition to $NbGe_2$, which had previously been reported. A ternary compound is formed in which carbon apparently substitutes for niobium in the Nb_2Ge lattice. Reactivities of the niobium germanides with some common chemicals are reported. Based on a thesis submitted by John H. Carpenter to Purdue University. First portion of work developed under Contract N7 onr-394/12, NR 032-331. Contract Nonr-222(32). UC IER Series 84, Issue no. 1.

Analytical Chemistry

Research consisting of spectrographic analysis of samples and development of spectrographic methods for the determination of impurities in pure silicon. Fourth quarterly progress report for the period Feb 1956 - Apr 1956, under Contract no. AF 19(604)-1416, by James M. Morris. Metal Hydrides, Inc., Beverly, Mass. May 1956. 19p graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 123953

Research consisted of: 1. An investigation of the copper spark and the graphite spark technique; 2. The preparation of standard samples and working curves; 3. The determination of the limits of sensitivity for the different elements; 4. An investigation of several techniques for the chemical separation of impurities from silicon metal and silicon compounds. For 1st-3rd reports see PB 119576 and 120227, and 121539. AF CRC TN 56-571.

Tantalum determination, by Ross W. Moshier and James E. Schwarberg. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Aeronautical Research Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Jun 1956. 39p diagr, graph, tables. Order from OTS. $1. PB 121819

The purpose of this investigation was to determine the analytical chemistry of newer alloying metals for which present accepted methods are inadequate. The investigation leads to certain conclusions: (1) A schedule for the analysis of mixtures containing titanium, zirconium, niobium, tantalum, molybdenum, and tungsten has been developed. (2) An improvement has been made in the separation of titanium, zirconium, niobium, and tantalum from the metals molybdenum and tungsten. (3) A reagent has been discovered and a method developed for the separation of tantalum from titanium, zirconium, and niobium. (4) A method is still required for the separation of titanium from niobium. AD 97194. Project 7360, Task 70327, 1st technical report. AF WADC TR 56-300.

Vibration spectrum of graphite and boron nitride. I: Two dimensional spectrum, by Gordon F. Newell. Brown University. Metals Research Laboratory, Providence, R. I. May 1955. 48p diagrs, graphs, table. Order from LC. Mi $3.30, ph $7.80. PB 124060

A mathematical study of the vibrational modes of graphite and boron nitride based on the effects of interactions between particles in the same layers of the lamellar structure. Contract Nonr-562(08), NR 017-614.

Miscellaneous Chemicals

Cavity formation in iron oxide, by D. W. Juenker, R. A. Meussner and C. E. Birchenall. Princeton University. James Forrestal Research Center, Princeton, N. J. Aug 1956. 34p photos, graphs. Order from LC. Mi $3, ph $6.30. PB 124144

A study is made of the deep oxidation of iron at high temperatures and in an oxygen atmosphere. An expression, analogous to the parabolic rate law for scaling of plane specimens, is developed for application to cylindrical geometry. AD 96047. Metallurgy report no. 8. AF OSR TN 56-389. PU FRC MR 8.

Electron spin resonance in carbons, by L. M. Matarrese, L. S. Singer, and R. E. Vander Vennen. U. S. Naval Research Laboratory. Mar 1957. 22p diagr, graphs, table. Order from OTS. 75 cents. PB 121790

A preliminary investigation has been made of electron spin resonance (ESR) absorption in sucrose and other materials charred between 300° and 700°C. The most important factors in determining the nature of the resonance absorption were found to be the temperature of carbonization and exposure of the samples to oxygen. Radio-frequency saturation effects were observed in samples prepared below 500°C. Samples charred above 500°C gave an intense, narrow absorption line provided they had not been exposed to air, but in air the line was broadened considerably. A comprehensive survey of the literature on ESR in carbons is given, and the nature of the resonance is discussed in the light of present knowledge of the structure of carbons. NRL R 4887.

Permeability of barrier materials to volatile corrosion inhibitors at various humidities, by J. P. Hohf and A. A. Mohaupt. U. S. Forest Products Laboratory, Madison, Wis. Dec 1956. 90p photos, graphs, tables. Order from OTS. $2.25. PB 121893

The comparative permeability of various barrier materials to certain volatile corrosion inhibitors (VCI) was determined at four relative humidities.

Barrier materials containing a metal foil were the most effective for retaining the VCI vapor. Polyester films and materials that conformed to grade C of Specification JAN-B-121 performed well but not as well as the foil barrier materials. Kraft paper proved ineffective for retaining VCI vapors for longtime storage, but certain fiberboards performed well enough to be considered for shipping and short periods of storage. In general, the volatility and transmission rates of the inhibitors increased as humidity increased. An inhibitor consisting of sodium nitrite and urea absorbed the greatest amount of water, while the oily inhibitors absorbed very little water. AD 110632. Project 7312, Task no. 73127. Covers work from July 1953 to Jan 1955. AF WADC TR 54-481.

Research on surface properties of fine particles, by J. M. DallaValle, Jr., Clyde Orr, Jr. and H. G. Blocker. Georgia Institute of Technology. State Engineering Experiment Station, Atlanta, Ga. Contract DA 039-sc-5411. Project 181-119. Dept. of the Army project: 3-99-15-022. Signal Corps project: 32-152B-0. Continues research under Contract W36-039-sc-38258. Order separate reports described below from LC, giving PB number of each part ordered.

Quarterly report no. 1. Jul 1951. 25p photos, graphs, tables. Mi $2.70, ph $4.80. PB 124021

The general objectives of this investigation are (1) evaluation of the various experimental methods for measuring the surface properties of finely divided materials, and (2) development of new methods where the need exists. The studies have been, and will continue to be, confined to methods for surface area and particle size measurement.

Quarterly report no. 2. Oct 1951. 33p diagr, graphs, tables. Mi $3, ph $6.30. PB 124022

Apparatus has been built to study a modification of the BET method, by which the adsorbing gas is allowed to flow continuously into the adsorption space. Preliminary results indicate that the method has merit. Study of the fatty acid technique was begun on a project sponsored by the Research Corporation and was found to be extremely valuable in determining the surface area of clays. The method is being explored on this project to establish its value in the determination of the surface area of metals and metal compounds.

Quarterly report no. 3. Jan 1952. 33p diagr, graphs, tables. Mi $3, ph $6.30. PB 124023

In this report, a number of experimental results relative to the continuous-flow method are presented and discussed; the rate of adsorption method is described in detail, and a few experimental results are given. Some results from previously described methods are included which were not available for the last report.

Quarterly report no. 4. Apr 1952. 103p photos, diagr, graphs, tables. Mi $5.70, ph $16.80. PB 124024

This report covers the initiation and first results of a study of catalytic activity as related to particle size, surface area, and other parameters. Surface area, determined by either the liquid-phase adsorption of stearic acid or by gas adsorption methods employing a measurement of the rate of gas adsorption or utilizing a constant rate of gas addition, was studied. In general, the agreement between gas-phase and liquid-phase adsorption was found to be very good when specific surface areas of less than about 50 $m.^2/g.$ were indicated. Two apparatus for determining the quantity of stearic acid in solution were employed -- a conductometric titrimeter and a surface-pressure hydrophil balance. Particle size, surface area, grain size, and a measure of catalytic activity and distortion within the crystal have been determined for specially prepared very pure-nickel powder samples.

Quarterly report no. 5. Jul 1952. 21p photos, diagr, graphs, tables. Mi $2.70, ph $4.80. PB 124025

During this report period an independent method of specific surface area measurement, a method depending on the rate of gas adsorption, has been studied and been found to confirm the results of other methods. In addition, a study of the catalytic power of metals in the form of powders and as thin films has been started. First results indicate that films far exceed powders in catalytic activity per unit of surface area. Furthermore, the films were found to increase in catalytic activity as the crystal structure of the metal developed. An apparatus has been built with which the heat of adsorption of a gas on a solid may be determined.

Quarterly report no. 6. Oct 1952. 35p photo, graphs, drawings, tables. Mi $3, ph $6.30. PB 124026

The catalytic abilities of eight nickel powders, produced from the same mass of nickelous hydroxide but being of different size fractions and/or having been reduced to the metal at different temperatures, were evaluated using the liquid-phase hydrogenation of oleic acid and the gas-phase hydrogenation of benzene. Some of the powders were found to be much better catalysts than others. Measurements of the energy effects accompanying the adsorption of nitrogen gas on a sample of each of

the nickel powders at various pressures and at the temperature of liquid nitrogen have been made. The quantities of nitrogen gas adsorbed by nickel samples at various pressures and at the temperature of liquid nitrogen have also been measured.

Quarterly report no. 7. Jan 1953. 22p graphs, tables. Mi $2.70, ph $4.80. PB 124027

These results pertain primarily to the chemisorption of hydrogen gas by nickel powders at the temperature of liquid nitrogen. They show that somewhat more heat is liberated by the chemisorption of hydrogen than by the adsorption of an equal volume of nitrogen at the same conditions of temperature and pressure.

Research on the synthesis of polar silane monomers, by Robert M. Silverstein, Leon Goodman and Allen Benitez. Stanford Research Institute, Menlo Park, Calif. Jan 1957. 27p graphs, tables. Order from OTS. 75 cents. PB 121887

The prime objective of this research is to synthesize polymerizable, polar silane monomers for use as precursors or modifiers for improved silicone rubbers. A second important objective of the project is to prepare gums from these monomers, homopolymerized or copolymerized with dimethylsilicone oils, such that the copolymer can be compounded to produce suitable silicone elastomers. Samples of dimethylsilicone copolymers containing the vinyl acetate adduct, the allyl acetate adduct, the vinyl ethyl ether adduct, and the allyl ethyl ether adduct were prepared. All of these were cross-linked and were unsuitable elastomer materials. AD 110717. Project 7340, Task 73404. Covers work from May-Sep 30, 1956. For earlier report see PB 121498. AF WADC TR 56-530. Contract AF 33(616)-2998.

Vibrational spectrum of disilane, by George W. Bethke and M. Kent Wilson. Harvard University. Dept. of Chemistry, Cambridge, Mass. Jun 1956. 45p photos, drawings, diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 123962

The purpose of this work was to acquire more information about disilane by obtaining the complete infrared gas spectra and Raman liquid spectra of both Si_2H_6 and Si_2D_6. AD 88366. Chem 30-13. AF OSR TN 56-246. Contract AF 18(600)-590.

ELECTRICAL MACHINERY

Communication Equipment

Development of a ground to aircraft radioteletype system, by P. D. McKeel. U. S. Civil Aeronautics Administration. Technical Development and Evaluation Center, Indianapolis, Ind. Sep 1944. 24p photos, diagrs, graphs. Order from LC. Mi $2.70, ph $4.80. PB 122283

See also PB 122274 for description of earlier equipment.
1. Radio teletype - Design 2. CAA TDR 45.

Development of an airways ultra-high-frequency communications circuit, by J. C. Hromada and P. D. McKeel. U. S. Civil Aeronautics Administration. Technical Development and Evaluation Center, Indianapolis, Ind. Feb 1938. 33p diagrs, graphs. Order from LC. Mi $3, ph $6.30. PB 122274

Originally printed as Report no. 6, Safety and Planning Division, Bureau of Air Commerce. Reprinted 1940.
1. Circuits, Ultra high frequency 2. Radio teletype - Design 3. CAA TDR 6.

Radio teletype transmission above the MUF, by Herbert A. Schulke, Jr. and Robert A. Kulinyi. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Nov 1955. 42p photos, diagrs, graphs (part fold). Order from LC. Mi $3.30, ph $7.80. PB 123171

Tests were conducted on the feasibility of maintaining continuously usable signal levels on a single frequency at ranges of from 1800 to 2000 miles. Data were collected on median signal levels, propagation, and antenna design. Dept. of the Army project no. 3-24-01-300. Signal Corps project no. 807A. Unclassified 5 Jun 1956. SCEL TM M-1713.

Electronics

Airborne radio: Resonant response characteristics of models AN/ARR-15 (XN-1) and (XN-2) radio receivers, by D. R. Schwarz, M. Shatavsky and R. C. Miedke. U. S. Naval Research Laboratory. Aug 1945. 45p diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 122788

Unclassified 15 Dec 1953.
1. AN/ARR-15 (Radio receiver) 2. Resonance, Radiofrequency 3. Radio receivers - Resonance 4. Radio, Airborne - Tests 5. NRL R-2601.

Analysis and type tests of remote control-indicator systems for MAR, RDR, RDZ radio communications equipment, by J. M. Klotz. U. S. Naval Research Laboratory. Sep 1946. 44p photos, graphs, table. Order from LC. Mi $3.30, ph $7.80. PB 122767

Unclassified 15 Dec 1953.

1. MAR (Radio) 2. RDR (Radio) 3. RDZ (Radio) 4. Indicators, Remote - Tests 5. Radio - Remote control - Indicators 6. NRL R 2974.

Analysis of model UM switching equipment, by J. W. Brogden. U. S. Naval Research Laboratory. Feb 1946. 10p photos. Order from LC. Mi $1.80, ph $1.80. PB 123343

Unclassified 15 Dec 1953.
1. Loran - Transmitters - Tests 2. UM (Switching gear) 3. Switches, Transfer - Tests 4. NRL R-2765.

Calibration of a permanent control beacon for a 300-meter photometric range, by T. H. Projector. U. S. Civil Aeronautics Administration. Technical Development and Evaluation Center, Indianapolis, Ind. Sep 1943. 7p photo, tables. Order from LC. Mi $1.80, ph $1.80. PB 123561

Preliminary report.
1. Radio beacons - Calibration 2. Projectors, Portable - Calibration 3. CAA TDR 34.

Concentrated capacity and inductance as substitute for horizontal antennas on board ship, by Oscar Norgorden, John M. Coe and R. B. Meyer. U. S. Naval Research Laboratory. Dec 1936. 84p photos, graphs, tables. Order from LC. Mi $4.80, ph $13.80. PB 122669

Unclassified 15 Dec 1953.
1. Antennas, Shipborne - Design 2. Antennas, Vertical - Theory 3. Antennas, Vertical - Design 4. NRL R 1331.

Correlation of two electrons, by R. H. Tredgold and J. S. Evans. Maryland. University. Physics Dept., College Park, Md. Aug 1956. 11p graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 124266

The exact ground state solution for a system consisting of two electrons in a three-dimensional harmonic oscillator potential is obtained. The system is also studied by various well-known approximate methods and the approximate solutions are compared with the exact solutions. It is shown that for all the approximate methods studied the wave functions fail badly for the region corresponding to small inter-electronic spacings. AD 96224. Submitted for publication in the Journal of Chemical Physics. AF OSR TN 56-415. UM TR 55. Contract AF 18(600)-1015.

Current-voltage relationship of galvanic anode arrays in cathodic protection, by L. J. Waldron and M. H. Peterson. U. S. Naval Research Laboratory. Feb 1957. 19p photos, diagrs, graphs, tables. Order from OTS. 50 cents. PB 121821

The current outputs of full-scale arrays of several anode sizes in use by the Navy for the cathodic protection of ship hulls were determined. Impressed-current anodes formed from sheet steel were substituted for convention galvanic anodes to reduce the weight and number of arrays necessary to obtain the desired information. A 1500-foot steel sea wall located in water with a resistivity of 34 to 38 ohm-cm acted as an unpolarizable cathode. The data can be used to estimate for any galvanic material both the initial current output of an anode array, and the continuing current output against a cathode polarized to a known potential. NRL R 4891.

Design considerations for rigid radomes, by J. R. O'Donnell. U. S. Air Force. Air Research and Development Command. Rome Air Development Center. Griffiss Air Force Base, Rome, N. Y. Jun 1956. 73p photos, diagrs, graphs, maps, tables. Order from LC. Mi $4.50, ph $12.30. PB 123976

This report presents a general discussion of the design information which has been gathered by investigators and fabricators in developing various sizes and modular configurations of rigid radomes. The design information which is included pertains to the aerodynamic, structural, and thermodynamic analyses. Test data are given concerning climatic studies, wind - simulated loading tests, transmission tests, and installation tests. A discussion is also included on the parameters and problems involved in material selection and fabrication procedures. The applicability of the collected design and test data to Air Force requirements is discussed and conclusions and recommendations are presented. AF RADC TN 56-99.

Determination of the components of the reverse current flowing in the control grid circuit of negatively biased transmitting tubes, by K. M. Soukaras. U. S. Naval Research Laboratory. Mar 1938. 16p diagr, table. Order from LC. Mi $2.40, ph $3.30. PB 123285

1. Vacuum tubes - Grid controlled 2. Vacuum tubes - Life expectancy 3. Grid currents 4. NRL R 1431.

Development of model XCX boat type sono radio buoy, by F. J. Hollweck. U. S. Naval Research Laboratory. Nov 1945. 50p photos, diagrs, (1 fold) graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 122781

Unclassified 8 Jun 1955.
1. XCX (Radio sono buoy) 2. Buoys, Radio-sonic - Design 3. Buoys, Radio-sonic - Equipment 4. NRL R-2685.

Dielectric properties of a lattice of anisotropic particles, by Zohrab A. Kaprielian. California.

Institute of Technology. Electrical Engineering Dept. Jun 1955. 29p diagrs, graphs. Order from LC. Mi $2.70, ph $4.80. PB 124171

The dielectric properties of lattices composed of identical metallic or dielectric elements of various geometries, such as spheres, discs and strips have been investigated from a molecular point of view. The main objective of this note will be to extend the treatment to general uniform lattice structures made of identically shaped and oriented particles of general constitutive characteristics. Thus, it will include the most general case of a uniform lattice with structural anisotropy and both element isotropy and anisotropy at the lattice points. CIT EE TR 6. Contract Nonr-220.

Diffraction by cylindrical reflectors, I, by Robert Plonsey. California. University. Division of Electrical Engineering. Electronics Research Laboratory. Antenna Group, Berkeley, Calif. Sep 1955. 33p diagrs, graphs, table. Order from LC. Mi $3, ph $6.30. PB 123985

It is first shown what simplifications in the rigorous theory are implied in the geometrical optics solution to the cylindrical reflecting antenna. Then, based on an assumed geometrical optics reflector current, a correction to the ray optics far field is obtained in terms of asymptotic expansions. These expansions are evaluated at the end points, as well as the stationary phase point. An analysis of the approximate region of usefulness of the asymptotic series is undertaken. As an example a diffraction integral arising from a pillbox feed-blocking problem is considered. CU IER Series 60, Issue 144. Contract N7 onr-29529, Report 46.

Dual display dual panoramic adaptor model CXJO, by R. Polkinghorn. U. S. Naval Research Laboratory. Feb 1946. 40p photos, diagrs (1 fold). Order from LC. Mi $3, ph $6.30. PB 123344

Unclassified 15 Dec 1953.
1. CXJO (Adaptor) 2. Adaptors, Radar 3. Jamming - Research 4. Radio - Countermeasures 5. NRL R-2762.

Economical logarithmic recording system, by Lloyd A. Robinson. Stanford Research Institute, Menlo Park, Calif. Jun 1956. 49p photos, diagrs, graphs. Order from LC. Mi $3.30, ph $7.80. PB 124296

A logarithmic recording system was designed to provide information concerning the side-lobe structure of the radiation pattern of an antenna. The system is not limited to use with antenna pattern ranges, but will plot any function that can be expressed as a voltage. The system obtains the logarithm of the input voltage by electromechanical serve techniques. A comprehensive description of the system is given, including derivation of all necessary design equations, a step-by-step outline of the design procedure, and diagrams and parameters for one of the SRI-built recording systems. AF CRC TN 56-758. SRI TR 56. Contract AF 19(604)-1296.

Electron spin resonance of V_1 - centers, by Werner Känzig. Illinois. University. Department of Physics, Urbana, Ill. Aug 1955. 7p tables. Order from LC. Mi $1.80, ph $1.80. PB 123127

The electron spin resonance of the F-center (electron bound to a negative ion vacancy) has been investigated extensively in the past. The hyperfine splitting has not been resolved. This suggests that the electron interacts with the magnetic moments of many nuclei and consequently that its wave function is distributed over many ions near the vacancy. The present work indicates that the electronic structure of the supposed antimorph of the F-center, the V_1-center (hole bound to a positive ion vacancy), is entirely different. A large resolvable hyperfine splitting has been observed in the V_1-center resonance. The pattern permits a detailed analysis of the electronic structure of this center and it is concluded that the hole is localized on but two negative ions. AD 71059. Contract N6 onr-07129, Technical report 18.

Evaluation of interference effects on speech communications, by Arthur Gottfried and Kurt Ikrath. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Mar 1956. 18p diagrs, graphs. Order from LC. Mi $2.40, ph $3.30. PB 123076

A simple method for measuring desensitization of receivers caused by radio interference is presented. The use of this method for obtaining true signal to noise ratio measurements at the output of a receiver is discussed. A standard speech test signal is suggested for intelligibility evaluation by means of the concept of articulation index. Dept. of the Army project no. 33-99-12-021. Signal Corps project no. 132A. Unclassified 7 Jun 1956. SCEL TM M-1748.

Field analysis of the M type backward wave oscillator, by Roy W. Gould. California Institute of Technology. Electron Tube and Microwave Laboratory, Pasadena, Calif. Sep 1955. 108p diagrs, graphs, table. Order from LC. Mi $5.70, ph $16.80. PB 123973

A field theory of electron beams focused by crossed electric and magnetic fields is given. The theory is basic to the understanding of the small signal behavior of crossed field electron devices. It is applied to explain the slipping stream, or diocotron, effects as a coupling of two surface waves of the electron beam, and to derive the start oscillation conditions of the M-type backward wave oscillator. It is found that the slipping stream effect can reduce the starting

current by an appreciable factor. The results are compared with the thin beam theory which neglects space charge effects. An analysis of a loaded strip transmission line is given, from which a method of representing space harmonic slow wave circuits by a surface admittance boundary condition is obtained. Forward and backward space harmonic interaction may be treated equally well. Technical report 3. Contract Nonr-220(13).

Final review report under Contract Nonr-220(14), by C. H. Papas. California Institute of Technology. Electrical Engineering Dept. Jul 1955. 6p. Order from LC. Mi $1.80, ph $1.80. PB 122970

Summarizes electromagnetic research during the past two years on diffraction theory, antenna theory, perturbation theory, and wave perturbation. For reports 1-4 see PB 114771, 115874, 115744 and 117105. Contract Nonr-220(14), Final report.

Flush-mounted horizontally polarized directional antenna, by Richard C. Honey. Stanford Research Institute, Menlo Park, Calif. Jan 1956. 26p diagrs, graphs. Order from LC. Mi $2.70, ph $4.80. PB 124509

A method for analyzing certain types of flush-mounted microwave antennas is described and applied to a directional antenna whose beam is polarized parallel to the plane of the radiating surface. The results of the analysis are presented in several families of curves which should be adequate for most antenna design work. AF CRC TN 56-355. SRI TR 54. SRI Proj 1197. Contract AF 19(604)-1296.

Harmonic generation by crystals at microwave and millimeter wave frequencies, by Y. C. Hwang. Maryland. University. College of Engineering. Glenn L. Martin Institute of Technology, College Park, Md. Jan 1956. 85p photos, drawings (part fold), diagrs, graphs. Order from LC. Mi $4.80, ph $13.80. PB 122997

The art of crystal harmonic generation at microwave and millimeter wave frequencies is reviewed and the results of a theoretical and experimental study are discussed. The causes of low efficiency are understood. Multipliers were constructed which gave better performance (by 4 to 10 decibels) for the second and third harmonics, than previously reported multipliers. Improvement was achieved by improving the power transfer to the crystal and by control of the length, contact, and pressure of the whisker. Some improvement was also achieved by a two phase arrangement. Power inputs of the order of thirty milliwatts were employed with harmonic outputs exceeding one milliwatt, in many cases. AD 88025. EE-2505. Contract AF 18(600)-1246, Final report. AF OSR TR 56-20.

Investigation of methods of producing single crystals of non-metallic ferromagnetic substances. Fourth quarterly report for the period 1 Apr-30-Jun 1956 under Contract AF 19(604)-1419, by John Koenig. Clevite Research Center, Cleveland, Ohio. Jul 1956. 48p photos, drawings, diagrs (1 fold). Order from LC. Mi $3.30, ph $7.80. PB 124140

During this period, thirty-five experimental runs were carried out, of which thirty had to do with magnetite and five with nickelous ferrite. All experiments dealt with hydrothermal systems, and these consisted of seeds, supplies, and ammonium halide solutions (mostly the chloride). Temperatures ranged between 400°C and 500°C and the pressures were in the neighborhood of 20,000 psi. Project 60108-G. For 1st-2nd quarterly reports see PB 122360 and 122191. AF CRC TN 56-756.

Long-persistence three-color indicator cathode-ray electron tube, by Chester D. Beintema, Lorin L. Vant-Hull and Sidney T. Smith. Hughes Aircraft Company, Culver City, Calif. May 1956. 29p photo, drawings, diagrs, graphs. Order from OTS. 75 cents. PB 121815

Multicolor storage tubes for applications with low frame rates have been built by modification of direct-viewing storage tubes. A perforated shadow mask is placed between the three writing guns and the storage surface. This shadow mask allows electrons from each writing gun to strike discrete storage areas, each containing a single aperture in register with a color dot on the view plate. In this way it is possible to write and store electrical signals independently in adjacent color areas. Factors causing color impurity are described together with the steps taken to minimize their effects. A tube has been built which shows good color purity in a 6-inch-diameter circle, has 75 total color-dots per inch resolution, 8 foot-lamberts brightness, and about 1-minute persistence. Other possible multicolor-sotrage-tube designs are discussed. AD 110626. Project 4156, Task 41748. Summarizes work from 31 Aug 1954-30 Oct 1955. AF WADC TR 56-48. Contract AF 33(616)-2177.

Low frequency propagation studies, by Robert A. Helliwell. Stanford University. Radio Propagation Laboratory, Stanford, Calif. Sep 1955. 61p photos, diagrs, graphs, table. Order from LC. Mi $3.90, ph $10.80. PB 122359

Study of Loran signals showed that E-layer fading rates are not always the same as those in the D-layer. Wide band multi-channel equipment for the study of various kinds of atmospherics was designed and constructed. An improved intervalometer was constructed. From whistler data obtained in Seattle and Stanford during 1951 and 1952, it was found that approximately 22% of the whistlers that occurred at either location were received at both

locations. This result provides support for Storey's theory of whistlers. Simultaneous whistler observations made at Stanford and on the U. S. S. Atka of the Navy Antarctic Expedition in December 1954 were analyzed. AF CRC TN 55-967. Contract AF 19(604)-795.

Magnetically focused secondary emission screen-type image intensifier. Final report under Contract AF 18(600)-19, by F. F. Rieke. Chicago. University. Chicago Midway Laboratories, Chicago, Ill. Aug 1956. 43p photos, diagrs. Order from LC. Mi $3.30, ph $7.80. PB 124263

Development of an image intensifier is described which makes use of cascaded fine mesh screens coated with an efficient secondary emitter, cesium-antimony, to achieve multiplication of weak photoelectron images from a cesium-antimony photocathode. An axial magnetic field is used together with appropriate potentials and spacings of the screens to keep the electron image in focus. Forty-five image tubes were produced under this contract, and the methods of production together with the results of tests and experiments on these tubes are described. Recommendations for the course to be followed in the further development of the screen-type intensifier to overcome the drawbacks of the present design are discussed. AD 96781. CML 56-TN-P108-4. Continuation of work begun under Contract AF 33(030)-25913. AF OSR TN 56-438.

Measurement and calculation of fluctuations in radar echoes from snow, by Walter Hitschfeld and Arnett S. Dennis. McGill University. MacDonald Physics Laboratory. "Stormy Weather" Research Group, Montreal, Canada. Jul 1956. 53p photos, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 124560

Intensities of the snow echoes obtained by a zenith-pointing radar from 180 different contributing regions are compared with suitably chosen thresholds. The probability of the intensities exceeding such a threshold and the frequency with which two intensities separated in time straddle it, are used to deduce the autocorrelation coefficients of the signals. The autocorrelation coefficient, after correction for receiver noise, is shown to be the product of three partial coefficients due to the differential settling of the particles, to a uniform wind driving the particles across the beam, and to turbulence. To the extent that differential settling and cross-wind are known, turbulence can be deduced from the measured coefficient of the signal. Considerations based on the theory developed suggest that measurements of turbulence in rain or snow in the horizontal beam of a high-resolution radar at close range should be feasible. Appendix 1: Correlation coefficients of the signal intensity, and of the amplitude components; the Wiener - Khintchine theorem. - Appendix 2. Auto correlation coefficients are "multiplicative." AF CRC TN 56-659. MW-23. Contract AF 19(122)-217.

Method of automatic amplitude control for speech frequencies, by Lyle R. Battersby. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Nov 1954. 20p photos, diagr, graphs. Order from LC. Mi $2.40, ph $3.30. PB 123077

An automatic amplitude control for speech frequencies is described which is characterized by unique circuitry in which two miniature vacuum tubes in conjunction with crystal diodes provide a dynamic control range of 35 db. Input amplitude variations over this range are reduced to approximately 1 db at the output with relatively little distortion. Modification of the speech wave insures that a maximum of the speech "intelligence" is transmitted. Dept. of the Army project no. 3-99-12-021. Signal Corps project no. 132A. Unclassified 14 Jun 1956. SCEL TM M-1609.

Multi-rate sampled systems, by George M. Kranc. Columbia University. Dept. of Electrical Engineering. Electronics Research Laboratories, New York, N. Y. May 1956. 104p diagrs, graphs (fold), tables. Order from LC. Mi $5.70, ph $16.80. PB 123980

Two contributions to the theory of sampled systems are presented in this dissertation: first, a method for the analysis of multi-rate sampled systems, which are defined here as systems with switches operating at different sampling rates; second, a method of compensation of an error-sampled feedback system by means of a multi-rate controller. CU-22-56-AF-677-EE. AD 88362. Project no. R-357-50-3. CUN ERL TR T-14/B. AF OSR TN 56-242. Contract AF 18(600)-677.

Nonmetallic ferromagnetic materials. General Electric Co. Electronics Division, Syracuse, N. Y. Contract AF 33(616)-2009. Project 4155, Task 41640. Covers period from Apr 1, 1943 to Oct 31, 1955. Order separate parts described below from OTS, giving PB number of each part ordered.

Part I: Thin films, by Robert W. Johnston, Gerald G. Palmer. Dec 1955. 18p photos, diagr, table. 50 cents. PB 121861

The work presented here describes the effort expended to produce and evaluate thin films of ferrite materials during the contract period. In this connection, sputtering and evaporation techniques were pursued. AD 110610. AF WADC TR 56-274, Part 1.

Part II: Low loss high temperature ferrites, by John M. Blank. Dec 1955. 27p graphs, table. 75 cents. PB 121874

The work presented here covers the investigation and development of low loss, high temperature, high saturation ferrites carried on under this contract. Initial consi-

derations in this investigation, based on the measurements of E. W. Gorter, led to the choice of the Ni-Zn ferrite system as the most promising for development of a high temperature, high saturation magnetic material. The initial considerations are reviewed and the results of experiments in the Ni-Zn system are given. Properties of ferrite number 164, a 30 - 20 Ni-Zn ferrite, are compared with the properties of a high quality Mn-Zn ferrite designed for use in the television industry. The effects of small additions of CuO, CdO, and V_2O_5 to a Ni-Zn ferrite are discussed. AD 110611. AF WADC TR 56-274, Part 2.

Part III: Ferrite single crystals, by Aaron P. Greifer and Gerald G. Palmer. Dec 1955. 23p photos, diagrs. 75 cents. PB 121858

The work presented here covers the investigations carried out in the crystal growing program. The choice of method of growth is discussed and the relationship between growth techniques and the phase equilibrium diagram is presented. The number and types of boules grown are given with recommendation for further work and evaluation. AF WADC TR 56-274, Part 3.

Part IV: $NiO-Fe_2O_3$ system, by Gerald G. Palmer and James P. Dietz. Dec 1955. 28p photos, diagrs, graph, table. 75 cents. PB 121869

The work presented here covers phase equilibrium studies in the system $NiO-Fe_2O_3$. The phase diagram is given and methods used for obtaining the necessary data are discussed. Some of the data were obtained using single crystal samples. The information gained in the course of this investigation has been valuable in the interpretation of behavior in polycrystalline materials. The phase diagram has been a guide for choosing compositions, firing atmospheres, and firing schedules for sintered compacts. AF WADC TR 56-274, Part 4.

Part V: Ferrite delay lines, by Gerald G. Palmer, Robert W. Johnston, Harold W. Katz and Robert E. Schultz. Dec 1955. 95p photos, diagrs, graphs, tables. $2.50. PB 121868

The work presented in this report covers the theory and development of the ferrite delay line carried out under the above contract. A detailed discussion of the theory of the line is presented and design formulae given. Application of the theory is made in the fabrication of a wide band high frequency line and a narrow band low frequency line. These lines are evaluated and performance data are given. The work performed under the materials development program is presented in detail. Compositions and firing schedules are given and the observed electrical and magnetic properties are discussed as functions of the appropriate processing variables. AF WADC TR 56-274, Part 5.

Notch coupling to the electromagnetic resonances of a delta-wing aircraft, by William L. Jones. Stanford Research Institute, Menlo Park, Calif. Dec 1955. 45p diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 124508

The use of a notch for exciting a delta-wing aircraft as an h-f antenna is investigated. From input impedance measurements on a shielded scale model it is found possible to observe resonant effects and to obtain a coefficient of coupling that describes the extent to which the notch couples to these resonances. Using the techniques developed, the principal resonant modes are investigated, and an attempt is made to relate the frequencies of resonance to the major airframe dimensions. A theory of notch coupling is developed, and the effect of notch dimensions on the coupling coefficient is investigated theoretically. The results of the theoretical investigation are compared with measured results for comparable situations. Contract AF 19(604)-1296. AF CRC TN 56-180. SRI TR 53. SRI Proj 1197.

On the eigenvalues which give upper and lower bounds on scattering phases, by Larry Spruch. New York University. Institute of Mathematical Sciences. Division of Electromagnetic Research. Apr 1956. 24p graphs. Order from LC. Mi $2.70, ph $4.80. PB 122995

1. Electrons - Scattering - Theory 2. Contract AF 19(122)-463 3. NYU RR CX 24 4. AF CRC TN 56-461.

On the scattering of radio waves from meteor trails, by Donald F. Winter. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Electronics Research Directorate. Propagation Laboratory, Bedford, Mass. Nov 1955. 29p diagr, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 124139

The formulation of the scattering phenomenon presented is a modification of normal mode theory. The advantages in using this type of modification are: the actual free electron distribution in the trail can be approximated without jump discontinuties; the attenuation of the incident wave passing through the cylinder can be taken into account; the formulation is valid over an extensive range of meteoric visual magnitudes. The final expression for the far scattered field is in the form of a computable infinite series. AF CRC TR 55-107.

Operating characteristics of flush-mounted bombing antennas, by E. M. T. Jones. Stanford Research Institute, Menlo Park, Calif. Nov 1955. 41p diagrs, graphs, table. Order from LC. Mi $3.30, ph $7.80. PB 124504

This report discusses the performance characteristics of flush-mounted bombing and navigation antennas on aircraft. A brief discussion of the operating characteristics of the AN/APQ-24 radar system is included in the report to acquaint the reader with the performance that is currently obtained with tilt-stabilized, recessed, flush-mounted antennas. An analysis is made of the reduction in operating range and of the increase in bearing errors that are occasioned by random variations in aircraft heading in an airborne radar employing a flush, unstabilized antenna. The optimum pattern for an unstabilized antenna is shown to be a fan beam, and a table is presented that shows the range penalty inherent in the use of a fan beam. Bearing errors that are occasioned by the use of tilt-stabilized or unstabilized flush antennas are presented in the form of contour plots of linear bearing on the ground for various values of pitch and roll of the aircraft. Appendix: Bearing errors in flush-mounted antennas. AF CRC TN 55-955. SRI TR 51. SRI Proj 1197. Contract AF 19(604)-1296.

Photoconductivity and recombination processes in tellurium, by David Redfield. Pennsylvania. University. Dept. of Physics, Philadelphia, Pa. Sep 1955. 64p drawings, diagrs, graphs. Order from LC. Mi $3.90, ph $10.80. PB 123948

Recombination processes in tellurium have been investigated, chiefly by use of the techniques of photoconductivity. Studies were made on single crystals having acceptor densities of about 10^{16} per cm^3. The interpretation of the results of the various photoconductivity experiments leads to the conclusion that in Te at 100°K direct recombination dominates over recombination through localized centers (traps) at all light intensities. An attempt to observe radiation which may be emitted in the recombination process was unsuccessful, possibly because of experimental limitations. Thesis-University of Pennsylvania. Some pages may not reproduce well. Contract N6 onr-24914, Technical report 13.

Proceedings of the tenth annual Symposium on Frequency Control, Asbury Park, N. J., 15-16-17 May 1956. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Jun 1956. 597p photos, diagrs, graphs, tables. Order from LC. Mi $11.10, ph $90.65. PB 125393

Contents: Piezoelectric survey of strain patterns in thickness shear quartz resonators, by K. S. Van Dyke. - Mathematical theory of vibrations of elastic plates, by R. D. Mindlin. - Structure sensitivity of quartz, by J. C. King. - Frequency temperature behavior of AT-cut quartz resonators, by A. R. Chi. - Defects in quartz crystals, by G. W. Arnold, Jr. - Growth of quartz at high temperature and pressure in the United Kingdom, by L. A. Thomas. - Optimum methods for quartz synthesis, by Danforth R. Hale. - Physical chemistry of aqueous solutions, by James F. Corwin. - Aging study of quartz crystal resonators, by R. B. Belser and Walter H. Hicklin. - Some phenomena in VHF crystal units, by E. Hafner. - Crystal unit design for use in a ground station frequency standard, by A. W. Warner. - Frequency standard at low temperature, by W. D. George. - Comparison measurements on frequency standards, by J. A. Pierce. - Atomic and molecular frequency standards, by R. Dicke. - Evaluation of phase-stable oscillators for coherent communication system, by Walter K. Victor. - VHF crystal measurements, by G. K. Guttwein and D. Pochmerski. - New method for measuring the equivalent parameters of VHF quartz crystals, by Douglas W. Robertson. - High-frequency crystal filters, by D. I. Kosowsky. - Design data for crystal oscillators, by H. E. Gruen. - Long and short term frequency stability of UHF cavity-controlled oscillators, by R. E. Meek. - Precision crystal oven, by M. D. McFarlane and Ramey B. Metz. - Crystal requirements for future military equipment, by J. M. Havel. - Transistorized 1 Mc/Sec frequency counter, by Nisson Sher and Ralph Goodwin. - Magnetron beam switching tube as a high speed frequency divider, by Hilary Moss. - Counter transfer oscillator system for microwave frequency measurements, by Alan Bagley and Dexter Hartke. - Change of state crystal ovens, by E. Snitzer and R. Strong. - Tests on hermetic enclosures of piezoelectric quartz crystals, by B. W. Schumacher. - Production procedures for VHF crystals, by R. D. Cortwright. - Manufacturing problems connected with high precision crystals, by J. M. Wolfskill. - Manufacturing problems connected with miniaturized crystals, by George K. Bistline, Jr. - Automatic X-ray sorter for crystal blanks, by Lester V. Wise.

Propagation of the effects of wall interaction in the rarefaction region of shock tube flow, by Albert C. Williams. Lehigh University. Institute of Research, Bethlehem, Pa. Aug 1955. 94p diagrs, graphs, tables. Order from LC. Mi $5.40, ph $15.30. PB 123123

A method for computing the effects of wall friction and heat flow upon the flow parameters in the rarefaction region of the shock tube is presented. The one dimensional equations of continuity and of motion, and the equation of state are written to include the wall forces and heat flow. AD 71338. Thesis by Albert C. Williams. Technical report 6. Contract N7onr-39302, NR 061-063.

Quarterly scientific report under Contract AF 19(604)-786. Harvard University. Cruft Laboratory. Order separate parts described below from LC, giving PB number of each part ordered.

No. 9 covering period 1 Jul - 1 Oct 1955. Oct 1955. 5p graph. Mi $1.80, ph $1.80. PB 122355

Each report summarizes work for the period on distributions, back scattering measurements and the propagation of slow waves. For Quarterly reports no. 7-8 and

11 see PB 117771, 118497, 123464. AF CRC TN 55-780.

No. 11, covering the period Jan 1 - Apr 1, 1956. Apr 1956. 6p. Mi $1.80, ph $1.80. PB 123464

1. Geometry, Optical - Theory 2. Waves, Electromagnetic - Scattering - Theory 3. Contract AF 19(604)-786, Quarterly Scientific report 11 4. AF CRC TN 56-197.

Radiation from a ferrite filled slot antenna, by D. J. Angelakos and M. M. Korman. California. University. Division of Electrical Engineering. Electronics Research Laboratory. Antenna Group, Berkeley, Calif. Sep 1955. 25p photo, diagrs, graphs. Order from LC. Mi $2.70, ph $4.80. PB 123945

A rectangular waveguide terminating in the plane of an infinite ground screen and radiating into a half space has a ferrite slab located at the aperture. With a TE_{10} mode of 9365 mc sent through the waveguide the far-zone radiation pattern in the H-plane has been measured as a function of a transversely applied static magnetic field. It was discovered that for certain thicknesses of the ferrite slab the radiation lobe deviated considerably from the normal to the infinite screen with only small changes in the applied magnetic field. UC IER Series 60, Issue no. 146. Contract N7 onr-29529, Report 47.

Requirements of direction finder indicator and determination of correct scanning rates for DF collector systems in the VHF, UHF and SHF bands, by J. R. Gruber and E. H. Flath. U. S. Naval Research Laboratory. Apr 1946. 56p photos, diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 122771

Unclassified 8 Jun 1955.
1. Radio direction finders - Equipment 2. Radar - Scanning 4. NRL R 2648.

S-band helical antenna, by C. R. Rivera and D. Shackelford. U. S. Air Force. Air Research and Development Command. Missile Test Center, Patrick Air Force Base, Fla. Jun 1956. 12p diagrs, graphs. Order from LC. Mi $2.40, ph $3.30. PB 122998

Describes the performance of an S-band antenna consisting of five, two and one half turn helical elements. The antenna has 360 degrees coverage in azimuth and 180 degrees coverage in elevation. AF MTC TR 56-3.

Sensitivity and accuracy comparisons of DAU vs. DAJ goniometers for DAJ-a installations, by S. F. George and E. H. Flath. U. S. Naval Research Laboratory. Jan 1946. 40p photos, diagr, graphs, table. Order from LC. Mi $3, ph $6.30. PB 123341

Unclassified 15 Dec 1953.
1. Goniometers - Tests 2. Radio direction finders - Equipment 3. DAU (Goniometer) 4. DAJ-a (Direction finder) 5. NRL R 2707.

Steady state response of networks to sinusoidal signals with sinusoidal frequency modulation, by E. Weber. Polytechnic Institute of Brooklyn. Microwave Research Institute, Brooklyn, N. Y. Sep 1955. 29p diagr, graphs. Order from LC. Mi $2.70, ph $4.80. PB 123969

A theoretical and experimental investigation of the distortion arising in the propagation of a sinusoidal signal with sinusoidal frequency modulation through a parallel resonant circuit is investigated. PIB 371. PIB RR 439-55. Contract Nonr-839(15), NR 375-214.

Stroboscopic X-ray studies of oscillating crystals. Final report under Contract DA 36-039-sc-21, by R. Pepinsky. Pennsylvania State University. Dept. of Physics, University Park, Pa. Jan 1953. 272p photos, drawings, diagrs, graphs, tables. Order from LC. Mi $11.10, ph $42.35. PB 123172

An X-ray investigation of the crystal-structural basis for piezo- and ferroelectric activity in solids, with the aim of prediction and development of new crystals for frequency-control elements. The X-ray studies are coordinated with electrical, mechanical, thermal and optical measurements on the materials concerned. The program has been concerned with development of special X-ray diffraction apparatus and piezoelectric testing devices of adequate sensitivity for crystal surveys, a survey of possible new piezoelectric crystals, and X-ray diffraction studies of KH_2PO_4, $NH_4H_2PO_4$, $LiNH_4$ tartrate $.H_2O$ and LiRb tartrate $.H_2O$. Dept. of the Army Project 3-99-11-022. Signal Corps Project 37-142-B (0-036401.1). Covers period of work from 15 Nov 1949 to 14 Nov 1952.

Study of methods for converting latent heat energy directly into electrical energy. First partial report, by Ross Gunn. U. S. Naval Research Laboratory. Sep 1936. 17p drawings, diagrs, graphs, table. Order from LC. Mi $2.40, ph $3.30. PB 122711

1. Electrolytic cells, Hydrogen-oxygen 2. Electricity - Generation 3. NRL A 1308.

Study of microwave double-layer pillboxes. Part II: Multiple-reflector systems, by Walter Rotman. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Electronics Research Directorate. Antenna Laboratory, Bedford, Mass. Jan 1956.

74p photos, drawings, diagrs, graphs (part fold), tables. Order from LC. Mi $4.50, ph $12.30.
PB 124270

This report discusses advanced scanning techniques for the pillbox with auxiliary reflector and for the circular-cardioid pillbox. Design criteria, construction details, and experimental results are given for each. Appendix A: Calculation of shape of auxiliary reflectors. - Appendix B: Paraxial focus: Scan angle relations in circular-cardioid pillbox. For Part 1 see PB 116642. AF CRC TR 56-101.

Test of four model AN/CRT-4 directional radio sono buoys, by J. M. Miles. U. S. Naval Research Laboratory. Oct 1945. 14p graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 122770

Unclassified 15 Dec 1953.
1. AN/CRT-4 (Radio sono buoy) 2. Buoys, Radio-sonic - Equipment - Tests 3. Buoys, Radio-sonic - Design 4. NRL R-2639.

Tests of sleeve andwhip antennas aboard LST-998, by L. R. White. U. S. Naval Research Laboratory. May 1945. 43p diagr, graphs, tables. Order from LC. Mi $3.30, ph $7.80.
PB 123389

Unclassified 15 Dec 1953.
1. Antennas, Sleeve - Tests 2. Antennas, Whip - Tests 3. Antennas, Shipborne - Tests 4. NRL R-2520.

Type approval test of AN/ARR-16B radio sono buoy receiver, by J. R. Kauke. U. S. Naval Research Laboratory. Aug 1945. 20p photos, graphs, tables. Order from LC. Mi $2.40, ph $3.30.
PB 122786

Unclassified 15 Dec 1953.
1. AN/ARR-16B (Radio sono buoy) 2. Buoys, Radio-sonic - Equipment - Tests 3. Buoys, Radio-sonic - Design 4. NRL R-2584.

Variational method for the calculation of the distribution of energy reflected from a periodic surface, by William C. Meecham. Michigan. University. Engineering Research Institute, Ann Arbor, Mich. Nov 1955. 29p diagrs, graphs, table. Order from LC. Mi $2.70, ph $4.80.
PB 124279

A variational method is presented which is used to calculate the energy appearing in the various diffracted orders set up when a plane wave is incident upon a periodic reflecting surface. Either the first or the second boundary condition can be so treated. A sample problem is worked showing that if the average absolute slope of the reflecting surface is small (segments of surface with large slope may be included) and if the displacement of the surface is not large compared with the wave length of the incident radiation, the formulation gives results correct to within a few per cent. The calculation shows clearly the existence of Wood anomalies; these are discussed in some detail. Method described in report was presented in a paper before the thirty-eighth annual meeting of the Optical Society of America. MU ERI Proj 1936-5-T.

Generators, Motors, Transmission

Inductance coil as an energy reservoir for an electromagnetic accelerator, by Charles R. Forbes and William S. Partridge. Utah. University. Dept. of Electrical Engineering, Salt Lake City, Utah. Aug 1956. 50p diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80.
PB 124264

The power required to accelerate a pellet to very high velocities is enormous. It is not feasible, nor necessary, to deliver this power from a continuous source. The extremely short time duration and small duty cycle allow the use of a system in which the energy is accumulated at a very slow rate and discharged at a very high rate. The feasibility of using the inductance coil as an energy reservoir for such a system is discussed. Three systems are analyzed. The first system has the simplest circuit possible to transfer the energy from the field of one coil to the field of another. The second system is a modification of the first using the addition of a capacitor for improved performance. The third system employs a bank of capacitors as the energy reservoir, and serves as a standard for measuring the merit of the other two systems. AD 96044. AF OSR TN 56-386. Contract AF 18(600)-1217.

Low-power pulse transformers, by Thomas F. Wimett. Massachusetts Institute of Technology. Servomechanisms Laboratory, Cambridge, Mass. Dec 1947. 114p photos, diagrs, graphs. Order from LC. Mi $6, ph $18.30. PB 124199

Analysis and design procedures are derived for application to low-power pulse transformers including, in particular, the types expected to be employed in many circuits of the electronic digital computer of Project Whirlwind. Pulse lengths considered are between a twentieth and a quarter microsecond. Although optimum reproduction of pulse shape is assumed to be a leading requirement, the procedures given are presumably general enough to be extended to applications for which faithful reproduction of input voltage or current waveform is not necessary. Project DIC 6345. Contract N5 ori-60. MIT SL R 122.

Permanent-magnet generators. Part I: Theory, by D. J. Hanrahan and D. S. Toffolo. U. S. Naval Research Laboratory. Mar 1957. 18p diagrs. Order from OTS. 50 cents.
PB 121862

A simple theory of the permanent-magnet generator is presented, based on an equivalent magnetic circuit and using the conventional synchronous machine constants. Steady-state and transient operation is analyzed, and the demagnetizing effect of a short-circuit transient is evaluated. The theory may be used for the prediction of machine performance and as the basis of an optimum design method. NRL R 4912.

Waukesha power unit-model 6-WAKU with model "ICK" starter: Operators manual: Maintenance manual, and Parts price list. Waukesha Motor Co., Waukesha, Wis. Feb 1943. 223p photos, drawings, diagrs, tables. Order from LC. Mi $9.90, ph $34.80. PB 124685

1. "WAKU" (generator) 2. Generators, Engine driven - Maintenance and repair 3. Generators, Engine-driven - Operation 4. Generators, Egine-driven - Parts.

FUELS AND LUBRICANTS

Adsorption of polar organic molecules on metal surfaces in relation to lubrication and corrosion inhibition, by F. H. Healey, A. C. Zettlemoyer, J. J. Chessick and A. V. Fraioli. Lehigh University. Surface Chemistry Laboratory, Bethlehem, Pa. Jun 1956. 42p photos, diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 123724

A gas adsorption apparatus has been designed and constructed to measure the adsorption of organic vapors on metals and metal oxides. The adsorption of ethyl alcohol was measured on oxide-coated iron, reduced iron, and titanium dioxide. Measurements are now being carried out with iron oxide powders. Part II details the apparatus and results obtained for the determination of static friction coefficients in the presence of organic vapors. Results of measurements of the friction of brass on brass in H_2O and C_2H_5OH vapors, and of steel on steel in the vapors of H_2O, C_2H_5OH, n-C_4H_9Cl, and n-C_4H_9OH are reported at various pressures below saturation. AD 25704. Ordnance project no. TB 2-0001 (457). Arsenal project TB 4-202 H-13 (457). Technical report 1 for the period May 1952 - December 1953 under Contract DA-36-034-ord-935. Contents: Part I. Adsorption of organic vapors on metals and metal oxides. - Part II. Static friction measurements.

Effect of concentration on ignition delays for various fuel-oxygen-nitrogen mixtures at elevated temperatures, by E. Anagnostou, R. S. Brokaw and J. N. Butler. U. S. National Advisory Committee for Aeronautics. Dec 1956. 34p diagrs, graphs. Order as TN 3887 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124430

Ignition delays for mixtures of ethane, n-butane, isobutane, hydrogen, or propane with oxygen and nitrogen were measured at various temperatures and fuel and oxygen concentrations using a flow system. Ignition delays for all fuels were inversely proportional to fuel concentration to some power between 0.6 and 1.7. They also decreased slightly with increasing oxygen concentration and decreased with increasing temperature. Two experimental procedures were used, and these gave different absolute values for the delay but the trends observed were the same by either method. NACA TN 3887.

Ignition delays and fluid properties of several fuels and nitric acid oxidants in temperature range from 70 to - 105 F, by Riley O. Miller. U. S. National Advisory Committee for Aeronautics. Dec 1956. 32p photos, diagr, graphs, tables. Order as TN 3884 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124427

Out of 17 acids containing various amounts of nitric acid, water, nitrogen tetroxide, sulfuric acid, ammonium nitrate, potassium nitrate, and perchloric acid, red fuming nitric acids containing about 19 percent nitrogen tetroxide and 3 percent water were best for low freezing points and short ignition delays in the NACA open-cup apparatus. Of the 29 fuels studied, several blends of aromatic amines in triethylamine were fluid and gave short delays at -76°F; at very low temperatures 30 percent o-toluidine in triethylamine gave the shortest delays with low-freezing red fuming nitric acid. Supersedes RME 51J11. NACA TN 3884.

Preparation and properties of some fluorine-containing diesters, by Joseph F. O'Brien, Robert Filler, Jack V. Fenner and George Rappaport. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Dec 1956. 38p graphs, tables. Order from OTS. $1. PB 121910.

The preparation and properties of six different types of fluorine-containing diesters for possible use as high temperature lubricants and hydraulic fluids are described. Both dicarboxylic acid diesters and glycol esters were prepared from fluorine-containing mono- and dicarboxylic acids, alcohols and glycols. Diesters derived from fluorine-containing acids and hydrocarbon alcohols or glycols were readily prepared by direct esterification. Diesters derived from fluorine-containing alcohols or glycols and hydrocarbon acids or fluorine-containing acids were prepared from the acid chloride and alcohol or glycol. The fluorine-containing diesters most resistant to hydrolysis were derived from the fluorine-containing alcohols or glycols and the hydrocarbon acids. The boiling point, refractive index, and surface tension of the fluorine-containing diesters were lower than those

of their hydrocarbon analogs, whereas the density and absolute viscosity were higher. The infra-red spectra of the diesters were recorded and the effect of fluorine atoms on the ester carbonyl frequency is described. AD 110674. Project 7340, Task 73404. Covers work from Sep 1951 - Aug 1953. AF WADC TR 56-11.

Stability limits and burning velocities of laminar hydrogen-air flames at reduced pressure, by Burton D. Fine. U. S. National Advisory Committee for Aeronautics. Nov 1956. 29p diagr, graphs, table. Order as TN 3833 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124392

Laminar burning velocity was measured at pressures of 1 atm and below and critical boundary velocity gradient for flashback below 1 atm over a range of compositions for hydrogen-air burner flames. Both quantities were correlated with pressure, the pressure dependence being independent of composition between equivalence ratios of about 1 and 2. A more general correlation involving quenching distance conformed to a simple quenching model. From this correlation and thermal equations for flame propagation, a reaction order was calculated. The general laminar stability loop was discussed in terms of quenching regions, normal laminar regions, and regions of laminar-turbulent transition. NACA TN 3833.

INSTRUMENTS

Application of high-speed computation to factor analysis operations, by Bruce P. Price and Harold H. Schatz. U. S. Air Force. Air Research and Development Command. Air Force Personnel and Training Research Center. Personnel Research Laboratory, Lackland Air Force Base, San Antonio, Texas. Dec 1955. 17p. Order from LC. Mi $2.40, ph $3.30. PB 123955

This report is concerned with programs for five different methods of factor analysis. These programs are general and can be made applicable to any of the various types of general purpose computers. Coding for input into the machine is the only additional step required before problems of this type can be solved with much greater accuracy in much less time than by other kinds of machine computation. These two advantages lead to a third, that of increasing the range of operations and the flexibility allowed the research worker when he must make a decision as to the kind of analysis he will employ for specific research problems. Project 7702, Task 77055. AF PTRC TN 55-64. Contract AF 18(600)-395.

Application of high-speed computation to linear discriminant function operations, by Bruce P. Price and Harold H. Schatz. U. S. Air Force. Air Research and Development Command. Air Force Personnel and Training Research Center. Personnel Research Laboratory, Lackland Air Force Base, San Antonio, Texas. Dec 1955. 18p. Order from LC. Mi $2.40, ph $3.30. PB 123954

This report provides a general method for solving linear discriminant function problems through the aid of any of a variety of high-speed computers. The running time for the computations, after programming and coding have been accomplished, is such that solutions can be obtained for large problems quickly and economically. Project 7702, Task 77055. AF PTRC TN 55-66. Contract AF 18(600)-395.

Bismanol, a new permanent magnet, by Edmond Adams, William M. Hubbard and Albert M. Syeles. U. S. Naval Ordnance Laboratory, White Oak, Md. May 1952. 19p photo, diagrs, graphs, tables. Order from OTS. 50 cents. PB 121730

A new permanent magnet of high coercive force and maximum energy product has been prepared and named Bismanol. This preliminary work shows that aside from its possibilities as a substitute for magnets requiring cobalt, this new material has a value which exceeds present materials for special applications where a high coercive force is desirable, as, for example, where one can not use a magnet that is long compared to the air gap required. NAVORD 2440.

Development of an air injector, by F. Cheers. National Research Council of Canada. Division of Mechanical Engineering. Mar 1956. 21p diagrs, graphs. Order from LC. Mi $2.70, ph $4.80. PB 122445

1. Ejectors, Air - Design - Canada 2. NRCC MT 31.

Development of methods for evaluation of rotating dental diamond abrasive instruments, by Jack L. Hartley, Donald C. Hudson, W. T. Sweeney and George Dickson. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. May 1956. 11p photos, diagr, graphs. Order from LC. Mi $2.40, ph $3.30. PB 124608

Cutting effectiveness of rotating diamond instruments was determined by measuring their rate of removal of Pyrex, window glass, and human enamel under controlled conditions. Results on enamel did not closely correlate with those on glass, although the most effective and least effective in glass were also the most and least effective, respectively, in cutting enamel. Examination of discarded diamond points indicated a breakdown of critical areas of instruments after clinical use. Evaluation of diamond instruments requires a breakdown test

capable of measuring the ability of the bonding materials to retain the diamond abrasive. The results of the work indicate that such a test can be based on cutting effectiveness in glass. AF SAM R 56-67.

Evaluation of characteristics of large size fuel shutoff valves, by Donald R. Wedan, Edward E. Glynn, John J. Casey. Flui Dyne Engineering Corp., Minneapolis, Minn. May 1954. 97p drawings, graphs, tables. Order from LC. Mi $5.70, ph $15.30. PB 124240

The performance characteristics of valves suitable for shutoff use in 4 to 20 inch aircraft and missile fuel and propellant lines were evaluated. The nine most promising types were selected in a preliminary study and representative designs were prepared for each type. Weight, dimensions, actuating requirements, sealing and pressure drop characteristics were evaluated for each type for 60 and 600 psi application. An operating temperature range from -65° to 450°F was considered. Three valve types are recommended for use in the 600 psi range and four types for use in the 60 psi range. AD 93331. Project 3084, Task no. 30280. AF WADC TR 54-562. Contract AF 33(616)-2152.

Flow losses in heat exchangers with oblique flow ducts, a summary of available design information, by D. C. Baxter. Stanford University. Dept. of Mechanical Engineering, Stanford, Calif. Jun 1955. 46p diagrs, graphs. Order from LC. Mi $3.30, ph $7.80. PB 124200

In order to obtain an overall heat exchanger design of reasonable compactness it becomes expedient to fold the core in some manner to form a more suitable shape. The use of such folded cores, where the fluid stream is turned and decelerated on entering and accelerated and turned again on leaving the core, can introduce additional flow stream mechanical energy losses which may in magnitude approach the heat exchanger core flow friction. The purpose of this preliminary report is to phrase the problem from the point of view of the heat exchanger designer, and to present a review of information already available in the literature. AD 70394. Research partly supported by the Ferrotherm Company, Cleveland, Ohio. SU ME TR 25. Contract N6 onr-251, T. O. 6, NR 065-104.

Frequency errors in thermal instruments, by J. D. Wallace and A. H. Moore. U. S. Naval Research Laboratory. Jan 1936. 46p photos, diagrs, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 122720

1. Ammeters - Tests 2. Meters, Frequency - Tests 3. NRL R-1228.

Measurement of static pressure and air flow with a modified E1R5 antibackdraft value (u), by Merton D. Mears. U. S. Chemical Corps. Chemical and Radiological Laboratories, Army Chemical Center, Md. Oct 1955. 27p photos, diagr, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 122594

An improved antibackdraft valve has been developed for use in protective shelters. It consists essentially of a housing and a hinged damper connected through a linkage system to a counterweight which is positioned within the housing. As a means of exhausting air from the entry air locks or the shelter proper, the principle purposes of the valve are: (1) Maintain a nearly constant pressure drop across it at varying air flows, and (2) prevent a reverse flow of air should the pressure levels be reversed. The pressure drop across the valve and the rate of air flow through it can be determined with good approximation by the position of the counterweight on its shaft and by means of an attached pointer and scale which indicates the degree of damper opening. The overall dimensions of the E1R6 valve are 12 in. wide, 17 in. high and 10 in. deep. It weighs 21 lb. The operating range is approximately 50 to 400 cu. ft./min. of air flow at a pressure differential of 0.1 to 1.0 of water gage. Project 4-80-12-005, Interim report. CC CRL R 445.

Shock characteristics of the American war standard shock testing mechanism for electrical indicating instruments, by Irwin Vigness. U. S. Naval Research Laboratory. Dec 1944. 24p photos, diagr, graphs, table. Order from LC. Mi $2.70, ph $4.80. PB 123377

1. Instruments, Indicating - Impact tests 2. Instruments, Electric - Impact tests 3. Indicators, Frequency - Impact tests 4. NRL O-2414.

Theory and design of a pneumatic temperature probe and experimental results obtained in a high-temperature gas stream, by Frederick S. Simmons and George E. Glawe. U. S. National Advisory Committee for Aeronautics. Jan 1957. 42p photo, diagrs, graphs. Order as NACA TN 3893 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124436

The basic theory of pneumatic temperature probes and deviations from this basic theory in practical application are presented. Design requirements and operating considerations are discussed. Temperatures between 1600° and 4000°R were measured with an experimental probe in hydrocarbon combustion exhaust gases and compared with those measured by thermocouples and a line-reversal pyrometer. Reasonable agreement among the instruments was obtained. NACA TN 3893.

LUMBER AND WOOD PRODUCTS

Laminated wood shoe lasts, a research study for military procurement, by Norvelle G. Hundley and Alfred H. Bishop. New York State College of Forestry, Syracuse, N. Y. Jun 1952. 106p photos, diagrs, graphs, tables. Order from LC. Mi $5.70, ph $16.80. PB 125387

The study included such variables as type of adhesives suitable for laminating lasts, evaluation of hard maple and beech, method of lay-up of components, special construction features such as rivet pins, thickness of laminates, and method of testing. The performance of vertically and horizontally laminated lasts of maple and beech glued with various adhesives were compared with solid lasts. Contract DA 44-qm-508-013907, Final report.

Role of Limnoria tripunctata in promoting early failure of creosoted piling, by H. Hochman, H. Vind, T. Roe, Jr., J. Muraoka and J. Casey. U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif. Apr 1956. 46p photos, graphs, tables. Order from LC. Mi $3.30, ph $7.80. PB 124989

Heavy impregnation with coal-tar creosote usually protects wooden piles in temperate waters from marine borer attack. However, this is often ineffective in tropical and subtropical waters. The difference between the species of marine borers prevalent in tropical waters and those in temperate waters was obtained supporting the postulate that a single species, Limnoria tripunctata, initiates the failure of creosoted piling in California harbors. It inhabits tropical and subtropical waters only. NCEREL M-109.

MACHINERY

Design and construction of an EMF pickup unit, by R. D. Smith, J. R. Osborn and D. W. Craft. Purdue University. Gas Turbine Laboratory, Lafayette, Ind. May 1955. 103p photos, drawings (part fold), diagrs, graph, table. Order from LC. Mi $5.70, ph $16.80. PB 124029

The EMF pickup unit described in this report was developed in connection with research concerned with the measurement of (a) the temperature distribution in an air-cooled radial flow turbine rotor, and (b) the measurement of strains in a rotating disk. Unclassified. Report no. RM 55-2. Contract N7 onr-39415.

Development and design of a laboratory machine for the continuous production of grease, by G. M. Hain and E. E. Stone. U. S. Naval Research Laboratory. Apr 1946. 10p photo, diagr. Order from LC. Mi $1.80, ph $1.80. PB 122756

1. Machines, Grease preparation - Design 2. Greases, Synthetic - Preparation 3. Greases, Low temperature - Preparation 4. NRL P 2813.

Effect of modifications on the performance characteristics of the light weight, high impact shock machine, by S. E. Young. U. S. Naval Research Laboratory. Oct 1945. 61p photos, diagrs, graphs, tables. Order from LC. Mi $3.90, ph $10.80. PB 123388

Unclassified April 1947.
1. Machines, Shock testing - Impact tests 2. NRL V-2666.

Investigation of rotating stall in a single-stage axial compressor, by S. R. Montgomery and J. J. Braun. U. S. National Advisory Committee for Aeronautics. Jan 1957. 28p photos, diagr, graphs. Order as TN 3823 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124387

The number of stall cells and their propagation velocities were found with and without stator blades. The measured velocities were compared with those predicted by Stenning's theory (see NACA TN 3580, PB 122517) assuming the downstream pressure fluctuations to be negligible, and correlation within 10 percent was obtained at the onset of stall. NACA TN 3823.

New shop techniques and developments. Third annual report. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Research Services Division, Cambridge, Mass. Dec 1955. 20p photos. Order from LC. Mi $2.40, ph $3.30. PB 123151

Describes the design of a shaking ball mill for producing metal powders and a printed circuit called a space potentiometer consisting of 12 concentric involute curves placed within the limits of a 3 in. square card. For 1st-2d reports see PB 111338 and PB 111668.

300-Mev nonferromagnetic electron synchrotron, by W. B. Jones, H R. Kratz, J. L. Lawson, D. H. Miller, R. D. Miller, G. L. Ragan, J. Rouvina, and H. G. Voorhies. General Electric Research Laboratory, Schenectady, N. Y. Jul 1955. 55p drawings, diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 123154

An electron synchrotron using no iron in the magnetic field and capable of generating a useful

electron beam up to energies of 300 million volts or more has been in satisfactory operation for some time. This report is intended to describe this machine as it now exists, to give some account of the development of the critical components, and to indicate how the machine performs. AD 70606. GE RL 55-1314. Contract N7 onr-332.

MEDICAL RESEARCH AND PRACTICE

Albumin-globulin conjugates in ethanol-precipitated fraction II indicated by agar column procedures, by William G. Glenn and Anna C. Garner. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Aug 1956. 6p photo, tables. Order from LC. Mi $1.80, ph $1.80. PB 124601

Partial absorption of four relatively specific antisera, two each to human fractions II and V, together with mutual antigen dilution studies in agar columns, verified the existence of albumin-globulin conjugates in solutions of commercially prepared gamma globulins. Comparison of these results with continuous boundary electrophoresis indicates that dissociation of the labile bonds responsible for these conjugates may occur when the proteins are separated by electrophoretic methods. AF SAM R 56-92.

Antigenic studies on the psittacosis-lymphogranuloma venereum group of viruses. B: Characterization of complement fixing antigens extracted with sodium lauryl sulfate, by Albert A. Benedict and Edith O'Brien. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jul 1956. 11p diagr, graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 124606

A water soluble complement-fixing antigen was efficiently extracted with sodium lauryl sulfate from purified virus suspensions of the psittacosis-lymphogranuloma venereum group. Partial purification was effected by repeated acid precipitation at pH 4.0 to 4.5 which yielded a heat-stable, nucleic, acid-free antigen composed of protein, carbohydrate, and lipid. Treatment of this complex with 5 percent phenol produced a periodate-sensitive, phenol-insoluble, complement-fixing antigen and a periodate-resistant, phenol-soluble antigen. The phenol precipitate was mainly a lipocarbohydrate and the phenol supernatant fraction was chiefly protein. AF SAM R 56-76.

Blood flow in the hind limbs of dogs after exposure to cold, by C. J. Imig, W. J. Roberson, Mona Gault and H. M. Hines. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Mar 1956. 9p graphs, tables. Order from LC. Mi $1.80, ph $1.80. PB 124613

Volume blood flow was measured in the hind limbs of dogs during and following rewarming of the tissues after exposure of the extremity to various intensities and durations of cold. The volume of blood flow was found increased during and following the rewarming period after cooling of the tissues to 0° or below and after cooling the tissues to approximately 12° C. by a 3 1/2-hour exposure. Cooling of the hind limb to approximately 15°C. by a 30-minute exposure to cold did not significantly affect the blood flow during the post-exposure period. No significant changes in blood flow were found during and following rewarming of the foot after cooling the tissues to 27° C. by exposure to cold for 20 minutes. AF SAM R 55-66.

CHABA second annual report for the period 1 Jun 1954 - 1 May 1955 under Contract Nonr-1151-(01), NR 140-069, by Hallowell Davis, Donald H. Eldredge and others. Armed Forces - National Research Council. Committee on Hearing and Bio-Acoustics, St. Louis, Mo. Jun 1955. 26p. Order from LC. Mi $2.70, ph $4.80. PB 124246

Supported jointly by the U. S. Office of Naval Research and the Central Institute for the Deaf, St. Louis, Mo.
1. Acoustic research 2. Contract Nonr-1151(01), NR 140-069.

Cytologic response in embryonated eggs to inoculums from cases of common cold infections, by Morris Pollard. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jul 1956. 8p graphs, tables. Order from LC. Mi $1.80, ph $1.80. PB 124603

Influenza and mumps viruses induced increased numbers of histiocytes in the allantoic fluids of embryonated eggs. The significance of this response was enhanced by coincident hemagglutinin production and by an interference effect on both responses by specific antiserums. Nasal washings from acute common cold (afebrile rhinitis) patients engendered increased numbers of histiocytes in the allantoic fluid of embryonated eggs. The agent or agents responsible for this cytologic response were thermolabile, were not inhibited by penicillin and streptomycin, and produced no detectable growth in bacteriologic media. The agent or agents were not demonstrable in nasal washings collected from the same patients during convalescence. Nasal washings from cases of acute allergic rhinitis did not induce increased numbers of histiocytes in the allantoic fluid of inoculated eggs. AF SAM R 56-89.

Effects of high intensity X-irradiation of the retina: A histologic, histochemical and chemical study in the rabbit, by Sidney P. Kent and Arnold A. Swanson. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jul 1956. 10p photos, graphs. Order from LC. Mi $1.80, ph $1.80. PB 124602

The retinae of 90 rabbits were examined chemically and histochemically for succinic dehydrogenase and glycogen. Morphologic changes consisting largely of pyknosis in the outer nuclear layer and fragmentation of the visual cell layers were first noted 4 hours postirradiation. These changes were noted in all subsequent irradiated groups. The glycogen content, particularly of the visual cell layer, increased in the 4-hour irradiated group while the succinic dehydrogenase activity decreased. Both changes were noted in all subsequent irradiated groups. AF SAM R 56-85.

Gaseous nitrogen elimination at ground level and simulated altitude and the occurrence of decompression sickness, by John P. Marbarger, William Kadetz, Joanna Paltarokas, Daina Variakojis, John Hansen and John Dickinson. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Feb 1956. 21p diagr, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 124612

Nitrogen elimination and amount of oxygen used were estimated during 2 hours of breathing oxygen in 33 subjects resting at ground level and at simulated altitudes of 8,000, 12,000, 18,000, and 22,000 feet. The incidence of bends at 38,000 feet simulated altitude after pre-oxygenation at these various altitudes was compared to those without pre-breathing of oxygen. The results indicated that fewer descents were necessary after denitrogenation at ground level or any altitude than were necessary without denitrogenation. The data obtained confirmed the results of others in that at simulated altitude, less supply oxygen was used with denitrogenation than at ground level. AF SAM R 55-73.

Generalization to varying tone frequencies as a function of intensity of unconditioned stimulus, by Philip J. Bersh, Joseph M. Notterman, and William N. Schoenfeld. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. May 1956. 5p graph, table. Order from LC. Mi $1.80, ph $1.80. PB 124605

Employing conditioned heart rate as a measure of experimental anxiety, two groups of 20 male students each are conditioned through the use of a 1920 c.p.s. tone and irregularly paired electric shock as punishment. The results of the experiment indicate that the acquired anxiety generalizes to tones as a function of (1) the difference in frequency between the test tone and the original conditioning tone and (2) the intensity of the electric shock during the conditioning trials. AF SAM R 56-79.

Mechanism of natural acclimatization: Studies on the native resident of Morococha, Peru, at an altitude of 14,900 feet, by Alberto Hurtado, Tulio Velasquez, Cesar Reynafarje and others. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Mar 1956. 63p photos, map, graphs, tables. Order from LC. Mi $3.90, ph $10.80. PB 124614

1. Altitude, High - Acclimatization 2. Altitude, High - Physiological effects 3. AF SAM R 56-1.

Neuromuscular damage resulting from exposure of the hind legs of rats and hamsters to cold, by H. M. Hines, C. J. Imig and L. C. Senay. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. May 1956. 6p graphs, tables. Order from LC. Mi $1.80, ph $1.80. PB 124611

Studies were made concerning the effects of exposing one hind leg of rats to baths at 0° C for 3 hours upon tibial nerves and gastrocnemii. Evidence was found that the changes in muscle were secondary to motor nerve damage. A diminution occurred in the capacity of tibial nerves of the legs which had been exposed to cold to elicit upon stimulation isometric tension in their gastrocnemii. The changes in muscle following exposure of a leg to cold resembled those following motor nerve denervation. AF SAM R 56-54.

Observations of the inulin space in dogs during the process of adaptation to high altitude, by Ernest L. Becker and Betty J. Joseph. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jul 1956. 3p table. Order from LC. Mi $1.80, ph $1.80. PB 124528

The volume of distribution of inulin was studied in three dogs prior to exposure to a simulated altitude of 20,000 feet, and several observations over a period of 18 months were made after the dogs had become acclimated to the altitude. None of the values were significantly different from the control values on these dogs. AF SAM R 55-141.

Rapid laboratory technics for detection and identification of causative agents of human pyogenic infections, by L. S. McClung and E. D. Weinberg. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. May 1956. 11p tables. Order from LC. Mi $2.40, ph $3.30. PB 124526

A new type of rapid micromethod for the identification of bacterial strains is described. The enzymatic pattern of cells of a large inoculum is determined by combining with preheated substrate and indicator in tubes or plates. Growth media are not employed in determining these physiologic reactions. Results of the rapid method are comparable to those of the standard method when a specific end-product is desired, but the results of the change-in-pH rapid tests do not always agree with the changes that occur in standard tests. The rapid micromethod is of considerable potential value in the laboratory in which studies of

large numbers of strains of specific bacterial groups are to be conducted. A battery of rapid enzymatic test procedures may serve as determinative criteria for the identification of certain genera of bacteria. AF SAM R 56-37.

Rapid method for determination of antibiotic sensitivity of agents of human pyogenic infections, by E. D. Weinberg. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. May 1956. 6p tables. Order from LC. Mi $1.80, ph $1.80. PB 124525

Three types of rapid methods for determination of microbial susceptibility to antibiotics were studied. Methods were based on the inhibition by the antibotics of the ability of concentrated cell suspensions (1) to reduce triphenyltetrazolium chloride, (2) to develop positive reactions in rapid biochemical tests, and (3) to multiply. Results of the first two technics did not correlate with the action of the antibiotics in standard growth-sensitivity tests, whereas the results of the third method were fairly comparable with those of the standard method. AF SAM R 56-38.

Renal function in men acclimatized to an altitude of 15,000 feet, by Ernest L. Becker, John A. Schilling, and Rodney B. Harvey. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jul 1956. 3p graph, table. Order from LC. Mi $1.80, ph $1.80. PB 124529

Studies of renal function were made on five normal men native to an altitude of 14,900 feet. Glomerular filtration rates were determined by the constant infusion of inulin, and effective renal plasma flow was measured by the constant infusion of para-aminohippurate. All subjects showed a statistically significant decrease in filtration rate, effective renal plasma flow, and effective renal blood flow, with an increase in hematocrit and filtration fraction. AF SAM R 55-142.

Reward value of heat at low temperatures during inanition and pantothenic acid deprivation, by Bernard Weiss and M. Bryan Danford. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jul 1956. 7p drawing, graphs, tables. Order from LC. Mi $1.80, ph $1.80. PB 124522

Albino rats were trained to obtain a burst of heat from a heat lamp by pressing a lever. It was found that the frequency of responding at an ambient temperature of 0° C. could be raised by restricting food intake. Combining pantothenic acid deprivation with food deprivation resulted in a significant increment of heat-rewarded responses. AF SAM R 56-72.

Survival of altitude-acclimatized rats following 800 R whole-body X-irradiation, by Eugene B. Konecci, Dominic Criscuolo and M. B. Danford. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. May 1956. 5p tables. Order from LC. Mi $1.80, ph $1.80. PB 124609

This study indicates that 6-month altitude acclimatized rats (2 months at 16,000 feet and 4 months at 18,000 feet) are in a better physiologic state to withstand an 800 r exposure than are otherwise comparable ground level controls. Although significant decreases in weight and in hematocrit were observed in the acclimatized animals, by the 19th day following the initial irradiation they had returned to approximately their pre-irradiation levels. AF SAM R 56-65.

Tolerance of the hyperthermic dog to carbon dioxide, by E. B. Brown, Jr. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jul 1956. 6p graphs, tables. Order from LC. Mi $1.80, ph $1.80. PB 124604

Tolerance of the hyperthermic dog to elevated CO_2 tensions in the inspired air was determined, and the results were compared with those of similar experiments obtained on normothermic dogs. An elevation of body temperature of 2° to 3° C. produced by inhalation of warm, moist oxygen and by warming with infrared lamps decreased the tolerance of dogs to elevated CO_2. AF SAM R 56-81.

Variability studies of the floating technic of analytical ultracentrifugation, by Lawrence J. Milch, Norman Weiner, and Lesly G. Robinson. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. May 1956. 6p graph, tables. Order from LC. Mi $1.80, ph $1.80. PB 124524

The sources of variability in the stepwise protocols for the ultracentrifugal estimation of blood plasma lipoproteins have been investigated. Reproducibility in the analytical step was found to be limited by the resolution capability of the optical system used in the Model E ultracentrifuge. Consequently, variability is large when low concentrations of lipoprotein are subjected to analysis. Over and above the concentration effect, there seems to be some further unaccountable difference in results obtained from the two Model E ultracentrifuges studied. The error introduced by enlargement tracing and planimetry was shown to be relatively insignificant, as was any cell assembly effect. AF SAM R 56-47.

METALS AND METAL PRODUCTS

Behavior of tin-lead solders at sustained low temperatures, by L. E. Kissinger. U. S. Naval Ordnance Laboratory. May 1952. 5p. Order from LC. Mi $1.80, ph $1.80. PB 125049

The mechanical properties of tin-lead solders at sustained low temperatures were investigated in a brief literature study. Reports indicate that tin-lead solders containing less than 60% tin will retain their strength for periods up to at least one year at - 100°F. Information on storage periods exceeding one year is incomplete and somewhat at variance. Stress and vibrations at low temperature are reported to cause no loss of strength over periods of one day to one week. NAVORD 2439.

Corrosion and ignition of titanium alloys in fuming nitric acid, by John B. Rittenhouse, Nicholas D. Stolica, Stephen P. Vango, Julia S. Whittick and David M. Mason. California Institute of Technology. Jet Propulsion Laboratory, Pasadena, Calif. Feb 1957. 67p photos, diagr, graphs, tables. Order from OTS. $1.75. PB 121940

The corrosion, ignition reactions, and stress-corrosion cracking of titanium and its alloys resulting from storage in fuming nitric acid (FNA) were studied. The metal samples were stored in the liquid and vapor phases of various concentrations of the system HNO_3-NO_2-H_2O for periods of time ranging from 1 hour to 90 days at temperatures ranging from room temperature to 71°C. The susceptibility to ignition reactions, the tendency toward stress-corrosion cracking and the corrosion rates of the metal were studied as a function of the chemical composition and temperature of the FNA. The corrosion-time relationships of two titanium alloys in anhydrous FNA (20% NO_2) over a temperature range from 25°C to 71°C were determined. Results of metallographic examinations of the corroded samples to ascertain the corrosion mechanism and the effects of heat treatment of the samples on the corrosion behavior are discussed. Chemical and X-ray diffraction analyses of the alloys, the FNA used, and the corrosion products developed are reported. AD 118028. Project 7312, Task 73122. Covers work from Aug 1955-Jul 1956 under Contract AF 33(616)-3006. AF WADC TR 56-414.

Department of Defense titanium sheet-rolling program. Status report no. 1, by C. R. Simcoe. Battelle Memorial Institute. Titanium Metallurgical Laboratory, Columbus, Ohio. Mar 1957. 43p graphs, tables. Order from OTS. $1.25. PB 121624

The sheet-rolling program is divided into three major phases. In Phase I the titanium producers are studying the process variables in melting and working the selected alloys. Design data will be collected on these alloys in Phase II; and Phase III will be the evaluation of the material in the aircraft industry. Each titanium producer's program is summarized, and the progress as of about January 1, 1957, is reported. BMI TML R46A.

Development of lean-alloy chromium-nickel stainless steels for high temperature use, by J. Salvaggi and G. J. Guarnieri. Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y. Dec 1954. 86p photos, graphs, tables. Order from OTS. $2.25. PB 121026

Three Ti and Ti-B chromium-nickel stainless steels, which displayed optimum high-temperature strength properties, were selected from approximately 150 experimental compositions of the initial study for further metallurgical investigation. Among the properties and variables evaluated were room-temperature tensile and bend characteristics, effects of solution temperature, finish rolling procedure and section size on the creep-rupture behavior at 1350 and 1500°F, stress-rupture properties at 1600 and 1700°F, strength of welded joints at 1500°F and intergranular corrosion susceptibility following various heat treatments. Through the use of multiple additions of Ti, B, and W to a 17 Cr- 15 Ni- 2.5 Mo- 0.15 C base composition, previous peak strength values for material solution treated at 2300°F and tested at 1500°F were equaled, with the added premium of improved ductility. The addition of tungsten was found to stabilize the microstructure and minimize sensitivity to variations in chemical composition. Final report under Contract no. NOa(s)-52-368-c. CAL KA-797-M-14.

Elastic constants of silver alloys, by Roger Bacon. Case Institute of Technology. Dept. of Physics, Cleveland, Ohio. Sep 1955. 49p diagrs, tables. Order from LC. Mi $3.30, ph $7.80. PB 123946

The elastic constants of single crystals of silver and of dilute alloys of silver have been measured by the ultrasonic pulse echo method. When the solute element is to the right of silver in the periodic table, there is a large fractional decrease, upon alloying, in the shear constant $(C_{11}-C_{12})/2$, and a relatively small decrease in C_{44}. This has been interpreted as indicating a decrease in the short-range crystal forces, due to a weakening of nearest neighbor repulsive bonds, and an increase in the long-range electrostatic forces, due to an increase in the average ion-core charge. Thesis - Case Institute of Technology. ONR TR 15. Contract N6 ori-27303, NR 017-611.

Forming of titanium and titanium alloys. Vol. I, by W. P. Achbach. Battelle Memorial Institute. Titanium Metallurgical Laboratory, Columbus, Ohio. May 1956. 247p photos, drawings, diagrs, graphs, tables. Order from OTS. $6.25. PB 121917

A survey of the airframe industry was made to determine the state of art of forming titanium sheet. Thirteen major forming methods evolved from information obtained by personal visit and discussion and through answers to questionnaires submitted to the airframe industry. Approximately 20 airframe producers were visited and their forming methods observed and discussed. In addition, some 300 questionnaires, designed on the basis of the information obtained during visits to airframe manufacturers, were submitted to companies directly engaged in forming titanium sheet metal shapes. Also, the literature collected by the Titanium Metallurgical Laboratory information

center was reviewed and extracted. For Vol. 2 see PB 121614. BMI TML R 42, Vol. 1.

Gamma ray radiography of pipe welds, by C. W. Briggs and R. A. Gezelius. U. S. Naval Research Laboratory. Feb 1938. 10p drawings, tables. Order from LC. Mi $1.80, ph $1.80. PB 123281

1. Welds - Radiographic inspection 2. Pipe - Welds - Radiography 3. NRL M-1423.

Ground zirconium metal powder pilot plant. Final technical report for Apr 21-Oct 20, 1952, by A. C. Demos. Foote Mineral Company, Philadelphia, Pa. Oct 1952. 44p photos, diagrs, graph, tables. Order from LC. Mi $3.30, ph $7.80. PB 124151

The objective of this contract was to develop, design, and operate a pilot plant with a production capacity of 20 pounds 100 mesh/10 micron ground fused zirconium powder per 8 hour shift per day. This has been successfully demonstrated in a 6-day operating trial in the pilot plant. During this period, a rate of 25.4 pounds GFZ per 8 hours per day was attained. This report includes a process flow sheet and covers methods of productions and specific data relating to the experimental work performed in conjunction with the pilot plant design or the operating tests. The process involves the production of fused zirconium sponge through the calcium reduction of $ZrCl_4$. This material is acid leached and then crushed and ground in suitable equipment to a powdery state. A certain fraction of the fine particles are removed in a water column elutriator to render the powder statistically insensitive. The zirconium powder is dried in a warm air dryer and then packaged. Project TSI-46-15. Unclassified. Sponsored by the Pitman-Dun Laboratories of the Frankford Arsenal. Contract DA 36-034-ORD-389RD. Contract DA 36-034-ORD-884RD.

Growth of ferrous sulfide on iron, by R. A. Meussner and C. E. Birchenall. Princeton University. James Forrestal Research Center, Princeton, N. J. May 1956. 39p photos, diagr, graphs, tables. Order from LC. Mi $3, ph $6.30. PB 124145

The rate of growth of ferrous sulfide on iron in sulfur vapor has been studied between 650 and 900°C. and between 10 and 500 mm. pressure of sulfur. Self-diffusion coefficients for the iron ions have been calculated approximately assuming that Wagner's theory of scale growth is applicable. It has been shown that unoxidizable inclusions slow down the rate of sulfidation. AD 96041. Metallurgy report no. 7. AF OSR TN 56-384. Contract AF 18(600)-967.

Hall effects of copper, nickel and the copper nickel alloys at low temperatures, by Philip Cohen. Carnegie Institute of Technology. Dept. of Physics, Pittsburgh, Pa. Jun 1955. 112p photo, diagrs, graphs, tables. Order from LC. Mi $6, ph $18.30. PB 124181

Gives the theory, instrumentation (cryostat, measuring and magnetic field apparatus) and experimental procedures used in a study of the Hall effect at temperatures from 2 to 300 degrees Kelvin. Based on a thesis by Philip Cohen. Contract Nonr-760(04), Technical report 1.

Investigation of the NiAl phase of nickel-aluminum alloys, by Edward M. Grala. U. S. National Advisory Committee for Aeronautics. Jan 1957. 33p photos, drawing, graphs, tables. Order as NACA TN 3828 from National Advisory Committee for Aeronautics, 1512 "H" St., N.W., Washington 25, D. C. PB 124388

The effects of composition and homogenization heat treatments on the room- and elevated-temperature mechanical properties of the cast NiAl intermetallic were determined. Small changes in composition within the NiAl phase field resulted in appreciable strength and hardness changes. Room-temperature hardness of alloys containing 25 to 35 percent aluminum exhibited a sharp minimum at 31.5 percent aluminum (stoichiometric NiAl). NACA TN 3828.

Photoelastic test of Bureau of Construction and Repair. Supplement, weld models 54-a, 54-b, 54-c, and 56-g, by R. B. Carleton. U. S. Naval Research Laboratory. Jan 1934. 15p graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 122722

1. Welds - Stresses 2. Welds - Tests 3. NRL H 1015.

Properties of constructional metals as a function of temperature and strain rate in torsion, by E. P. Klier, N. Feola, A. Viggiano and V. Weiss. Syracuse University, Syracuse, N. Y. Nov 1956. 201p photos, drawings, diagrs, graphs, tables. Order from OTS. $4. PB 121912

Seven structural metals have been tested in torsion at four strain rates and at selected testing temperatures. The torque-twist relationships have been determined at the three lowest strain rates. The experimental results confirm the trends which have been shown to arise from changes in the torque-twist diagrams for the respective materials in strain-rate intervals which are essentially unchanged for the different metals and which center on a strain rate of about 0.1 in./in./sec. Both solid and tubular specimens have been tested and for the tubular specimens the normal strain rate modification of the modulus of rupture is observed at high strain rates. Differences in the trends of the data for the solid and hollow specimens are attributed to the action of the heat sink which the core of the solid specimen

constitutes. It has been possible to explain the several types of properties vs. strain rate curves by means of alterations in the torque-twist curve arising from strain hardening, temperature increase in the specimen due to plastic working, and to strain rate modification of the yield strength. AD 110559. Project 7360, Task 73605. Covers work from Jul 1, 1954-Dec 31, 1955 under Contract AF 33(616)-2606. Appendix I. Calculations of the torsion values reported. - Appendix II. Interpretation of ductile brittle transitional behavior in terms of the flow curve. AF WADC TR 56-216.

Studies on solidification and contraction in steel castings: The rate of skin formation, by C. W. Briggs and R. A. Gezelius. U. S. Naval Research Laboratory. Aug 1935. 38p graphs. Order from LC. Mi $3, ph $6.30. PB 122663

Final report. See also reports NRL M 1026 (PB 120649) and NRL M 1108 (PB 120502).
1. Steel castings - Solidification - Research
2. Steel castings - Contraction - Research 3. NRL M-1182.

X-ray diffraction studies of the solid-liquid transition of sodium metal, by Bernard A. Kulp, Charles H. Shaw, and Rudolph Speiser. Ohio State University Research Foundation, Columbus, Ohio. Aug 1955. 69p photos, drawings, diagrs, graphs, tables. Order from LC. Mi $3.90, ph $10.80. PB 123935

The observations for both the melting and the solidification of the dispersed sample of sodium are explained as a particle size effect. Particle size distributions are obtained from the melting data and from the solidification data. The melting data predict a size range from about 1×10^{-6} cm to 2×10^{-4} cm radius, while the solidification data predict a size range from about 5×10^{-6} cm to 2×10^{-4} cm. The upper limit in each case was essentially determined by microscopic observation of the sample. The distribution curves are also somewhat different. However, considering that the theories for both the lowering of the melting point and the lowering of the freezing point are largely qualitative in nature the agreement is not unsatisfactory. In addition to this, some important characteristics of the solidification of the sample have been observed. These characteristics may be summarized as follows: (1), there is an undercooling which depends to some extent on the rate of cooling, (2), over part of the range of solidification the transformation is non-isothermal, but if the temperature is raised from a low value to a higher one, the transformation will, in time, proceed isothermally, (3), the transformation is reversible over part of its range, though there is hysteresis in the reversibility, and, (4) the transformation exhibits a "stabilization" effect. Thesis: Bernard A. Kulp, Ohio State University Research Foundation. Technical report 3. OSURF Proj 384. Contract N6 onr-22521, NR 017-606.

METEOROLOGY AND CLIMATOLOGY

Atmospheric turbulence investigation by sailplane. Final report under Contract AF 19(604)-1107, by P. B. MacCready, T. J. Lockart, R. J. Diamond and T. B. Smith. Meteorology Research, Inc., Pasadena, Calif. Mar 1956. 56p photos, diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 123927

A sailplane was used to make measurements of atmospheric turbulence under a variety of conditions. Continuous signals from an airborne accelerometer and a hot wire anemometer were recorded on a magnetic tape recorder, and reproduced later in the laboratory for statistical analyses of the frequency spectra of vertical and horizontal turbulence. A total of fifteen frequency spectra curves were analyzed from parts of the best five of the ten flights. The energy spectrum is measured by finding the mean square value of the voltage passing through a narrow band pass filter. A "rotating disk square integrator" was developed to yield this mean square value averaged over any time interval. AD 98701. AF CRC TR 56-279.

Experiment in stability and moisture analysis, by Dorothy L. Bradbury. Chicago. University. Dept. of Meteorology. Apr 1956. 35p maps, diagrs, tables. Order from LC. Mi $3, ph $6.30. PB 123121

The purpose of this study is to relate the observed patterns of clouds and precipitation to the integrated patterns of water vapor content and the convergence of water vapor into a developing extratropical cyclone, and, furthermore, to ascertain whether any useful relations exist between the patterns of precipitation and those of static stability and isallobaric systems. AF CRC TN 56-473. Contract AF 19(604)-1293, Scientific report 8.

Infrared emission spectrum of the atmosphere, by Raymond William Sloan. Ohio State University. Dept. of Physics and Astronomy, Columbus, Ohio. Mar 1956. 203p photos, diagrs, graphs, tables. Order from LC. Mi $9.30, ph $31.80. PB 123461

The present report gives a description of apparatus for measuring the infrared radiation in the wavelength interval between 4 μ and 15.5 μ reaching the earth's surface from the sky and gives the results obtained during the year 1954. AF CRC TN 56-474. OSURF Proj 587, Scientific report no. 3. Contract AF 19(604)-1003.

Lower tropospheric inversions at Ice Island T-3, by A. D. Belmont. McGill University. Arctic Meteorology Research Group., Montreal,

Canada. Aug 1955. 103p map, diagrs, graphs, tables. Order from LC. Mi $5.70, ph $16.80. PB 124661

The complete record of the first two years of radiosonde observations from the Polar Basin have been analyzed with respect to thermal inversions. An objective classification system was introduced to permit exact determinations of type, magnitudes of component layers, and frequencies of occurrence, of inversions. The method has general applicability to other portions of the radiosonde ascent. A new unit of inversion intensity was introduced and appears to be an improvement over the use of lapse rate. Some new relationships of inversion characteristics are presented, and a general qualitative theory is suggested to explain the differences found with previous theory. For other reports under this contract see PB 118175, 118797, 122363 and 122363s. Arctic Meteorology Research. Group Publication in Meteorology no. 4. AF CRC TN 56-680. Contract AF 19(604), 1141, Scientific report no. 2.

Mesometeorological analysis of atmospheric phenomena. Illinois. State Water Survey. Meteorologic Laboratory, Urbana, Ill. Contract DA 36-039-sc-64656. Dept. of the Army project 3-99-07-022. Signal Corps project 172B. Order separate reports described below from LC, giving PB number of each report ordered.

First quarterly technical report for the period 1 May - 31 Jul 1955, by J. C. Neill. Aug 1955. 9p. Mi $1.80, ph $1.80. PB 124262

Second quarterly technical report for the period 1 Aug - 31 Aug 1955, by Roy Blackmer. Nov 1955. 20p diagrs, graphs. Mi $2.40, ph $3.30. PB 124257

Third quarterly technical report for the period 1 Nov 1955 - 31 Jan 1956, by Roy Blackmer. Feb 1956. 25p diagrs. Mi $2.70, ph $4.80. PB 124552

Fourth quarterly technical report for the period 1 Feb - 30 Apr 1956, by Roy H. Blackmer, Jr. and Harold M. Gibson. May 1956. 24p map, diagrs. Mi $2.70, ph $4.80. PB 124259

Plasma oscillations and radio noise from the disturbed sun, by Roy W. Gould. California Institute of Technology. Electron Tube and Microwave Laboratory, Pasadena, Calif. Nov 1955. 132p diagr, graphs, tables. Order from LC. Mi $6.90, ph $21.30. PB 124273

Many investigators have suggested that plasma oscillations in the solar corona may be the source of large bursts of radio noise in the meter wavelength region. Two aspects of this problem are considered in this report: (a) the excitation of plasma oscillations by directed beams of charged particles, and (b) the conversion of energy in the longitudinal plasma oscillations to transverse electromagnetic waves by means of random inhomogeneities in electron density. Contract Nonr-220(13). CIT ETML TR 4.

Project Skyhook. Final report for the period 1 Sep 1953-31 Jul 1954 under Contract Nonr-875(00), Annex X, by R. F. Mautner and C. P. Merrell. General Mills, Inc. Engineering Research and Development Dept., Minneapolis, Minn. Jul 1955. 45p graphs (part fold), table. Order from LC. Mi $3.30, ph $7.80. PB 124201

Flights covered periods from Sept 1953-July 1954. General Mills supplied the balloons and various laboratories the scientific instruments. Considerable data was developed. AD 72187. Report 1434. Projects: 85002 and 85023. For reports under earlier Contract see PB 112477, 112994, 113729, 113853, 114769, 116160 and 117265.

Simplified falling-sphere method for upper-air density, by L. M. Jones and F. L. Bartman. Michigan. University. Engineering Research Institute. Dept. of Aeronautical Engineering, Ann Arbor, Mich. Jun 1956. 100p photos, drawings (1 fold), diagrs (fold), graphs (part fold), tables. Order from LC. Mi $5.40, ph $15.30. PB 123951

The successful development and field test of the small-sphere rocket experiment for upper-air density and temperature was carried out. The general aerodynamics of the method was applied specifically to the small-sphere case. An accelerometer for measuring drag acceleration directly was developed. A telemetering and ground-station system was designed, built, and operated. The Nike-Deacon rocket system was adapted to sounding purposes. Two flights, one carrying the complete experiment, were carried out. Densities to 260,000 feet and temperatures to 228,000 feet were obtained. The errors were evaluated. Project 2215. AF CRC TN 56-497. MU ERI Proj 2215-10-T. Contract AF 19(604)-999.

Solar, geomagnetic, and ionospheric phenomena as indices of solar activity, by Frederick W. Ward, Jr. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Geophysics Research Directorate, Bedford, Mass. Nov 1956. 88p diagr, graphs, tables. Order from OTS. $2.25. PB 121906

One facet of the problem of establishing or disproving a solar-weather relationship is investigated, namely, that of choosing an index of solar variability. The investigation covers three broad fields: solar physics, geomagnetism, and ionospherics. A number of possible measures of solar variability are studied to establish the de-

gree of their interrelationship, and the availability, reliability, and usefulness of the data published concerning them. AD 110221. AF CRC TR 56-213. AF GRD P 54.

Some relationships between the F_1 and the F_2 regions of the ionosphere, by A. P. Mitra. Pennsylvania State University. Ionosphere Research Laboratory, University Park, Pa. Nov 1955. 30p graphs, table. Order from LC. Mi $2.70, ph $4.80. PB 122358

Supplements scientific report no. 53 (PB 112888). 1. Ionosphere - Research 2. Ionosphere - F-layer - Analysis 3. Meteorology - Observations - Upper air 4. Contract AF 19(604)-1304 5. PSC IRL SR 79 6. AF CRC TN 55-1050.

Study of the earth's electrical field. Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y. Contract AF 19(122)-467. Order separate parts described below from LC, giving PB number of each part ordered.

Second quarterly report for period Aug 1 - Nov 1, 1951, by R. L. Ives. Nov 1951. 14p photos, diagrs. Mi $2.40, ph $3.30. PB 125061

AD 131338. For 1st, 5th, 8th-13th reports see PB 123142, 108441, 112157, 113586, 115167-115169, 116380. CAL RA 764-P-2.

Third quarterly report for period Nov 1, 1951 - Mar 1, 1952, by R. L. Ives. Apr 1952. 34p photo, diagrs, graphs. Mi $3, ph $6.30. PB 125062

ATI 170419. Some pages may not reproduce well. CAL RA 764-P-3.

Fourth quarterly report for the period Feb 1 - May 1, 1952, by R. L. Ives. Jun 1952. 55p photos, drawing, diagrs (part fold). Mi $3.60, ph $9.30. PB 125063

ATI 170544. CAL RA 764-P-4.

Sixth quarterly report for period Aug 1, 1952 - Nov 1, 1952, by David H. Garber. 6p. Mi $1.80, ph $1.80. PB 125064

AD 13198. CAL RA 764-P-6.

Seventh quarterly report for the period Nov 1, 1952 - Jan 31, 1953, by David H. Garber. Mar 1953. 9p. Mi $1.80, ph $1.80. PB 125065

AD 28624. CAL RA 764-P-7.

Final report, by David H. Garber and Seville Chapman. Jun 1955. 176p photos, drawings, diagrs, graphs, tables. Mi $8.10, ph $27.30. PB 125066 CAL RA-764-P-15. AF CRC TR 55-273.

Synoptic climatology of the Moscow Basin, by David I. Blumenstock and Olga Ph. Prozorowski. Rutgers University, New Brunswick, N. J. Apr 1956. 232p diagrs, graphs, tables, maps. Order from LC. Mi $10.20, ph $36.30. PB 124319

1. Meteorological research - Russia 2. Climate - Classification - Russia 3. Climatology - Research - Russia 4. Weather charts - Evaluation - Russia 5. Weather forecasting - Russia 6. Contract AF 19(604)-1004.

MINERALS AND MINERAL PRODUCTS

Improvement of sand testing techniques for shell mold and core sands, by P. J. Ahearn, F. C. Quigley, J. F. Wallace. U. S. Arsenal, Watertown, Mass. Rodman Laboratory. Jul 1956. 35p photos, drawings, graph, tables. Order from OTS. $1. PB 121412

The study indicates that the conventional tensile test briquettes for shell molds and sand cores yield inconsistent values, due largely to stress concentration attributable to the geometry of the specimen. A new design for these briquettes which minimizes the concentration of stresses at the critical testing zone demonstrated a higher apparent tensile strength for all sands tested, and improved reproducibility for rammed resin and oil-bonded sands. WAL RPL 13/1.

Molding sand testing technique - investigation of effect of rammer support on physical properties, by R. E. Morey. U. S. Naval Research Laboratory. Jul 1944. 29p diagrs, graph, tables. Order from LC. Mi $2.70, ph $4.80. PB 123391

1. Rammers, Sand 2. Sands, Molding - Testing methods 3. NRL M-2321.

Studies on European molding sands, by R. A. Gezelius. U. S. Naval Research Laboratory. Jan 1934. 28p photos, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 122712

1. Sands, Molding - Tests 2. NRL M 1016.

PACKING AND PACKAGING

Packaging and packaging materials. U. S. Office of Technical Services. Mar 1954. 6p. Order from LC. Mi $1.80, ph $1.80. PB 125240

1. Packaging - Bibliography 2. Packaging materials - Bibliography 3. CTR 72.

PERSONNEL APTITUDE TESTING

Aviation mechanic testing program in the operational commands, by Howard J. Hausman and Joseph E. Marsh. U. S. Air Force. Air Research and Development Command. Air Force Personnel and Training Research Center. Personnel Research Laboratory, Lackland Air Force Base, Texas. May 1956. 23p table. Order from LC. Mi $2.70, ph $4.80. PB 124634

A method for determining where training is most critically needed, and who is most in need of training, was considered an essential step in providing information for the planning of a training program. Diagnostic testing instruments answer this purpose. Accordingly, the purpose of this report is to describe the development and use of some of these instruments. Project no. 7950, Task no. 79500. AF PTRC TN 56-53.

Factorial analysis of complex psychomotor performance, by Edwin A. Fleishman and Walter E. Hempel, Jr. U. S. Air Force. Air Research and Development Command. Air Force Personnel and Training Research Center. Skill Components Research Laboratory, Lackland Air Force Base, Texas. Apr 1954. 22p tables. Order from LC. Mi $2.70, ph $4.80. PB 124632

This report describes a graphical process of finding solutions for a particular type of nonlinear differential-difference equations. This method is similar to techniques that have been used with pure differential equations, but certain modifications are necessary. In addition, there is an appendix extending an analysis begun in Report No. 9 and making use of the graphical technique developed here. Project no. 7703, Task no. 77084. AF PTRC TR 54-12.

Research study of the prediction of adaptability to the Navy, by William A. Gorham, William S. Barker and Thomas E. Hanlon. Psychological Research Associates, Washington, D. C. May 1955. 57p tables. Order from LC. Mi $3.60, ph $9.30. PB 124055

From the results obtained it is concluded that: The present psychiatric interview given in the initial screening examination of each recruit has no statistical relationship to later adjustment; and that those who are unfit for service are being effectively screened out. In addition biographical information on the Standard Medical Screening Form A has minimal value for predicting adjustment. PRA report 55-4. Contract Nonr-1484(00), Technical report 1.

Statistical description of criterion measures for USMC junior officers, by Walter L. Wilkins. St. Louis University. Dept. of Psychology, St. Louis, Mo. Aug 1955. 42p tables. Order from LC. Mi $3.30, ph $7.80. PB 122938

1. Officer performance records - Evaluation 2. Military training - Methods 3. Psychological tests - Rating scales 4. Contract N7 onr-40802, NR-151-092, Technical report 5.

Submarine personnel selection, by Clark L. Wilson. Management and Marketing Research Corporation, Los Angeles, Calif. May 1955. 5p. Order from LC. Mi $1.80, ph $1.80. PB 124056

The purpose of this project was to provide a criterion of the shipboard performance of recent Submarine School graduates so that two selection procedures, currently employed at the Enlisted Basic Submarine School, New London, could be validated. These were the U. S. Medical Research Laboratory personnel assessments, a clinical prediction of the candidates' medical and psycho-sociological fitness for submarine duty, and the MRL Personal History Form, a biographical questionnaire concerned with a wide variety of personal background information. For Technical reports 1-2 see PB 119040 and 118030. Contract Nonr-1113(00), NR 151-141, Final summary report. NAVMED Proj. 002-013.

PHOTOGRAPHIC AND OPTICAL GOODS

Applications of the Luneberg lens, by J. I. Bohnert and H. P. Coleman. U. S. Naval Research Laboratory. Mar 1957. 19p diagrs. Order from OTS. 50 cents. PB 121809

A number of significant attempts at fabrication of the Luneberg lens have been made both at NRL and elsewhere. Some of these attempts have resulted in lenses of practical applicability, if suitable limitations are accepted. A brief resumè of possible applications of the lens to problems in the field of microwave radar is given, and the state of the art regarding the fabrication of the lens is indicated. NRL R 4888.

Evaluation of the film: Military police in emergencies (Riot control) TF 19-1701. Pennsylvania State University, University Park, Pa. Oct 1954. 39p diagrs, graph, tables. Order from LC. Mi $3, ph $6.30. PB 124650

Project 20-E-4. Instructional film research program. 1. Motion pictures, Educational - Effectiveness 2. Military police - Training equipment 3. Contract N6 onr-269 4. SDC TR 269-7-52.

Exploratory studies in the use of pictures and sound for teaching foreign language vocabulary, by

J. H. Grosslight and Charles J. McIntyre. Pennsylvania State University, University Park, Pa. Aug 1955. 58p photos, tables. Order from LC. Mi $3.60, ph $9.30. PB 124592

Project 20-E-4. Instructional film research program.
1. Motion pictures, Educational - Effectiveness
2. Teaching methods 3. Learning - Theory
4. Contract N6 onr-269 5. SDC TR 269-7-53.

Profile analysis and its effect on learning when used to shorten recorded film commentaries, by Richard M. Fletcher. Pennsylvania State University, University Park, Pa. Aug 1955. 28p photo, diagr, graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 124593

Project 20-E-4. Instructional film research program.
1. Motion pictures, Educational - Effectiveness
2. Contract N6 onr-269 3. SDC TR 269-7-55.

Raindrop camera, by Douglas M. A. Jones and Lawrence A. Dean. Illinois. State Water Survey. Meteorologic Laboratory, Urbana, Ill. Dec 1953. 22p photos, diagrs. Order from LC. Mi $2.70, ph $4.80. PB 124222

A camera to photograph raindrops incorporating simple optical devices and electronic flash equipment is described. A discussion of measurement accuracy is given and sources of measurement error are evaluated. It is shown that the camera is capable of measuring precipitation particles larger than 0.5 mm to an accuracy of 0.3 mm. Examples of actual photographs are presented with discussions of the particles pictured. It is concluded that the camera is capable of performing the task for which it was designed. Suggestions for future work are given. Dept. of the Army project: 3-99-07-022. Signal Corps project: 124-172B. Contract DA 36-039-sc-42446, Research report 3.

Star calibration procedures for CZR-1 cameras, by E. Stern. U. S. Air Force. Air Research and Development Command. Missile Test Center, Patrick Air Force Base, Fla. Aug 1956. 28p photos, (fold) drawing, diagrs, tables. Order from LC. Mi $2.70, ph $4.80. PB 124122

A test was designed to record star trails from different parts of the sky with the CZR-1 camera in order to evaluate the feasibility of CZR-1 dial orientation and to obtain unbiased statements of the dial data reliability. A venetian-blind type shutter and a driver-sequencer for its control were designed and built. Results show that the method employed is feasible for star photography with simultaneous introduction of time identification into the trails. AD 96614. AF MTC TN 56-62.

Test of the polarization of light at sea, by E. O. Hulburt. U. S. Naval Research Laboratory. Nov 1933. 18p photos, diagr, graph. Order from LC. Mi $2.40, ph $3.30. PB 122725

1. Light - Polarization 2. NRL H-1003.

Use of lead filters in X-ray radiography of steel sections in the range 100-220 KV. I. Study of effective ranges, by Herman F. Kaiser, Arthur L. C. Christenson and Robert H. Hafner. U.S. Naval Research Laboratory. Dec 1941. 58p photos, drawing, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 122730

1. Steel - Radiography 2. Filters, X-ray
3. Filters, Photographic - Tests 4. Photography, X-ray 5. Steel - X-ray tests 6. NRL M-1828.

Use of the Kelsh plotter, by Allen C. Gunn. U. S. Air Force. Aeronautical Chart and Information Center. Air Photographic and Charting Service, St. Louis, Mo. Apr 1955. 53p. Order from LC. Mi $3.60, ph $9.30. PB 124756

This technical report provides the instructions necessary for the operation, maintenance and adjustment of the Kelsh Plotter. It furnishes background information on the theory and practice of the procedures described and is intended to be used as a training manual as well as a reference handbook on this subject. AF ACIC TR 37.

Validity of pictorial tests and their interaction with audio-visual teaching methods, by Edwin F. Lefkowith. Pennsylvania State University, University Park, Pa. Aug 1955. 20p photo, diagr, tables. Order from LC. Mi $2.40, ph $3.30. PB 124591

Project 20-E-4. Instructional film research program.
1. Motion pictures, Educational 2. Psychological tests 3. Teaching methods 4. Contract N6 onr-269 5. SDC TR 269-7-49.

PHYSICS

General

Addition theorems for the functions of the paraboloid of revolution, by Harry Hochstadt. New York. University. Institute of Mathematical Sciences. Division of Electromagnetic Research. May 1956. 24p. Order from LC. Mi $2.70, ph $4.80. PB 123114

AD 87063.
1. Bodies of revolution - Theory 2. Mathematical equations and solutions 3. Contract AF18(600)-367 4. NYU RR BR 18 5. AF OSR TN 56-190.

Analysis of gas flow systems for dynamic control purposes, by W. K. McGregor, Jr., R. W. Messick, D. W. Russell, and L. F. Burns. U. S. Air Force. Air Research and Development Command. Arnold Engineering Development Center, Tullahoma, Tenn. Apr 1956. 57p. Order from LC. Mi $3.60, ph $9.30. PB 122389

This report presents results of an investigation of the problems involved in the design of an automatic pressure control system for the Engine Test Facility and Ram-Jet Addition, Arnold Engineering Development Center. Methods are developed for the prediction of frequency and indicial responses of gas flow systems on both a lumped parameter and a distributed parameter basis. Examples are presented in the appendices to add clarification to the method and its implications. The report correlates existing knowledge of gas flow systems as a basis for formulating an inclusive reference to be used in the design of a gas flow system having desirable dynamics and in the design of control systems. AD 88130. Appendix 1. Compressible flow through a control valve. - Appendix 2. Determination of the transfer function of a typical gas flow system. - Appendix 3. Numerical calculation of the response characteristics. AF AEDC TR 55-11.

Analysis of laminar heat transfer in wedge-shaped passages, by E. R. G. Eckert, T. F. Irving, Jr. and J. T. Yen. Minnesota. University. Dept. of Mechanical Engineering. Heat Transfer Laboratory, Minneapolis, Minn. Apr 1956. 58p diagrs, graphs, tables. Order from OTS. $1.50. PB 121781

Analyses of forced convection heat transfer in circular sector and open wedge passages with laminar fully developed flow are presented. The boundary conditions of constant peripheral wall temperature and constant wall to fluid temperature gradient around the periphery are considered. The basic equations and boundary conditions are reviewed. Four solutions are presented for the different boundary conditions described above and for the several geometries. Local peripheral heat flows and heat transfer coefficients are calculated and plotted for ducts having a variety of apex angles. A sample problem illustrates the differences in the overall heat transfer characteristics and the tendency to form local hot spots when a circular sector duct has the two extreme boundary conditions. A further comparison is presented between a circular sector duct and a circular duct which both have to perform the same heat transfer task. AD 110451. Project 3080, Task 70143. AF WADC TR 56-98. Contract AF 33(616)-474.

Analysis of variance. Iowa State College. Statistical Laboratory, Ames, Iowa. Contract AF 33(616)-2145. Project 7060, Task 70418. Order from OTS, giving PB number of each part ordered.

Vol. I: Preliminary tests, pooling, and linear models. Preliminary tests of significance and pooling procedures for certain incompletely specified models, by Helen Bozivich, T. A. Bancroft, H. W. Hartley and David V. Huntsberger. Mar 1956. 148p graphs, table. $3.75. PB 121333

Part I considers certain pooling procedures with regard to the power and size resulting from them. The theory is based on certain "incompletely specified" linear models. This work is an extension of the investigations of Paull and Bechhofer for the component of variance model and the linear hypothesis model respectively. Based on these curves, recommendations are made for the guidance of research workers employing these pooling procedures. The formulas for the power and size of the pooling procedure in a component of variance model are derived in Appendix 4. Those for a linear hypothesis model are derived in Appendix 5. Part II describes and illustrates a generalized pooling procedure which utilizes a weighted estimator. The efficiencies of the weighting procedure, for a particular weighting function, and of the sometimes-pool procedure are compared relative to the never-pool procedure in the case of normally distributed estimators. It is shown that for this case the weighting procedure has greater control over possible disturbances resulting from pooling than does the sometimes-pool procedure. Problems concerned with the selection of weighting functions are discussed. Third of a series of reports on analysis of variance. AF WADC TR 55-244, Vol. I.

Vol. II: Preliminary tests, pooling, and linear models. Derived linear models and their use in the analysis of randomized experiments, by M. B. Wilk and O. Kempthorne. Mar 1956. 132p tables. $3.50. PB 121334

The development and interpretation of linear models for randomized experiments are presented. A number of standard designs (completely randomized, randomized-block, latin square, split-plot) are considered in connection with rather general experimental situations. The order of presentation is in the direction of increasing complexity of design and experimental situation, and of diminishing assumptions. The central features of both the philosophy and the detail of the investigations underlying the work in Volume II are the concept of "experimental unit" and the use of randomization in the design and analysis of experiments. Appendix I gives a discussion of these concepts. The main results in this volume are given in the derived models and the expectations of analysis of variance mean squares. AF WADC TR 55-244, Vol. II.

Buckling of a thin circular ring-plate under a thermal impulse, by Tsu-Tao Loo. Rensselaer Polytechnic Institute. Dept. of Mechanics, Troy, N. Y. Dec 1955. 17p. Order from LC. Mi $2.40, ph $3.30. PB 124816

The thermal buckling of a thin circular ring-plate is studied. It is assumed that the plate is given a sudden thermal impulse uniformly distributed along the edge and through the thickness of the plate. The cases of a ring-plate under thermal heating along the internal edge and thermal cooling along the external edge are considered in the analysis. ONR Project NR 064-405. Contract Nonr-591(02), Technical report no. 14.

Computation of parameters of ellipses by approximations, by Joel S. Greenberg. U. S. Air Force. Air Research and Development Command. Rome Air Development Center, Griffiss Air Force Base, Rome, N. Y. Nov 1956. 13p diagrs, table. Order from LC. Mi $2.40, ph $3.30. PB 124779

The curve traced out by a missile in free flight in the presence of the earth's gravitational field is an ellipse. If two points on the trajectory and the time elapsed between points are known, the parameters of the ellipse can be determined from a set of three simultaneous equations. These equations cannot be solved explicitly. This report presents a method (based on approximating an ellipse with a parabola) whereby the parameters of the ellipse can be solved explicitly. AD 97802. AF RADC-TN-56-333.

Differential equations with a discontinuous forcing term, by Donald Wayne Bushaw. Stevens Institute of Technology. Experimental Towing Tank, Hoboken, N J. Jan 1953. 82p diagrs. Order from LC. Mi $4.80, ph $13.80. PB 124996

Thesis - Princeton University, Jun 1952.
1. Equations, Differential - Linear 2. Equations, Differential - Non-linear 3. Equations, Differential - Theory 4. SIT ETT 469.

Electrical cleanup of gases. Quarterly report under Contract no. AF 18(600)-1049 for the period Apr-Jun 1956, by L. J. Varnerin, Jr. and J. H. Carmichael. Westinghouse Electric Corp. Westinghouse Research Laboratories, East Pittsburgh, Pa. Jul 1956. 8p graphs. Order from LC. Mi $1.80, ph $1.80. PB 124846

Research report 71F191-R9. For 1st-7th reports see PB 116569-116571, 117718, 118391, 119370 and 120232.
1. Gases - Ionization - Measurement 2. Helium - Ionization - Measurement 3. Contract AF 18(600)-1049, Report 9.

Fractional replication for mixed series, by Milton Morrison. Stevens Institute of Technology. Experimental Towing Tank, Hoboken, N. J. Jul 1955. 31p graphs, tables (part fold). Order from LC. Mi $3, ph $6.30. PB 124487

In this report, a method of general applicability is developed for forming fractionally replicated designs for mixed series. The designs for half-replicates of $2^4 \times 3$ and $2^4 \times 4$ factorials are developed in detail; the analysis of variance is given and estimates of the effects and missing observations are discussed. The method is applied to a set of experimental data in which a full $2^4 \times 3$ replication was taken. The numerical results of the full replication and the hypothetical half-replication are calculated and compared. E.T.T. Project FT 1658. SIT ETT 575. Contract Nonr-263(08).

Graphical solution of certain nonlinear differential-difference equations, by W. J. Cunningham. Yale University. Dunham Laboratory of Electrical Engineering, New Haven, Conn. Nov 1955. 39p graphs. Order from LC. Mi $3, ph $6.30. PB 124274

Appendix: "Simultaneous oscillation at several frequencies", extends an analysis begun in Report no. 9.
1. Equations, Differential - Nonlinear 2. Graphic methods 3. Oscillators, Frequency - Mathematical analysis 4. Contract Nonr-433(00), Report no. 11.

Growth of disturbances in a flame-generated shear region, by Perry L. Blackshear, Jr. U. S. National Advisory Committee for Aeronautics. Nov 1956. 151p photos, drawings, diagrs, graphs, tables. Order as TN 3830 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124389

This paper contains a stability analysis of the flow field that arises when a flame is anchored in a duct, and an experimental examination of the growth of disturbances imposed on an anchored V-flame in a duct. The stability analysis shows that the flow is stable to all symmetric disturbances, and unstable to antisymmetric disturbances having wavelengths greater than the critical wavelength. Thesis - Case Institute of Technology. NACA TN 3830.

Improved approximations to differential equations by difference equations, by W. Robert Mann, C. L. Bradshaw and J. Grady Cox. North Carolina. University, Chapel Hill, N. C. Jan 1956. 13p tables. Order from LC. Mi $2.40, ph $3.30. PB 122411

The purpose of this paper is to illustrate a method for approximating differential equations with difference equations more closely than is done with the usual finite difference approaches, but without

introducing higher order differences. This paper is largely taken up with an illustration of the usefulness of the method in the solution of a two-region, two-dimensional, one-group reactor problem which is simple enough to be solved analytically. Numerical data, obtained on the ORACLE of the Oak Ridge National Laboratory, enable one to compare the analytical solution for the buckling with values obtained by the ordinary difference methods and those obtained by the refined process presented in this paper. The results show that the refined process gives significantly greater accuracy than the ordinary difference methods, and the cost in increased labor is comparatively small. AD 81049. AF OSR TN 56-57. Contract AF 18(600)-1139.

Investigation of transient pool boiling due to sudden large power surge, by Robert Cole. U. S. National Advisory Committee for Aeronautics. Dec 1956. 44p photos, diagrs, graphs, tables. Order as TN 3885 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124428

The transient heat-transfer characteristics of a system composed of a nickel ribbon immersed horizontally in a pool of water were determined at atmospheric pressure for average heat-generation rates of 3, 10, and 20 x 10^6 Btu/(hr)(sq ft), and fluid bulk temperatures from 76° to 203°F. The power surge duration was limited to 30 milliseconds. Transient heat-transfer coefficients and critical-heat-flux values are tabulated. NACA TN 3885.

On conjugate states of plane strain, by William Prager. Brown University. Graduate Division of Applied Mathematics, Providence, R. I. Nov 1955. 7p diagrs, graph. Order from LC. Mi $1.80, ph $1.80. PB 124278

The dual correspondence between states of plane strain in incompressible elastic solids, which was recently described by Hill (1955), is shown to be a special case of a general dual correspondence between states of plane strain in pairs of incompressible solids such that the relation between the stresses and the strains in one solid has the same mathematical structure as the relation between the strains and the stresses in the other. GDAM C11-4. Contract Nonr-562(10), NR 064-406.

On minimizing and maximizing a certain integral with statistical applications, by Jagdish Sharan Rustagi. Stanford University. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Oct 1955. 55p diagr, graph. Order from LC. Mi $3.60, ph $9.30. PB 124824

The minimizing problem is considered in Part I of this paper, the maximum problem in Part II. The results have many applications, some of which are discussed here. They might be used in deriving many classical inequalities, particularly of the Tchebycheff type and in obtaining the bounds for the efficiency of some important non-parametric tests. SU AMSL TR 32.

On singular and regular Cauchy problems, by J. B. Diaz. Maryland. University. Institute for Fluid Dynamics and Applied Mathematics, College Park, Md. Jul 1956. 16p. Order from LC. Mi $2.40, ph $3.30. PB 124623

The singular and regular Cauchy problems in question are relative to the Euler-Poisson-Darboux equation (initial conditions being given on the singular plane $t = o$ and the regular plane $t = t_o > o$). This account reviews the progress made at Maryland on the subject, and was presented at the Conference in Differential Equations held at the University of California at Berkeley, June 1955. AD 95440. Technical note BN-79. AF OSR TN 56-354. Contract AF 18(600)-573.

On subharmonic functions and differential geometry in the large, by Alfred Huber. Maryland. University. Institute for Fluid Dynamics and Applied Mathematics, College Park, Md. May 1956. 93p. Order from LC. Mi $5.40, ph $15.30. PB 124678

AD 88981. Technical note BN-72.
1. Harmonic functions 2. Mathematical equations and solutions 3. Equations, Differential 4. Sequential analysis 5. Contract AF 18(600)-573 6. AF OSR TN 56-261.

On the characteristic frequencies of a symmetric membrane, by G. Polya. Stanford University. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Jul 1955. 16p table. Order from LC. Mi $2.40, ph $3.30. PB 124482

1. Mathematical functions - Symmetrization - Theory 2. Mathematical equations and solutions 3. Contract Nonr-225(11), NR 041-086 4. SU AMSL TR 40.

On the formal theory of collision and reaction processes, by Bruno Zumino. New York University. Institute of Mathematical Sciences. Division of Electromagnetic Research. Mar 1956. 33p diagr. Order from LC. Mi $3, ph $6.30. PB 122994

The aim of this paper is to investigate the formal theory of processes like scattering of particles, or the capture and the emission of a particle by a system. It is concerned especially with the case when the energy of the incident particle is close to the energy with which the particle can be bound, so that resonance phenomena occur. The problem is to evaluate the effect of a perturbation on such an unperturbed system and to solve the corresponding time-dependent Schrödinger problem, giving also asymptotic formulas for large values of the

time. AF CRC TN 56-459. NYU RR CX-23. Contract AF 19(122)-463.

On the gradient of harmonic polynomials, by G. Szego. Stanford University. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Dec 1955. 51p. Order from LC. Mi $3.60, ph $9.30. PB 124294

The report is concerned with the case $Z_0 = 0$. It is proved that $\mu(n, o) = u_2(n) = \frac{2}{m+1} \operatorname{ctg} \frac{\pi}{2(m+1)}$. Here $n = 2m$ or $n = 2m-1$, according as n is even or odd. Contract N onr-225(11), NR 041-086. SU AMSL TR 46.

On the use of the harmonic linearization method in the automatic control theory (K voprosu o primenenii metoda harmonicheskoi linearizatsii v teorii regulirovaniya), by Egor Paul Popov. Jan 1957. 6p. Order as TM 1406 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124452

This paper considers the use of harmonic linearization as applied to the analysis of nonlinear automatic control systems. This approach, which has been proven in practical engineering applications, involves the replacement of a nonlinear equation by a linear equation. In establishing the method a small parameter is considered which makes it possible to speak with some degree of approximation of the solution of the new equation to that of the given linear equation. Thus, the mathematics of nonlinear mechanics is brought to bear on the problem by explaining and extending the usefulness of automatic control theory and nonlinear systems. Translated by S. Reiss from Doklady Akademiia Nauk (SSSR) v. 106, no. 2, 1956, p. 211-214. NACA TM 1406.

On the vibration of elastic bodies having time-dependent boundary conditions, by J. G. Berry and P. M. Naghdi. Michigan. University. Engineering Research Institute, Ann Arbor, Mich. Apr 1955. 12p. Order from LC. Mi $2.40, ph $3.30. PB 123746

This paper contains a method of solution for the motion of any finite, vibrating, elastic body having arbitrary time-dependent boundary conditions. It consists essentially in transforming the original problem into an equivalent forced vibration problem with homogeneous boundary conditions. Under special circumstances the procedure reduces to those given previously. MU ERI Proj 2150-3-T. Contract Nonr-1224(01), NR 064-408, Report no. 3.

On transition from laminar to turbulent flow, by Francis R. Hama, James D. Long and John C. Hegarty. Maryland. University. Institute for Fluid Dynamics and Applied Mathematics, College Park, Md. Aug 1956. 54p photos, drawings, graphs. Order from LC. Mi $3.60, ph $9.30 PB 124597

Water-tank observation of the flow phenomena associated with boundary-layer transition has confirmed that a two-dimensional discrete vortex line, which is considered to be the consequence of an amplified perturbation wave, has a strong tendency in shear flows to form a three-dimensional vortex loop with a marked transverse wave length. The formation and development of the vortex loop are found to be the essential features preceding the origination of a turbulence spot, which takes place near the top of the vortex loop and near the outer edge of the boundary layer, and the guiding principle of laminar-to-turbulent transition not only in boundary layers but in wakes and in jet boundaries as well. As an application, an efficient turbulence-stimulation device is proposed. AD 95817. Technical note BN-81. Project R-353-20-17. AF OSR TN 56-381. Contract AF 18-(600)-1014.

On univalent mappings by solution of linear elliptic partial differential equations, by Paul W. Berg. Stanford University. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Oct 1955. 16p. Order from LC. Mi $2.40, ph $3.30. PB 124835

In 1936 H. Lewy showed that even for plane harmonic mappings (mappings by pairs of not necessarily conjugate harmonic functions) univalence implies the non-vanishing of the Jacobian. This statement, however, cannot be made quantitative. It is easy to construct univalent harmonic mappings of the unit disc onto itself which leave the origin fixed but have arbitrarily small Jacobian at the origin. Nevertheless, the weaker statement that the first partial derivatives of such a mapping do not all vanish at a point can be made quantitative. This was proved by E. Heinz in a recent paper. The theorem discussed in this paper extends this result to mappings by solutions of general second order linear elliptic systems of partial differential equations with a common principal part. SU AMSL TR 43. Contract Nonr-225(11), NR 041-085.

Problems and methods in partial differential equations. Part I: Origin and evolution of the theory, by F. J. Bureau and E. J. Pellicciaro. Duke University. Dept. of Mathematics, Durham, N. C. Aug 1956. 148p diagrs. Order from LC. Mi $7.20, ph $22.80. PB 124631

This report represents a group of lectures given at Duke University during the academic year 1955-56. Their purpose was to give a resumé of some topics in the theory of partial differential equations, with emphasis on the Cauchy problem. The first part is concerned with problems and methods which were introduced during the time up to about 1900. An appendix on the Laplace

transform has been added, the contents of which are confined to meet only the requirements of these lectures. The second part introduces the theory of the finite part and the logarithmic part of some divergent integrals and applies it to the study of the wave equation, the damped wave equation, and the singular equation of Euler-Poisson-Darboux. AD 96784. AF OSR TN 56-441. Contract AF 18(600)-1341.

Reflection laws of linear differential equations of mixed type, by Y. W. Shen. Wayne University, Detroit, Mich. Aug 1956. 32p. Order from LC. Mi $3, ph $6.30. PB 124643

AD 96057. Project R-354-10-19.
1. Equations, Differential - Linear 2. Mathematical equations and solutions 3. Contract AF 18-(600)-437 4. AF OSR TN 56-399.

Some contributions to the problem of the extension of positive definite functions. On infinitely differentiable positive definite functions, by Allen Devinatz. Connecticut. University, Storrs, Conn. Oct 1955. 46p. Order from LC. Mi $3.30, ph $7.80. PB 123117

Unclassified.
1. Mathematical functions 2. Contract AF 18(600)-1223 3. AF OSR TN 55-421.

Stochastic model for the growth of stem rust, by Joseph Daly. Stanford University. Applied Mathematics and Statistics Laboratory. Aug 1955. 23p table. Order from LC. Mi $2.70, ph $4.80. PB 123204

The report is intended to provide a theoretical basis for the observation that the growth law is approximately exponential and to extend the result to the case in which the growth process is subject to a simple type of chance variability. Continuation of work conducted under Contract DA 18-35-CML-2704. Contract N6 onr-25140 (NR 342-022). SU AMSL TR 31.

Study of the effect of nonnormality on sampling distributions of the range, by Landis G. Gephart. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Aeronautical Research Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Mar 1955. 163p graphs, tables. Order from LC. Mi $7.80, ph $25.80. PB 123937

Thirteen distributions were prepared in a form suitable for sampling. The distributions utilized were the normal, four Pearsonian Type III, and eight specified by Edgeworth series. Effects of non-normality on the range were estimated from sampling distributions composed of ranges of 2,000 samples. Sample sizes of 3, 5, 7, and 10 were investigated for each of the above mentioned thirteen populations. Summary type results are given. AD 76799. Project 7060, Task 70417. AF WADC TR 55-128.

Tables of scattering functions for spherical colloidal particles. 2nd appendix to Technical report 2, by Max Krolik and Wilfried Heller. Wayne University. Chemistry Dept., Detroit, Mich. Sep 1955. 8p tables. Order from LC. Mi $1.80, ph $1.80. PB 123739

Supplement to technical report no. 2 (PB 117034). Technical report 14.
1. Tables, Mathematical 2. Particles, Charged - Scattering - Tables 3. Contract Nonr 736(00), Project NR 330-027, Technical report 14.

Unified theory of information, by Kerns H. Powers. Massachusetts Institute of Technology. Research Laboratory of Electronics. Feb 1956. 110p diagrs, graphs. Order from LC. Mi $5.70, ph $16.80. PB 124295

The probabilistic theory of information is extended to processes involving the most general probability distributions. A unified definition for the amount of concomitant information, which takes the form of a functional of the a priori and a posteriori measures, is introduced. This definition is sufficiently general to be applied to a theory that includes both the discrete and continuous theories as special cases. The definition is applied in a study of the information associated with the realizations of a stochastic process. A brief investigation is made of the problems of communication in the presence of noise and through linear networks. Report is identical with a thesis submitted to the Dept. of Electrical Engineering, MIT, 1956. MIT RLE TR 311.

Zero-pressure thermodynamic properties of some fifteen technically important gases, by Serge Gratch. Pennsylvania. University. Thermodynamics Research Laboratory, Philadelphia, Pa. Jun 1950. 87p graphs, tables. Order from LC. Mi $4.80, ph $13.80. PB 124957

This report presents definitive values of the zero-pressure thermodynamic properties of the stable, naturally occurring isotopes and the normal isotopic mixtures of the following monatomic gases: H, He, C, N, O, F, S, Cl, A, Br, I, and carbon dioxide, diatomic nitrogen, and carbon monoxide. These values were computed by the methods of statistical mechanics and quantum mechanics. The present physical accuracy of all values except for CO_2 is indicated by charts of estimated uncertainties. The calculated values are in satisfactory agreement with those obtained from calorimetric and acoustic velocity measurements in all cases in which the latter are available. ATI 79488. Contract N6 onr-24907.

Electronic states of molecules. III: The electronic structure of BH, by R. C. Sahni. University of Western Ontario. Dept. of Physics, London, Ontario, Canada. Oct 1955. 25p tables. Order from LC. Mi $2.70, ph $4.80. PB 122356

The calculation of the wave function of the ground state ($1\Sigma^+$) of the BH molecule, by the self-consistent field (SCF) molecular orbital (MO) method, is reported together with its ionization potentials, dipole moment, total energy, and the binding energy. For these calculations, the interactions of all the electrons have been included explicitly, and all integrals have been computed exactly at the internuclear equilibrium distance, 1.2325A, of BH. The electron distribution analysis is carried out to get intimate insight into the distribution of charges around and between the nuclei, and to determine the bonding and antibonding nature of MO's. For parts 1 and 2 see PB 117276 and PB 118725. AF CRC TN 55-874. Contract AF 19(122)-470, Scientific report 22.

Emissivity of hydrogen atoms at high temperatures, by Henry Aroeste and William C. Benton. California Institute of Technology. Daniel and Florence Guggenheim Jet Propulsion Center, Pasadena, Calif. May 1955. 22p graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 124035

Report uses results of a thesis submitted by William C. Benton.
1. Atomic power - Research 2. Hydrogen - Thermionic emissions 3. Hydrogen - Spectrum analysis 4. Contract Nonr-220(03), NR 015-401, Technical report 16.

Liquid propane bubble chamber, by J. Leitner, N. Samios, M. Schwartz and J. Steinberger. Columbia University. Physics Dept. Nevis Cyclotron Laboratories, Irvington-on-Hudson, N. Y. May 1955. 11p photo, drawing, diagr. Order from LC. Mi $2.40, ph $3.30. PB 124065

A glass and metal liquid propane bubble chamber is described. A piston type expansion mechanism permits fast recompression and consequently, large duty cycles. Dark field illumination provides good contrast and uniformity at large stereo angles. The use of plates within the sensitive volume is discussed. CU-84-55-ONR-1-Physics. Nevis-10. R-105. CU 84. Contract N6 ori-110, T. O. 1.

New tables of Mie scattering functions for spherical particles. Part 6: Total Mie scattering coefficients for real refractive indices, by Rudolf B. Penndorf. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Geophysics Research Directorate, Bedford, Mass. Mar 1956. 111p graphs, tables. Order from OTS. $3. PB 121905

This report is based on extensive computations of the total Mie scattering coefficient K using the IBM 701 Electronic Data Processing Machine. The detailed results show very clearly the nature and the complexity of the scattering function. The theory, the computations and the results have been extensively discussed. Included is also a list of all the tables and all the published reliable K values for real refractive indices. Finally an empirical method is outlined for the computation of K for an α and any arbitrary n. The method is based on the existing data and one can compute using it the phase and amplitude values of a smoothed K function to about $\pm 3\%$ or better. Based on this empirical method, K values are listed for selected refractive indices. AD 98772. For Part 5 see PB 114180. AF CRC TR 56-204(6). AF GRD P 45.

Quarterly progress report no. 20, for the period Jan 1-Mar 31, 1955 under Contract AF 33(038)-20681. Texas. University. Nuclear Physics Laboratory, Austin, Texas. Mar 1956. 14p table. Order from LC. Mi $2.40, ph $3.30. PB 124020

Contents: 1. Cockcroft - Walton apparatus, by E. W. Bennett. - 2. Coulomb excitation of heavy nuclei, by J. C. Groseskreutz. - 3. Calculations of the $O^{16}(d, p) O^{17}$ stripping reaction, by E. V. Ivash. - 4. Deuteron-induced reactions leading to N^{16}, by E. L. Hudspeth (Abstract only. Paper presented at the Houston meeting of the American Physical Society, Feb 1956 and printed in the Bulletin of the American Physical Society for that meeting). - 5. Position annihilation studies, by E. W. Millett. - 6. Low temperature studies, by E. W. Millett. - 7. Theoretical excitation curves for $C^{14}(d, p)C^{15}$, by W. W. Clendenin.

PHYSIOLOGY

Factors in, variability in, and prediction of regional sweating rates of humans, by Iain D. Ferguson, Margaret L. Christensen, Joseph G. Kappel and Alrick B. Hertzman. St. Louis University. School of Medicine, Dept. of Physiology, St. Louis, Mo. Dec 1956. 44p tables. Order from OTS. $1.25. PB 121923

Two factors affecting regional sweating rates were isolated. These factors vary in their amount of contribution to sweating rates of different regions on the body surface, and also in their amount of contribution to sweating rates of different individuals. Factors affecting magnitudes of sweating are probably not the same as

those affecting variability. Individualistic patterns of sweating may be clearly identifiable only on the forehead, abdomen and lower extremity. Prediction of regional sweating rates from two regions to others on the body surface is both possible and practical, through the use of weighted magnitudes of regional sweathing rates, the weightings being obtained from a factorial analysis. A large number of experiments under constant environmental conditions would be required, either to represent adequately one individual's normal regional sweating variations on different days, or to represent adequately normal regional sweating variations among individuals. The reported results, especially in regard to factors affecting regional sweating rates and a practical method of predicting regional sweating rates, may have important applications in the optimal design and use of ventilated clothing. AD 118055. Project no. 7155. Experimental data analyzed in this report were presented in WADC TR 56-38. AF WADC TR 56-312. Contract AF 33(616)-3357.

Influence of barometric pressure and vapor pressure on insensible weight loss in nude resting man, by Frank C. Hale, Ronald A. Westland and Craig L. Taylor. California. University. Dept. of Engineering, Los Angeles, Calif. Jan 1957. 37p diagr, graphs, tables. Order from OTS. $1. PB 121921

To determine the dependency of human insensible weight loss on barometric and water vapor pressure, two nude subjects were exposed to barometric pressures of 760, 506, and 253 mm Hg in combination with water vapor pressures of 6, 16, and 26 mm Hg. Chamber temperature was kept constant at 28°C and air movement was kept at measured low levels. The subjects were free from sweating under these conditions. Total weight loss was measured directly. Under these conditions, using an orthogonal square design technique, it was found that total body weight loss in a sweatfree subject is inversely dependent on both water vapor pressure and barometric pressure. This affirms the hypothesis that insensible weight loss is dependent on physical factors. The calculated skin insensible weight loss is also inversely dependent on barometric pressure, but is not clearly related to vapor pressure. AD 110730. Project no. 7155. Covers work from Feb-June 1956 under Contract AF 33(616)-3338. AF WADC TR 57-9.

Relative intensity of sound at various anatomical locations on the head and neck during phonation of vowel sounds, by Henry M. Moser, John J. Dreher and Herbert J. Oyer. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Operational Applications Laboratory, Bolling Air Force Base, Washington, D. C. Jun 1956. 9p diagr, tables. Order from LC. Mi $1.80, ph $1.80. PB 124137

On the basis of the measurements of the intensity of 12 English vowels recorded at 16 locations on the head and neck, four categories are established to group locations of equivalent output. These categories are given in order of their diminishing intensity. Project 7681. AF CRC TN 55-70. OSURF Proj 664, Technical report no. 31. Contract AF 19(604)-1577.

PSYCHOLOGY

Ability of untrained observers to match visual forms that are slightly disparate in contour, by James Deese. Johns Hopkins University. Institute for Cooperative Research, Baltimore, Md. Oct 1956. 18p diagrs, tables. Order from OTS. 50 cents. PB 121820

The present report describes an exploratory study of the ability of observers to match, by a method of overlay, slightly disparate imaginary contours defined by three points each. Twenty-two subjects matched 100 pairs of contours, each formed by points plotted by random decision. Subjects were scored in terms of the discrepancy of location of the centers of mass of the two contours. AD 110535. Project 7192, Task 71598. AF WADC TR 56-570. Contract AF 33(038)-22642.

Absolute judgments as a function of the stimulus range and the number of stimulus and response categories, by Charles W. Eriksen and Harold W. Hake. Johns Hopkins University. Institute for Cooperative Research, Baltimore, Md. Apr 1954. 19p graphs, tables. Order from LC. Mi $2.40, ph $3.30. PB 123939

In the psychophysic al method of absolute judgment, subjects are required to identify by a name, number or other value each member of a set of individually presented stimuli. Since the method does not provide any explicit standard for comparison, the subject is required to base his judgments upon some subjective standard or reference point. This is essentially the condition under which we make many important judgments during our daily activities. The effects of three variables upon judgmental accuracy under the absolute method were studied. These were: the range on a stimulus dimension over which stimulus categories were selected for judgment, the number of stimulus categories presented for judgment, and the number of response categories available to the subject for expressing his judgments. AD 38145. AF WADC TR 54-162. Contract AF 33(038)-22642.

Bibliography of human engineering reports on tracking, by Robert B. Lockard. U. S. Naval Ordnance Test Station, China Lake, Calif. Apr 1956. 93p. Order from LC. Mi $5.40, ph $15.30. PB 125214

This report is a bibliography of human engineering reports on tracking. The concept of a power-driven tracking instrument is implicit throughout,

and the order of the categories roughly follows a theoretical tracking loop: tracking; experimental psychology; human engineering; bibliography of tracking reports. NAVORD 5272. NOTS 1486.

Discrete tracking in one and two dimensions, by Edmund T. Klemmer. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Operational Applications Laboratory, Bolling Air Force Base, Washington, D. C. Apr 1956. 11p graph, tables. Order from LC. Mi $2.40, ph $3.30. PB 124645

This report concerns human operator performance in two pursuit tracking tasks. In the first task the target appeared in random positions on a linear path and in the second task it took positions on a plane surface. The number of possible positions of the target was varied within each of these tasks. All test runs were self-pacing. Scores are given in terms of tracking rate and amount of information transmitted per second. AF CRC TN 56-2.

Effects on learning of the perceived usefulness of the material to be learned, by Malcolm McNiven. Pennsylvania State University, University Park, Pa. Aug 1955. 35p tables. Order from LC. Mi $3, ph $6.30. PB 124649

Project 20-E-4. Instructional film research program.
1. Learning - Theory 2. Learning - Psychological factors 3. Motion pictures, Educational - Effectiveness 4. Contract N6 onr-269 5. SDC TR 269-7-54.

Factorial study of psychomotor abilities, by Edwin A. Fleishman. U. S. Air Force. Air Research and Development Command. Air Force Personnel and Training Research Center. Skill Components Research Laboratory, Lackland Air Force Base, Texas. May 1954. 46p drawings, tables. Order from LC. Mi $3.30, ph $7.80. PB 124633

The research described attempted to isolate basic factors of psychomotor skill through the administration of a large battery of tests. These included tests specially designed in accordance with hypothesized factors. After extensive pretesting, 38 apparatus and printed tests were given to 400 basic airmen. Scores converted to stanines were correlated. By extraction of centroid factors and orthogonal rotation, 12 relatively independent factors were identified to account for performance in the range of tasks investigated. Project no. 7703, Task no. 77084. AF PTRC TR 54-15.

Number telling of repeated digits, exact hundreds and thousands, by Henry M. Moser, John J. Dreher and Sol Adler. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Operational Applications Laboratory, Bolling Air Force Base, Washington, D. C. Jun 1956. 10p tables. Order from LC. Mi $1.80, ph $1.80. PB 124136

It is concluded on the basis of the experimental evidence presented that: A. Use of the terms "double" and "triple" to denote multiple successive occurrences of digits does not offer any advantage over the method of telling these digits singly. B. Use of the terms "hundred" and "thousand" is inferior to single-digit telling of the numbers involving these magnitudes. AF CRC TN 55-73. OSURF Proj 664, Technical report no. 32.

Predicting bomber crew performance from the aircraft commander's role, by Robert L. Hall. U. S. Air Force. Air Research and Development Command. Air Force Personnel and Training Research Center. Crew Research Laboratory, Randolph Air Force Base, Texas. Feb 1956. 20p tables. Order from LC. Mi $2.40, ph $3.30. PB 124149

The general problem of this study is to examine predictive relationship between the aircraft commander's interpersonal role during training and the effectiveness of his crew's later performance. In part, the hypotheses tested here are based upon the general conception of the development of role structure described in AF PTRC TN 55-73, and, in part, they are suggested by the results of other research on bomber crews. Project 7713, Task 77223. AF PTRC TN 56-28.

Preliminary test of Air Defense Command procedure words, by Henry M. Moser and John J. Dreher. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Operational Applications Laboratory, Bolling Air Force Base, Washington, D. C. Jul 1956. 17p tables. Order from LC. Mi $2.40, ph $3.30. PB 124134

Project 7681.
1. Speech - Intelligibility - Tests 2. Articulation tests 3. Contract AF 19(604)-1577 4. AF CRC TN 56-54 5. OSURF Proj. 664, Technical report no. 34.

Procedures for including human engineering factors in the development of weapon systems, by Harold P. Van Cott and James W. Altman. American Institute for Research, Inc., Pittsburgh, Pa. Oct 1956. 119p diagrs, graphs, maps. Order from OTS. $3. PB 121916

This report is intended to suggest systematic procedures for the human engineering of developmental weapon systems. A brief discussion of man-machine systems and the role of human engineering in their design is followed by a design schedule. This schedule suggests at what points

and in what ways human engineering should be accomplished. Following the design schedule, procedures that may be used to assess and solve human engineering problems are suggested. Finally, human capabilities and limitations are discussed from the point of view of the man as a system component. AD 97305. Project 5-(7-7192), Task 71633. AF WADC TR 56-488. Contract AF 33(616)-2986.

Program of human engineering research on the design of aircraft instrument displays and controls, by Alexander C. Williams, Jr., Marvin Adelson and Malcolm L. Ritchie. Illinois. University. Aviation Psychology Laboratory, Urbana, Ill. Dec 1956. 39p. Order from OTS. $1.
PB 121896

This report outlines a program for research on the human factors in the design of aircraft instrument displays and controls. The effort is intended as a source for the Air Force Integrated Display - Integrated Control Program. It consists of three major approaches. One of these concerns the development of a cockpit for a particular airplane or type of airplane. Another consists in the development of principles of man-machine relations applicable to many types of aircraft. The third approach is that of working with formal conceptual systems which may have some promise of general applicability to the cockpit problems. AD 110424. Project 6190, Task 71753. Report written during 1954. AF WADC TR 56-526. Contract AF 33(616)-300.

Relative effectiveness of verbal introductions to kinescope recordings and training films, by Paul M. Hurst, Jr. Pennsylvania State University, University Park, Pa. May 1955. 26p graphs, tables. Order from LC. Mi $2.70, ph $4.80. PB 123994

The purposes of this study were (a) to ascertain whether trainees will learn more or less from a training film if they are told that it is a "kinescope recording of a television program," rather than a regular "training film," and (b) to see if trainees will learn more or less from a kinescope recording if it is introduced to them as being a "training film" rather than a "kinescope recording." Special Devices Center Project 20-E-4. Extension of SDC 20 TV1 (PB 111223). SDC TR 267-7-42. Contract N6 onr-269.

Score equivalence of the Wechsler-Bellevue intelligence scales, Forms I and II, by J. R. Barry, S. C. Fulkerson, and A. L. Kubala, and M. R. Seaquist. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. May 1956. 5p tables. Order from LC. Mi $1.80, ph $1.80. PB 124530

In order that the equivalence of Form I and Form II of the Wechsler-Bellevue Adult Intelligence Scale might be evaluated, these two forms were administered on alternate days to 38 officers. When the tests were used as equivalent forms, a reliability coefficient of .71 was obtained. IQ differences were considered to be excessive for 9 of the 38 officers even after corrections for practice were made. The implication of the study is that the two forms should be used interchangeably in the clinic only with caution. AF SAM R 56-23.

RUBBER AND RUBBER PRODUCTS

Acoustical properties of rubber as a function of chemical composition, by W. S. Cramer and I. Silver. U. S. Naval Ordnance Laboratory. Feb 1951. 58p diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 125050

This report presents some preliminary results of a study of the dynamic properties of elastomeric materials by acoustic methods. This study emphasizes the variations in acoustical behavior of these elastomers with changes in chemical composition. The acoustical properties are also affected very substantially by such things as frequency, temperature, static pressure or tension, etc. Declassified. NOL Task no. FR-5-51. NAVORD 1778.

STRUCTURAL ENGINEERING

Buckling of initially imperfect clamped-end cylindrical shells subject to torsion, by William A. Nash. Florida. Engineering and Industrial Experiment Station, Gainesville, Fla. Apr 1956. 22p graphs. Order from LC. Mi $2.70 ph $4.80. PB 124490

An analytical solution based upon large deflection shell theory is presented for the problem of the elastic instability of a thin cylindrical shell subject to torsion. The fundamental equations used are those presented by Donnell in 1934 and these equations together with the condition of stationary potential energy are employed to determine all arbitrary deflection parameters. Load-deformation relations for various magnitudes of initial imperfection of the shell are determined for clamped-end specimens. Lastly, values are presented for an imperfection factor based upon exist ing experimental evidence for clamped-end shells. The investigation described here is a continuation of work done earlier by Loo. Contract DA 01-009-ORD-404.

Deformations of an electric-plastic cylindrical shell with linear strain hardening, by P. G. Hodge and F. Romano. Polytechnic Institute of Brooklyn. Dept. of Aeronautical Engineering and Applied Mechanics, Brooklyn, N. Y.

Sep 1955. 38p graphs. Order from LC. Mi $3, ph $6.30. PB 123967

A thin-walled circular cylindrical shell of finite length is subjected to a slowly increasing uniform radial pressure. The tensile stress-strain diagram of the material of the shell consists of two straight line segments, the first representing elastic behavior and the second plastic. Various limiting cases are considered, including elastic-perfectly plastic and rigid-strain hardening. The results are applied to an example, and salient features are shown graphically. PIB AL 299. Contract Nonr 267(00), NR 360-001.

Relationship between load spectra and fatigue life, by Bo Lundberg and Sigge Eggwertz. Flygtekniska Forsöksanstalten (FFA), Stockholm. Mar 1956. 31p graphs, tables. Order from LC. Mi $3, ph $6.30. PB 123966

A study of available data on accelerations experienced by fighter planes indicates that the load spectrum for this category can be approximated by a straight line in a semilog plot (s_a vs. log H). The important parameter of straight line spectra is the slope, the possible variation of which is analyzed. Using the cumulative damage theory, the influence of this slope on the damage intensity curve and fatigue life of the element is investigated. Two methods have been developed for the correction or evaluation of fatigue life times obtained by use of cumulative damage theory or program testing. One of the methods deals with the influence of the cut-off top of a load spectrum, while the other takes into account a variation in stress level, implying also a change of the mean stress and thus altered constants in the S-N equation. In view of the results obtained, an adoption of straight line spectra for program testing would yield "program test properties" or "spectrum properties", for materials or components, which would be of about the same basic nature as S-N properties. Presented by Bo Lundberg at the International Conference on Fatigue in Aircraft structures organized by Columbia University, Jan 30 - Feb 1, 1956. To be published in the Proceedings of the Conference. FFA 67.

TRANSPORTATION EQUIPMENT

Aeronautics

Aircraft

Accelerated modernization of the U. S. air traffic control and navigation system. U. S. Air Coordinating Committee. Mar 1957. 112p photos, diagr. Order from OTS. $1.75. PB 121932

In early 1954 the government brought together outstanding operational and technical leaders from both government and industry (Special Working Group 13) to conduct a comprehensive study of the present day navigation and traffic control system and flight operation for the purpose of recommending methods of solving the problems created by the growing complexity of air navigation and traffic control. This report presents conclusions and recommendations of the group, and their relationship to the growth of civil aviation and to air defense.

Cumulative fatigue damage of aircraft structural materials. Part II: 2024 and 7075 aluminum alloy, additional data and evaluation, by Alfred M. Freudenthal and Robert A. Heller. Columbia University, New York, N Y. Oct 1956. 27p graphs, tables. Order from OTS. 75 cents. PB 121909

Most of the test results have been presented in Part 1. Some recent results are included in the present report. An approximate non-linear cumulative damage theory based on a thermal mechanism of fatigue supported by a purely statistical approach is developed. The theory approximates test results reasonably well for the unnotched specimens used in the investigation. Its validity, for specimens having stress concentrations, is currently being tested. AD 110491. Project 7360, Task 73604. Covers work from 15 Nov 1953 - 15 June 1956. AF WADC TN 55-273, Part 2. Contract AF 33(616)-2274.

Magnetic compensation of aircraft, by J. McClay and B. Shuman. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Geophysics Research Directorate, Bedford, Mass. Aug 1955. 55p diagrs, graphs, tables. Order from LC. Mi $3.60, ph $9.30. PB 123161

When a magnetometer is installed in an aircraft, in addition to measuring the geomagnetic field, spurious indications are recorded by the instrument. This report discusses the permanent and induced magnetic fields of the aircraft as detected by swinging the aircraft on the ground. The report is divided into four parts. Part one is an effort by the authors to arrive, in a logical manner, at mathematical expressions for the magnetic disturbances produced at the detector by the ferromagnetic masses in the aircraft. The second part contains a numerical analysis of these equations using data obtained by swinging the aircraft on the ground. Part three discusses the physical significance of the results and the sensitivity of the computed parameters to the accuracy of the data used. Finally in part four an empirical method of compensating the aircraft is discussed. AF CRC TR 56-206. AF GRDIGR 4.

Measurement of the longitudinal moment of inertia of a flexible airplane, by Henry A. Cole, Jr. and Frances L. Bennion. U. S. National Advisory Committee for Aeronautics. Nov 1956. 30p photos, drawings, diagrs, graphs, tables. Order as NACA TN 3870 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124421

Supersedes RMA55J21.
1. Aeroelasticity - Theory 2. Equations of motion 3. Moments of inertia 4. Inertia - Measurements 5. NACA TN 3870.

On the contribution of turbulent boundary layers to the noise inside a fuselage, by G. M. Corcos and H. W. Liepmann. Douglas Aircraft Co., Santa Monica, Calif. Dec 1956. 40p photos, drawings, diagrs, graphs, tables. Order as TM 1420 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124453

1. Airplanes - Noise - Reduction 2. Airplanes - Vibration - Theory 3. Boundary layer, Turbulent 4. NACA TM 1420.

Theoretical investigations of optimum pressures in aircraft hydraulic systems, by Conrad H. Cooke, Eugene Gessner and Robert L. Smith. Glenn L. Martin Co., Baltimore, Md. Jan 1954. 171p drawings, graphs (1 fold.), tables. Order from LC. Mi $8.10, ph $27.30. PB 124958

The appendix contains a detailed analysis of the weight and space of the elements comprising an aircraft hydraulic system. Other information of interest to the study is also presented. In the analysis of the elements, many assumptions have been made for the derivation of the formulas for weight and space. A weight comparison between 3000 psi and 5000 psi for a typical subcircuit has been made by North American Aviation. A presentation of the analysis of Lou Berthelson is presented in Appendix A. AD 33062. For Vol. 1 see PB 123645. Vol. 2 is Appendices A - H, determination of the weight and space of various components. AF WADC TR 54-189, Vol. 2. Contract AF 33(616)-344.

Theory and experiment in the solution of structural problems of supersonic aircraft. Polytechnic Institute of Brooklyn. Dept. of Aeronautical Engineering and Applied Mechanics. Mar 1956. 361p photos, diagrs, graphs, tables. Order from OTS. $7.50. PB 121326

Chapters were originally published separately. Project 1347, Task no. 70131. Contents: Part I. Aerodynamic heating and its effects. Chapter 1. Structural effects of aerodynamic heating, by N. J. Hoff. - Chapter 2. Thermal conditions associated with aircraft in flight, by Martin Bloom. - Chapter 3. Temperature distribution and thermal stresses in a model of a supersonic wing, by Frederick V. Pohle and Henry Oliver. - Chapter 4. Temperature distribution in a diamond shaped model wing with constant heat input, by I. Mirsky. - Chapter 5. Bibliography on thermal elasticity, by William I. Berks and Alexander Chwick. - Part II: Effect of rapid creep. - Chapter 6. Rapid creep in structures, by N. J. Hoff. - Chapter 7. Creep buckling, by N. J. Hoff. - Chapter 8. Approximate analysis in the presence of moderately large creep deformations, by N. J. Hoff. - Part III: Theory and practice of induction heating. - Chapter 9. On the theory of strong electromagnetic waves in massive iron, by William R. MacLean. - Chapter 10. Electromagnetic induction heating units at the Polytechnic Institute of Brooklyn, by William R. MacLean and S. Lederman. - Chapter 11. Induction heating thermostable work circuit, by William R. MacLean. - Chapter 12. Experimental verification of the thermostable work circuit, by William R. MacLean and S. Lederman. Contract AF 33(616)-116. AF WADC TR 55-291.

Instruments

Design of an air supply system and test section for research on scavenging systems for propulsion wind tunnels, by John G. Wilder, Kenneth Hindersinn, and Roger Weatherston. Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y. May 1956. 63p photos, diagrs, graphs, tables. Order from OTS. $1.75. PB 121444

This report presents a description of the design, construction, and operational features of an air supply system designed to drive supersonic or transonic test sections of approximately one square foot in area. The facility has been made adaptable to experimental studies of scavenging systems and their interaction with the diffuser geometry by providing the test section with porous walls to avoid wall interference caused by the relatively long model configurations and an adjustable diffuser to account for losses from the scavenging scoop. In addition the diffuser can be completely replaced when special requirements on scavenging-scoop size calls for extreme changes in diffuser geometry. Components and component systems, including the pressurized shell diffuser-ejector, instrumentation, air drying system, lubrication system, cooling system, electrical control system, and supersonic and transonic test sections are discussed from the standpoint of design requirements, and the factors which influenced the choice of system are given. The basic engineering design analyses as well as operating performance data based on preliminary test calibrations are also included. Project 1363, Task 70123. AF WADC TR 56-6. Contract AF 33(038)-21508.

Downward ejection flight tests of a shock-absorbing seat firing control system, by Kenneth F. Hecht

and Edward G. Sperry. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Aircraft and Aero Medical Laboratories, Wright-Patterson Air Force Base, Dayton, Ohio. Feb 1957. 50p photos, diagr, graphs, tables. Order from OTS. $1.25. PB 121951

This report covers the 28 flight test ejections of a downward ejection seat conducted from a B-47B airplane. Measurements of the forces encountered in the wrists when utilizing a D-ring type of firing control during downward ejection are presented. Other test results, including those from two high altitude human subject ejections, obtained from motion picture records and subjective reactions of the human subjects, are reported. It is concluded that the downward ejection seat as modified for the human subject phase is a satisfactory escape device throughout the speed and altitude range tested. AD 118053. Project 1362, Task 13440. Covers work from 1 Apr-3 Aug 1954. AF WADC TN 55-239.

Improvements to DME interrogators and development of accessories, by Warren E. Haworth. U. S. Civil Aeronautics Administration. Technical Development Center, Indianapolis, Ind. Jan 1957. 16p photos, diagrs. Order from OTS. 50 cents. PB 121880

This report describes a number of design improvements to DME interrogators which have led to increased reliability, greater utilization, improved performance, and lower initial installation and maintenance costs. Several special devices are described which were developed as DME accessories, including the field-strength recorder, orbit meter, and range servo. CAA TDR 296.

Engines and Propellers

Performance standardization for a turbojet engine equipped with a variable area nozzle controlled by engine speed, by Robert L. O'Neal. U. S. Air Force. Air Research and Development Command. Air Force Flight Test Center, Edwards Air Force Base, Calif. Mar 1956. 17p graphs. Order from OTS. 50 cents. PB 121989

Performance corrections for aircraft with fixed geometry turbo jet engines have been made heretofore in a rather simple manner. However, engines are now appearing with variable geometry exhaust nozzles controlled in such a way that the performance correction process is more involved. Such a case is the engine equipped with a variable area jet nozzle and having a single lever control system. This paper is written to put on record a method of performance standardization developed for an engine of this type. AF FTC TM 56-7.

Response of helicopter rotors to oscillatory rotor plane drag forces at the blades, by Orville R. Rogers and William Oleksak. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Aircraft Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Sep 1952. 31p diagrs, graphs. Order from LC. Mi $3, ph $6.30. PB 123940

A theoretical analysis is given for the response of an elastically restrained rotor (having drag hinges) to a harmonic force (in the rotor plane) acting on each blade. The purpose of the analysis is to lead to a method of providing the helicopter dynamics engineer with means of controlling flight vibration characteristics. Results are presented in the form of equations from which hub displacement and resonant frequency expressions are derived for simplified conditions. The cases treated are those in which the ratio of hub elastic restraint in one direction to that in the orthogonal direction is zero, one, and infinite. A numerical example is worked out for each case, with a combination of known and assumed parameters which is typical of a medium size helicopter. The results are presented in the form of graphs which show variation of hub response as a function of change in hub restraint. AD 1178. AF WADC TR 52-270.

Tabulation of mass-flow parameters for use in design of turbomachine blade rows for ratios of specific heats of 1.3 and 1.4, by Warren J. Whitney. U. S. National Advisory Committee for Aeronautics. Oct 1956. 111p diagr, graph, tables. Order as TN 3831 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 124390

1. Turbines - Blades - Flow - Calculation 2. Flow - Tables 3. Pressure distribution - Tables 4. NACA TN 3831.

Training and Training Devices

Troubleshooting trainer for the E-4 fire control system, by Leslie J. Briggs. U. S. Air Force. Air Research and Development Command. Air Force Personnel and Training Research Center. Maintenance Laboratory, Lowery Air Force Base, Colo. Jul 1956. 19p photos. Order from LC. Mi $2.40, ph $3.30. PB 124268

The device described in this paper is a prototype troubleshooting trainer intended for experimental use in training and testing E-4 Fire Control System mechanics in troubleshooting. Performance on the device proceeds much faster than performance on operational equipment because essential system functioning data are obtained without performance of the normal, time-consuming check procedures. The device emphasizes and requires performance of a troubleshooting procedure which leads to discovery of the smallest replaceable part which is causing the symptom. The procedure further requires application of a systematic

analysis by the use of schematic and wiring diagrams; it does not permit opportunity for solution of the problem by use of "tricks of the trade." AD 098870. Project 7709, Task nos. 77153 and 37302. AF PTRC TN 56-94.

Airports and Airways

Airport lighting systems testing kit, by Lester C. Simpson and Stewart S. Knapp. Elastic Stop Nut Corp. of America. A'G'A Div., Elizabeth, N. J. Jun 1955. 47p. Order from LC. Mi $3.30, ph $7.80. PB 123938

Considerable difficulty has been encountered in correcting electrical failures in airport lightning systems. This investigation has made possible the recommending of a kit of instruments and a procedure for conducting tests on new installations for acceptance, periodic preventive maintenance testing, and trouble shooting when failures occur. The recommended kit contains commercially available instruments and equipment. AD 80233. Project 6061, Task 60428. AF WADC TR 55-326. Contract AF 33(600)-29193.

Aerodynamics

Calibration of the flexible plate nozzle in the transonic model tunnel of the propulsion wind tunnel, by John C. Marshall. U. S. Air Force. Air Research and Development Command. Arnold Engineering Development Center, Tullahoma, Tenn. Jun 1956. 32p photo, drawings, graphs, table. Order from LC. Mi $3, ph $6.30. PB 123006

The flexible nozzle is used in conjunction with a slotted or perforated wall test section to produce flows in the Mach number range from 0.70 to 1.60. The Mach number distribution along the axial centerline of the nozzle was computed from static pressure surveys. The effects of jack deflections on the Mach number distribution were determined experimentally and used in an attempt to improve the flow quality. Included are curves of the initial and corrected Mach number distribution and representative jack effects. The flow inclination at the nozzle exit station was measured with a yaw probe, and was found in some cases to deviate from the nozzle axis by as much as 0.21 deg. No corrections were attempted on the flow inclination. AD 88604. AF AEDC-TN-56-5.

Investigation of deformations and stresses in swept-back and tapered wings with discontinuities, by R. L. Bisplinghoff and Arthur Lang. Massachusetts Institute of Technology. Dept. of Aeronautical Engineering, Cambridge, Mass. Jul 1949. 159f photos, drawings, diagrs (part fold), graphs, tables. Order from LC. Mi $7.50, enl pr $25.80. PB 125298

The research described in this report concerns both theoretical and experimental investigations on the determination of stresses and deformations in complex aircraft structures. Investigations are limited to wings with thin skins where the assumptions can be made that the stringers and flanges, together with appropriate effective widths, carry the normal stress, and the sheets carry the shear stresses. Two types of wings are investigated; a constant section single cell 45^{o} swept back wing and an unswept two cell tapered wing with 3 to 1 taper ratio. A matrix of flexibility influence coefficients is predicted theoretically and checked by experiment. Effects of introducing cut-outs are investigated. Contract NOa(s)-8790.

Noise transmission from boundary layer pressure fluctuations, by Robert H. Kraichnan. Columbia University, New York, N. Y. Mar 1956. 65p graphs. Order from OTS. $1.75. PB 121894

A theoretical study is made of noise spectra radiated by the vibration of thin, stiff, flat plates under the action of turbulent boundary layer pressure fluctuations. Several possible procedures for reducing the noise transmission are mentioned briefly. AD 110523. Project 1370, Task 13463. AF WADC TN 56-263. Contract AF 33(616)-2331.

Rockets and Jet Propulsion

Direct measurement technique of determining rocket exhaust velocities, by Loren E. Bollinger and Rudolph Edse. Ohio State University. Dept. of Aeronautical Engineering. Rocket Laboratory, Columbus, Ohio. Nov 1956. 40p photos, drawings (part fold), diagrs, graphs, tables. Order from OTS. $1. PB 121871

A new technique of directly measuring supersonic gas velocities has been developed. The front of a luminous wave, whether naturally or artificially produced in the gas stream, is detected by a set of optical probes employing photomultiplier tubes. Signals from these probes are used to trigger an electronic ten-megacycle, six-channel chronograph which will indicate in discrete steps of 0.1 microsecond the time required for the luminous wave to pass between any of the seven optical probes. The velocity measurement system has been tested by measuring known detonation velocities of gaseous mixtures in the neighborhood of 10,000 ft/sec. Excellent correlation was obtained between the measured velocities and those reported in the literature which were obtained by other measurement methods. AD 110500. Project 3058, Task 70158 and Task 70175. AF WADC TR 56-336. Contract AF 33(616)-2078.

Land Transportation

American commodity flow and rail traffic, by Edward L. Ullman and others. Washington.

University, Seattle, Wash. Jun 1955. 94p maps, table. Order from LC. Mi $5.40, ph $15.30. PB 125262

This report consists of two parts: (1) A brief text accompanied by some new maps of rail and other traffic; (2) maps of state-to-state rail traffic for 18 states based on the ICC 1% sample carload waybill analyses. Report no. 15. For reports 9-12, 16 see PB 116390, 118767, 119081, 124600 and 123180. Contract Nonr-477(03).

WATER SUPPLY, SANITATION AND PUBLIC HEALTH

Leak detection in water mains using radioisotopes, by S. Jefferson, J.F. Cameron, A.M. Wildblood and J. L. Putman. Gt. Brit. Ministry of Supply. Atomic Energy Research Establishment. Jan 1956. 22p photos, diagrs. Order from British Information Services, 30 Rockefeller Plaza, New York 20, N Y. 91 cents. PB 123630

S. O. Code no. 91-3-2-45.
1. Water pipe lines - Leaks - Detection - Gt. Brit.
2. Radioisotopes - Uses - Gt. Brit. 3. AERE I/R 1693.

MISCELLANEOUS

Abstracts of published papers and list of publications, Vol. 4 no. 4, abstracts 145-195. Australia. Commonwealth Scientific and Industrial Research Organization. Apr 1956. 26p. Order from LC. Mi $2.70, ph $4.80. PB 123070

For earlier issues see PB 119617, 122458.
1. Scientific research - Bibliography - Australia
2. Industrial research - Bibliography - Australia.

Final report under Contract no. AF 19(604)-546, for the period Feb 1953 - Jun 1956. California. University. Institute of Geophysics. Oahu Research Center, Oahu, Hawaiian Islands. Jun 1956. 129p photos, diagrs, graphs, tables. Order from LC. Mi $6.30, ph $19.80. PB 124267

The report covers the scientific work carried out at Wheeler Field, Oahu T. H. by a group of meteorologists from the Institute of Geophysics, University of California, from February 1953 to June 1956. The results of the work have been fully set out in fifteen scientific reports, and five scientific papers, four of which have been published. The work for which the contract was assigned is completed with the inclusion, as part of the Final Report, of an account of the indirect erology of the tropical Pacific. Includes "An indirect aerology of the tropical Pacific", by Clarence E. Palmer, James R. Nicholson and Richard M. Shimaura. AF CRC TR 56-287.

Report of NRL progress. U. S. Naval Research Laboratory. Apr 1957. 62p. Order from OTS. $1.25. Also available at annual subscription rate of $10 a year in the U.S.A., foreign rate $13 a year. PB 121988

Contents: Weathering of creosote related to marine borer control, by T. R. Sweeney and T. R. Price. - NRL rocket studies of ionospheric structure, by J. E. Jackson. - Accelerator produces monoenergetic 2-mev electron beam, by J. McElhinney and R. A. Tobin. - Scientific program: Problems accepted: Problem notes: Applications research: Content analysis of simulated CIC battle problems. - Astronomy and astrophysics: Night airglow and radiation from celestial objects measured at high altitudes with rocket-borne photometers sensitive to selected regions of the visible, middle-ultraviolet, and extreme-ultraviolet spectrum....Microwave radiation from Jupiter.... Power fluxes at 440 Mc from the brightest discrete radio stars and from selected regions of the Milky Way....Precision instruments for calibrating radiometers at 4.3-mm wavelength....Random vibration testing of high-altitude research rocket components....Presentation of weather radar pictures, including constant-altitude precipitation patterns, by a simplified fascimile method. - Electricity: Permanent-magnet generators--design considerations....Flux reversal in toroidal core of magnetic amplifiers. - Metallurgy and ceramics: Investigation of the creep-rupture properties of Mo-V low-alloy steels....Electrical resistivity of Ni-Pd alloys....Fracture characteristics of copper-base alloys....Graphitization rates of malleable iron....Explosion-bulge test performance of low-carbon Ni-Cr-Mo-B quenched and tempered steel weldments....Corrosion studies in high-temperature water by a hydrogen effusion method. - Nuclear and atomic physics: Evidence concerning excited states of Ga and Se^{75}. - Radio: Distribution of electron-beam velocities in crossed-field type electron tubes....Secondary electron emission from storage tube insulators.... Thermionic and semiconducting properties of /Ag/ -- Cs, O, Ag, Cs....Proposed model for the germanium point-contact, microwave crystal diode. - Solid-state physics: Irradiation of polyvinyl methyl ether with electrons and gamma rays to form elastomers....Magnetization studies of Cs^{+++} using the Faraday effect. - Sound: "Closed-loop" delay (1, 2, 3, 4, 5, 6 sec) for processing acoustic signals. - Supporting techniques: Simple technique for measuring small angles of microwave Faraday rotation....Reduction of losses from thermal insulators. - Published reports. - Papers by NRL staff members. - Patents.

ATOMIC ENERGY COMMISSION REPORTS

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Biology and Medicine

Semiannual report to the Atomic Energy Commission, by Leon O. Jacobson and Antreen Pfau. Argonne Cancer Research Hospital, Chicago, Ill. Sep 1956. Contract AT(11-1)-69. 114p. Order from OTS. 60 cents. ACRH-6

The mechanism of the photochemical activity of isolated chloroplasts. 3. Light intensity dependence. 4. Effect of pH. 5. Effect of heavy water. Technical report no. 21, by John S. Rieske, John D. Spikes, and Rufus Lumry. Utah. Univ., Salt Lake City. Jul 1956. Contract AT(11-1)-82. 114p. Order from LC. Mi $6, ph $18.30. AECU-3378

Genetics in plant breeding. Report of symposium held May 21 to 23, 1956. Brookhaven National Laboratory, Upton, N Y. n.d. 236p. Order from OTS. $1.25. BNL-396(C-23)

Radioactivity levels of the Columbia River below Richland, Washington for the period January, February, March 1956, by H. V. Clukey. Hanford Atomic Products Operation, Richland, Wash. Oct 1956. Contract W-31-109-eng-52. 9p. Order from LC. Mi $1.80, ph $1.80. HW-45983

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Development of manual welding procedure for a pressure vessel closure, by E. C. Piotter and M. H. Mackusick. Babcock and Wilcox Co. Research and Development Center, Alliance, Ohio. Jun 1952. Changed from Official Use Only July 2, 1956. 100p. Order from LC. Mi $5.70, ph $16.80. BW-5413

HRP dynamic slurry corrosion studies: Quarter ending July 31, 1956, by E. L. Compere, H. C. Savage, S. A. Reed, G. E. Moore, R. M. Warner, R. M. Pierce, D. B. Weaver, J. A. Russell, Jr., and S. R. Buxton. Oak Ridge National Lab., Tenn. Jul 1956. Contract W-7405-eng-26. 49p. Order from LC. Mi $3.30, ph $7.80. CF-56-7-51

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Electrodeposition of zirconium. Progress report no. 2 covering period February 1, 1952 to April 30, 1952. Graham, Crowley, and Associates, Inc., Jenkintown, Penna. Changed from Official Use Only June 22, 1956. Contract AT(11-1)-173. 47p. Order from LC. Mi $3.30, ph $7.80. COO-106

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Brazing beryllium tubing to high-temperature alloy collars, by K. G. Wikle and R. Magalski. Brush Beryllium Co., Cleveland, Ohio. Jun 1956. Contract AT(30-1)-541. 22p. Order from OTS. 20 cents. COO-310

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Flow stress recovery of Zircaloy-3b, by Dale E. Johnson. Hanford Atomic Products Operation, Richland, Wash. Sep 1956. Contract W-31-109-eng-52. 20p. Order from LC. Mi $2.70, ph $4.80. HW-44906

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Tabulation, bibliography, and structure of binary intermetallic compounds. II. Compounds of beryllium, magnesium, and calcium, by K. A. Gschneidner, D. J. Beerntsen, R. W. Vest, J. A. Kingston, and J. F. Smith. Ames Lab., Ames, Iowa. Dec 1956. Contract W-7405-eng-82. 36p. Order from OTS. 30 cents. ISC-812

The KAPL beryllium hot pressing process. I. The method, by A. U. Seybolt, R. M. Linsmayer, and J. P. Frandsen. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 1948. Changed from Official Use Only Aug 30, 1956. Contract W-31-109-eng-52. 29p. Order from LC. Mi $2.70, ph $4.80. KAPL-113

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Surface finish determination on pitted specimens, by Charles W. Donnelly. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 1956. Contract W-31-109-eng-52. 11p. Order from LC. Mi $1.80, ph $1.80. KAPL-M-AME-2

The corrosion behavior of some zirconium 8 w% uranium alloys in 680 F water, by Donald C. Belouin. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 1956. Contract W-31-109-eng-52. 12p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-DCB-1

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Standard operating procedure for preparations and instructions for handling fires in plant 9 production and storage areas. (Section 2.9.4), by Robert W. Cahalane. National Lead Co. of Ohio, Cincinnati. Jan 1956. Contract AT(30-1)-1156. 6p. Order from LC. Mi $1.80, ph $1.80. NLCO-608

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Technical progress report. Part I. Progress on work. Part II. Diffusion of the elements of the IB and IIB sub-groups in silver, by A. Sawatzky and F. E. Jaumot, Jr. Franklin Inst., Labs. for Research and Development, Philadelphia. Dec 1956. Contract AT(30-1)-1484. 19p. Order from LC. Mi $2.40, ph $3.30. NYO-7652

Progress report no. 5 for the period November 1—November 30, 1946, by C. B. Sawyer. Brush Beryllium Co., Cleveland. Jan 1947. Decl. Feb 1956. Contract W-22-075-eng-11. 26p. Order from LC. Mi $2.70, ph $4.80. P-804

Progress report no. 11 for May 1—May 31, 1947, by P. R. Kalischer. Brush Beryllium Co., Cleveland. Jul 1947. Decl. Feb 1956. Contract W-22-075-eng-11. 34p. Order from LC. Mi $3, ph $6.30. P-810

Progress report no. 12 for June 1—June 30, 1947. Section A. Fluorides, by P. R. Kalischer. 35p. Section B. Chloride reduction, by S. J. Morana. Brush Beryllium Co., Cleveland. 1947. Decl. Feb 1956. Contract W-22-075-eng-11. 10p. Order from LC. Mi $3.30, ph $7.80. P-811

Progress report no. 13 for July 1--July 31, 1947. Section A. Fluorides, by P. R. Kalischer. 24p. Section B. Chlorides, by S. J. Morana. Brush Beryllium Co., Cleveland. 1947. Decl. Feb. 1956. Contract W-22-075-eng-11. 10p. Order from LC. Mi $3, ph $6.30. P-812

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Development of solid-phase bonding of nickel base alloys. Final report for January 1—July 31, 1956. Dept. of Chemical Research and Development. Vitro Job 2054, by A. C. Werner, H. G. Scheible, and H. Vartanian. Vitro Labs., West Orange, N. J. For Pratt and Whitney Aircraft. n.d. Contract AT(11-1)-229. 24p. Order from LC. Mi $2.70, ph $4.80. PWAC-158

The hot wire process for zirconium. II. Results of some pressure measurements in the cracking bottle, by Robert B. Holden. Sylvania Electric Products Inc., Bayside, N. Y., May 1951. Changed from Official Use Only Aug 7, 1956. Contract AT-30-1-gen-366. 12p. Order from LC. Mi $2.40, ph $3.30. SEP-57

Nucleation of voids in metals during diffusion and creep, by R. Resnick and L. Seigle. Atomic Energy Division. Sylvania Electric Products, Inc., Bayside, N. Y. May 1956. Contract AT-30-1-gen-366. 35p. Order from OTS. 30 cents. SEP-213

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Metallurgy information meeting, Ames Laboratory, Iowa State College, May 2, 3 and 4, 1956. Ames Lab. Iowa State College, Ames, Iowa. Feb 1957. 281p. Order from OTS. $1.50. TID-7526(Pt. 1)

Fatigue notch sensitivity of zirconium and zirconium alloys, by J. J. Kearns and W. L. Mudge, Jr. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh. Oct 1953. Changed from Official Use Only July 18, 1956. Contract AT-11-1-gen-14. 46p. Order from LC. Mi $3.30, ph $7.80. WAPD-88

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Note on the numerical evaluation of integrals of the form $\int_{-\infty}^{\infty} f(x)\,\varphi(x)\,dx$, with particular reference to the determination of the expectation of a function of a normally distributed random variable. Sandia Corp., Albuquerque, N. Mex. Sep 1953. 12p. Order from LC. Mi $2.40, ph $3.30. AECU-3203

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The specific heat of a degenerate electron gas at high density, by Murray Gell-Mann. Rand Corp., Santa Monica, Calif. Nov 1956. For Univ. of Calif. Radiation Lab. Contract W-7405-eng-48. 13p. Order from LC. Mi $2.40, ph $3.30. AECU-3376

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Thermal neutron irradiation of natural thorium, by Frank R. Taraba. Argonne National Lab., Lemont, Ill. Jul 1954. Contract W-31-109-eng-38. 21p. Order from OTS. 35 cents. ANL-5335

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Shielding of irradiated APPR-1 fuel elements, by F. B. Fairbanks and D. C. Morse. Alco Products, Inc., Schenectady, N. Y. Jul 1956. Contract AT(11-1)-318. 9p. Order from LC. Mi $1.80, ph $1.80. APAE-Memo-34

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Leakage measurement technique, by W. H. Moyer and E. C. Piotter. Babcock and Wilcox Co. Research and Development Dept., Alliance, Ohio. Feb 1952. Changed from Official Use Only July 2, 1956. For Westinghouse Electric Corp. Atomic Power Div. 73p. Order from LC. Mi $4.50, ph $12.30. BW-5402

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The ionic fractionation still. Final report for February 1, 1951—January 31, 1952, by J. A. Marinsky, E. Parsi, and S. Alexander. Ionics, Inc., Cambridge, Mass. Changed from Official Use Only Oct 3, 1956. For Oak Ridge National Lab. Contract W-7405-eng-26. 79p. Order from LC. Mi $4.50, ph $12.30. CF-52-2-124

A two-group two-region approximation for blanket breeder reactors, by M. C. Edlund. Oak Ridge National Lab., Oak Ridge, Tenn. May 1953. Contract W-7405-eng-26. 17p. Order from OTS. 30 cents. CF-53-5-119

Temperature and stress distribution in a sectional cylindrical shield as typified by the research reactor, by F. T. Binford. Oak Ridge National Lab., Tenn. Oct 1953. Changed from Official Use Only Oct 3, 1956. Contract W-7405-eng-26. 14p. Order from LC. Mi $2.40, ph $3.30. CF-53-10-141

Ground scattering of neutrons from a cylindrically symmetric source, by H. E. Stern and A. Simon. Oak Ridge National Lab., Tenn. Aug 1954. Contract W-7405-eng-26. 8p. Order from LC. Mi $1.80, ph $1.80. CF-54-8-103

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A semi-empirical equation for pair production below 5 Mev, by C. D. Zerby and H. S. Moran. Oak Ridge National Lab., Tenn. Dec 1956. Contract W-7405-eng-26. 11p. Order from LC. Mi $2.40, ph $3.30. CF-56-12-4

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Irradiation experiment on aluminum fuel element containing U_3O_8 dispersion, by R. J. Beaver. Oak Ridge National Lab., Tenn. Dec 1956. Contract W-7405-eng-26. 6p. Order from LC. Mi $1.80, ph $1.80. CF-56-12-116

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Maximum force of a warped rod against a rigid constraint, by A. V. Martin. Chicago. Univ. Metallurgical Lab. Oct 1944. Decl. Feb 1956. Contract W-7401-eng-37. 7p. Order from LC. Mi $1.80, ph $1.80. CP-2273

Transparency to far infrared, by R. L. Reynolds. Hanford Atomic Products Operation, Richland, Wash. Oct 1955. Contract W-31-109-eng-52. 3p. Order from LC. Mi $1.80, ph $1.80. HW-39536

Metallography of irradiated uranium, by James R. Morgan. Hanford Atomic Products Operation, Richland, Wash. Mar 1956. Decl. May 1956. Contract W-31-109-eng-52. 20p. Order from LC. Mi $2.40, ph $3.30. HW-42532

High-density concrete for reactor construction, by Harold S. Davis. Hanford Atomic Products Operation, Richland, Wash. Apr 1956. Decl. May 1956. Contract W-31-109-eng-52. 23p. Order from LC. Mi $2.70, ph $4.80. HW-42555

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Resonance capture of neutrons by thorium cylinders, by M. V. Davis. Hanford Atomic Products Operation, Richland, Wash. Jul 1956. Contract W-31-109-eng-52. 21p. Order from OTS. 35 cents. HW-44281

Magnetic properties of holmium and thulium, by B. L. Rhodes, Sam Legvold, and F. H. Spedding. Ames Lab. Iowa State College, Ames, Iowa. Dec 1955. Contract W-7405-eng-82. 58p. Order from OTS. 40 cents. ISC-701

Electrical properties of magnesium silicide and magnesium germanide, by Charles R. Whitsett and G. C. Danielson. Ames Lab. Iowa State College, Ames, Iowa. Jul 1955. Contract W-7405-eng-82. 81p. Order from OTS. 50 cents. ISC-714

A basic manual of routines for the 650, edited by E. M. Kidd. Oak Ridge Gaseous Diffusion Plant. Union Carbide Nuclear Co., Oak Ridge, Tenn. Mar 1957. Contract W-7405-eng-26. 38p. Order from OTS. 70 cents. K-1322

Compton scattering of gamma rays from a thick slab at skew angles, by L. Tonks and L. H. Root. Knolls Atomic Power Lab., Schenectady, N. Y. Mar 1950. Changed from Official Use Only June 26, 1956. Contract W-31-109-eng-52. 19p. Order from LC. Mi $2.40, ph $3.30. KAPL-317

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LA-2014

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Results of miscellaneous two-dimensional potential computations, involving pole-face currents, of possible interest in FFAG magnet design, by L. Jackson Laslett. Midwestern Universities Research Assn., Urbana, Ill. Aug 1956. 15p. Order from LC. Mi $2.40, ph $3.30. MURA-135

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A numerical method for the time-dependent transport equation, by R. D. Richtmyer. AEC Computing Facility. Institute of Mathematical Sciences. New York University, New York, N. Y. Feb 1957. Contract AT(30-1)-1480. 40p. Order from OTS. 30 cents. NYO-7696

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sorption in polymers of polychlorotrifluoroethylene (thesis), by Barbara J. Winnemore. Jun 1953. Ranger Project Contract AT(40-1)-1340. 111p. Order from LC. Mi $6, ph $18.30. ORO-158

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The anatomy of plasmons, by Winston H. Bostick. California. Univ., Livermore. Radiation Lab. Nov 1955. Contract W-7405-eng-48. 29p. Order from LC. Mi $2.70, ph $4.80. UCRL-4530

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Spatial distribution of thermal neutrons from a polonium-beryllium source in water-zirconium mixtures, by William Baer. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh. Dec 1953. Changed from Official Use Only July 18, 1956. Contract AT-11-1-gen-14. 15p. Order from LC. Mi $2.40, ph $3.30. WAPD-99

Shock calculations for an elastic system with distributed mass, using the starting velocity concept, by Carl M. Friedrich. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh. Dec 1954. Changed from Official Use Only July 18, 1956. Contract AT-11-1-gen-14. 51p. Order from LC. Mi $3.30, ph $7.80. WAPD-115

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Outline of PWR reactor vessel testing program, by P. A. Halpine. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh. Apr 1955. Contract AT-11-1-gen-14. 5p. Order from LC. Mi $1.80, ph $1.80. WAPD-RD-22

Feasibility of the gaseous fission product monitor for the monitoring station in the PWR fuel element failure instrumentation system, by N. J. Palladino. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh. Sep 1955. 2p. Order from LC. Mi $1.80, ph $1.80. WAPD-RD-87

Study-by simulator techniques-of transient pressures in high pressure water systems utilizing a surge tank, by W. M. Gajewski. Bettis Plant. Westinghouse Electric Corp., Pittsburgh, Pa. Sep 1955. 20p. Order from OTS. 20 cents. WAPD-T-88

Estimated film boiling heat transfer coefficients at burnout, by S. J. Green. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh. Sep 1955. Changed from Official Use Only Oct 3, 1956. 11p. Order from LC. Mi $2.40, ph $3.30. WAPD-TH-132

Additional pressure drop tests on parallel flow rod subassemblies with tube sheets, by B. W. LeTourneau and R. E. Grimble. Westinghouse Electric Corp. Bettis Plant, Pittsburgh. Nov 1955. 11p. Order from LC. Mi $2.40, ph $3.30. WAPD-TH-153

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General reactor comparisons. A. Water moderated and cooled. B. Heavy water moderated and cooled. C. Sodium cooled. Commonwealth Edison Co., CEPS Group, Chicago. Jul 1953. Decl. Oct 1956. 3p. Order from LC. Mi $1.80, ph $1.80. CEPS-1134

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Run summary of HRT-CP-7, by R. H. Winget. Oak Ridge National Lab., Tenn. Dec 1956. Contract W-7405-eng-26. 5p. Order from LC. Mi $1.80, ph $1.80. CF-56-12-48

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Resonance effects in one-region thorium breeder reactors, by Seymour Jaye. Oak Ridge National Lab., Tenn. Dec 1956. Contract W-7405-eng-26. 19p. Order from LC. Mi $2.40, ph $3.30. CF-56-12-61

Laboratory test of a core cooler for ORR loop HN-1, by R. A. Lorenz and D. T. Jones. Oak Ridge National Lab., Tenn. Dec 1956. Contract W-7405-eng-26. 18p. Order from LC. Mi $2.40, ph $3.30. CF-56-12-65

Run summary of HRT-CP-7A and 8, by R. H. Winget. Oak Ridge National Lab., Tenn. Dec 1956. Contract W-7405-eng-26. 7p. Order from LC. Mi $1.80, ph $1.80. CF-56-12-81

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