

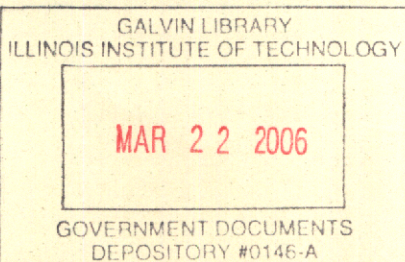
U. S. Government

RESEARCH REPORTS

June 15, 1956

Vol. 25, No. 6

. . . A monthly listing of
Government research reports
available to industry . . .



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Circuit Packaging and Integration of Auto-Sembled Electronic Equipment

Transistors and Transistor Manufacturing Equipment

Systems Engineering

New High-Temperature Intermetallic Materials

Improvement of Colorfastness on Fabrics

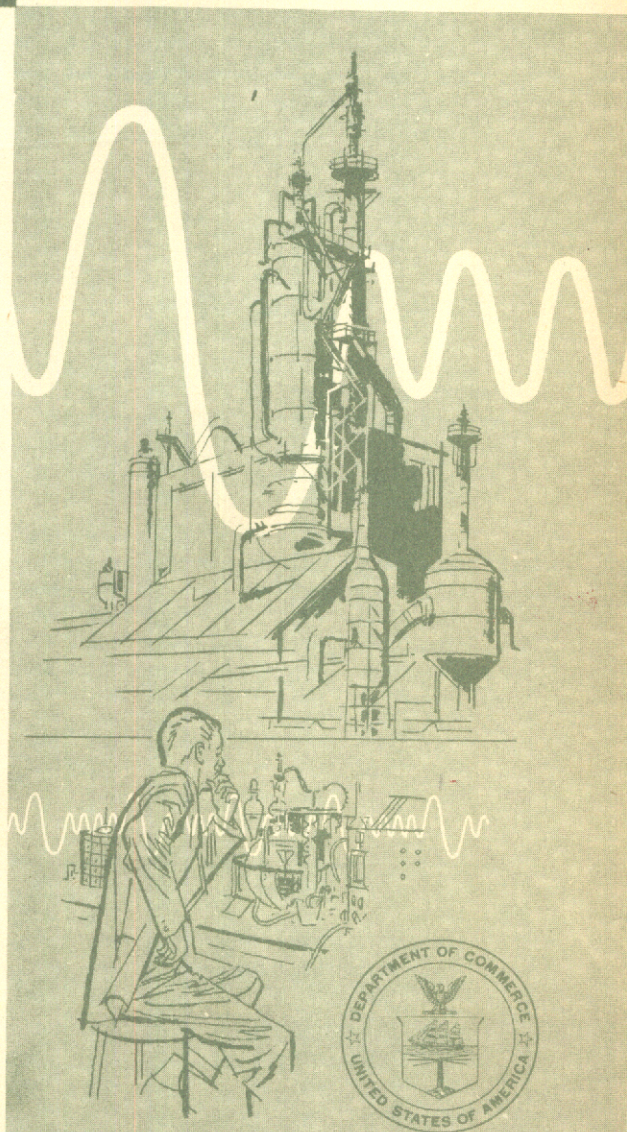
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Precision Steel Castings for Aircraft Use

Sandwich Construction for Aircraft

Five Reports on Titanium

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on page 277*



U. S. DEPARTMENT OF COMMERCE

Office of Technical Services

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OFFICE OF TECHNICAL SERVICES
John C. Green, *Director*

U. S. DEPARTMENT OF COMMERCE
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U. S. DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

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Titanium alloys for analytical standards. (PB 121107) 75 cents	281

CARTOGRAPHY

Procedures in the descriptive analysis of terrain.
Annual summary report on investigation, by
Edwin H. Hammond, Jan 1955. 6p. Order from
LC. Mi \$1.80, ph \$1.80. PB 119607

1. Terrain data - Analysis 2. Terrain data - Pre-
sentation 3. Contract Nonr-1202(01).

Terrain measurement. Interim engineering report
for the period 14 Apr-14 Jul 1955 under Contract
no. DA 20-018-ORD-13754. Michigan, Univer-
sity. Engineering Research Institute, Willow
Run Laboratories, Willow Run Airport, Ypsilanti,
Mich, Jul 1955. 49p diags. Order from LC.
Mi \$3.30, ph \$7.80. PB 119935

Determination of the most suitable method of
measuring terrain geometry and a preliminary de-
sign of the type of measuring system selected.
Report no. 2384-3-P.

CHEMICALS AND ALLIED PRODUCTS

Organic Chemicals

Aromatic complexes, by George Jura, California,
University, Dept. of Chemistry and Chemical
Engineering, Berkeley, Calif. Feb 1955. 14p
graphs, tables. Order from LC. Mi \$2.40, ph
\$3.30. PB 119836

In recent years there has been considerable in-
terest in complexes between Lewis acids and
bases. Among those which have been extensively
investigated are those between the aromatic hydro-
carbons and the halogens. The major references
here can be found in the enclosed paper. This in-
vestigation was undertaken to see whether evidence
for this type of reaction occurred generally with
metallic ions, or was restricted to those few which
have been known to complex in the past, namely
silver, cuprous, platinum, etc. Final report under
Contract no. ONR 222-09, project no. NR 358-285.

New reaction for the detection for the metalloid-
(non-metal) labile halogen linkage, a colloquium
lecture in the H.G.L., Spandau 29.7.44, by R. B. R.
Schonemann. Translated by C. L. Wheeler. Jun
1946. 9f. Order from LC. Mi \$1.80, enl pr
\$3.30. PB 119887

ETF 550G-1212.

1. Hydrocyanic acid - Detection - Germany
2. Sarin (Trade name) 3. Tabun (Trade name).

Study of laminar flow phenomena utilizing a doubly
refracting liquid. Progress report 2: Determi-
nation of the flow double refraction properties of
aqueous milling yellow dye solutions, by John W.
Prados and Fred N. Peebles, Tennessee. Engi-
neering Experiment Station and Tennessee. Uni-
versity. Dept. of Chemical Engineering, Knox-
ville, Tenn. Mar 1955. 138p photos, drawings,
diags, graphs, tables. Order from LC. Mi
\$6.90, ph \$21.30. PB 120028

It has been discovered recently that aqueous solu-
tions of an organic dye, milling yellow, exhibit
strong double refraction characteristics, while at
the same time possessing low viscosity and good
stability. The present work is concerned with the
measurement of the flow double refraction charac-
teristics of some of these solutions. Results are
given for ten different solutions, varying in con-
centration from 1,248 to 1,455 per cent dye by
weight. Thesis - University of Tennessee. Con-
tract Nonr-811(04).

Thermal conductivity and heat capacity of molten
materials. Part 6: Thermal conductivity of
beryllium oxide from 40° to 750°, by D. A.
Ditmars and D. C. Ginnings. U. S. National
Bureau of Standards. Oct 1955. 23p drawing,
graphs, tables. Order from OTS. 75 cents,
PB 121154

The thermal conductivity of beryllium oxide has
been measured from 40° to 750°C with an apparatus
employing steady-state longitudinal heat flow along
a rod of high-fired beryllium oxide surrounded by
a "guard" tube with matching temperature gradient
to minimize radial heat loss. The estimated ac-
curacy of the measurements is about 2%. However,
the values of thermal conductivity of the ideal BeO
crystal are probably somewhat higher than the

values given because of the low density (2.62 g/cm³) of the sample used. Project no. 1252. Covers work conducted from Jan 1955 to Jun 1955 under Contract AF 33(616)-52-10, AF WADC TR 53-201, Part 6.

Plastics and Plasticizers

Adhesive for composite materials used in printed circuitry. Final report for period 15 Mar 1953 through 14 Mar 1955 under Contract DA 36-039-sc-42708, by Russell M. Houghton and Virgil G. Lorenzini, Houghton Laboratories, Inc., Olean, N. Y. Mar 1955. 41p tables. Order from OTS. \$1.25. PB 111869

Final report covers period of March 15, 1953 through March 14, 1955. During that period seven other quarterly progress reports were prepared. They are available at indicated prices. Only final report is available at mimeo prices. An additional 12 months for research is being granted. All studies were primarily on improving bonding of copper foil to different base laminates. Data is tabulated and critically reviewed. For quarterly reports no. 1-7 see PB 118939-118945. Dept. of Army project no. 3-93-00-503. Signal Corps project no. 2005D.

Development of an improved fungicidal vinyl coating for cotton fabrics, by Richard R. Heitkamp, William J. Dewar and Dudley D. Eichorn, Flex-firm Products, El Monte, Calif. Aug 1954. 46p graphs, tables. Order from OTS. \$1.25. PB 121020

Secondary plasticizers and extenders were evaluated for their ability to impart fungistatic properties when incorporated into vinyl coatings and applied to cotton fabrics. The evaluations were carried out by determining the tensile strength of coated fabric samples before and after two weeks soil burial as described in Federal Specification CCC-T-191a Supplement Section IV, part 5, pages 54 and 55. Of all the secondary plasticizers and extenders, only one, dehydroabietylammonium pentachlorophenoxide, satisfied all requirements in providing the protection from microbial attack and at the same time giving the vinyl formulator the utmost leeway in producing an unlimited color range in water-proof coatings. AF WADC TR 53-474. Contract AF 33(616)-81.

Paints, Varnishes and Lacquers

Effect of parkerizing and pentrate black on the performance of small, highly stressed springs, by D. W. Marchant, U. S. Arsenal, Rock Island, Ill. Jan 1943. 12p graphs, tables. Order from LC. Mi \$2.40, enl pr \$4.80. PB 122087

Tests have been made to determine the fatigue life of spring steel before and after treatment with

parkerizing solution and with pentrate black. Results are given with graphs and tables. RIAL R 43-698.

Finishes: Parkerizing, pentrate, browning, carbonia black, oil black, nitre blue, by T. Rice, U. S. Arsenal, Rock Island, Ill. Oct 1940. 5p. Order from LC. Mi \$1.80, enl pr \$3.30. PB 122086

Gives method of application and chemical analysis for each type of coating. RIAL R 40-4780.

Microscopic examination of zinc chromate primers, by A. L. Alexander, U. S. Naval Research Laboratory. Aug 1939. 20p photos, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120446

It is the object of this study to devise an accurate and speedy method for determining the tolerance of certain type compositions such as zinc chromate primer (corresponding to Bureau of Aeronautics Specification P-27-b-1) for the various thinners designed to be used with them. NRL P-1555.

Notes on the control of the parkerizing operations conducted at Rock Island Arsenal, by H. L. Faigen, L. O. Gilbert and J. W. Arkis, U. S. Arsenal, Rock Island, Ill. Nov 1941. 20f. Order from LC. Mi \$2.40, enl pr \$4.80. PB 122084

Summarizes the Laboratory's experience in controlling and in correcting difficulties in the operation of the parkerizing units employed at this Arsenal. It discusses the chemical nature of the parkerizing solution, its general composition, chemical theory of operation, working concentration ranges and analytical procedures for chemical analysis of components, and gives special details of tank operation. RIAL R 41-8570.

Report on investigation of parkerizing on machine gun belt links using the X-ray diffraction unit, by A. W. Hanson, U. S. Arsenal, Rock Island, Ill. Sep 1942. 5p table. Order from LC. Mi \$1.80, enl pr \$3.30. PB 122085

The object of this investigation was: 1) To determine the composition of the parkerized surface. 2) To determine what constitutes a "good" parkerized surface. 3) To determine the relation between composition of the parkerized surface and the parkerizing tank solution concentrations. RIAL R 42-8291.

Inorganic Chemicals

Aggregation reactions of phosphates in anisole media, by R. K. Osterheld, Cornell University, Ithaca, N. Y. 1954. 52p graph, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 120362

Large scale use of high temperature reactions in essentially anisotropic media is an important part of the phosphate industry, particularly for the preparation of aggregated species. To provide a basis for a better understanding of phosphate aggregation reactions, the present project undertook to augment available data pertaining to the thermal aggregation (thermal decomposition) of sodium and potassium hydrogen phosphates with comparable data for other alkali metal systems (specifically, for lithium and cesium hydrogen phosphates) and for divalent metal systems (specifically, for barium and lead hydrogen phosphates). Inasmuch as there was evidence that the course and product of the thermal aggregation of hydrogen phosphates depends upon the humidity of the atmosphere surrounding the sample, this phenomenon was also investigated. Final report under Contract no. 401(05)-NR 356-294.

Development of fibrous glasses having high elastic moduli, by George R. Machlan, Owens-Corning Fiberglas Corp., Newark, Ohio. Nov 1955. 112p photos, diagrs, tables. Order from OTS. \$3. PB 111789

A fifty percent increase in modulus of elasticity of fibrous glass was achieved by the continuous formation of fibers of a calcium aluminate glass in a small textile glass bushing. The resistance of these glasses to chemical attack by water and water vapor is much less than that of commercially produced textile fibrous glass. The glasses are resistant to hydrofluoric acid but are completely soluble in hydrochloric acid. The dielectric constants of these glasses were found to be higher than the dielectric constant of present textile glass and the loss tangents were found to be approximately the same as that of present textile glass. Several compositions were investigated which contained tin oxide as the major constituent but no glasses were found. An exploratory study of glass-plastic combinations from the calcium aluminate glass was initiated. Volan A was found to be the best coupling agent tested for this glass. Project no. 7340, Task no. 73400. Covers period of work from Jun 1954 to Jul 1955 under Contract AF 33(616)-2422. AF WADC TR 55-290.

Analytical Chemistry

Research consisting of spectrographic analysis of samples and development of spectrographic methods for the determination of impurities in pure silicon. Second quarterly progress report for the period Aug-Oct 1955 under Contract no. AF 19-(604)-1416, by James M. Morris. Metal Hydrides, Inc., Beverly, Mass. Dec 1955. 10p diagrs. Order from LC. Mi \$1.80, ph \$1.80. PB 120227

A total of 52 samples were submitted for analysis. These samples consisted of raw materials, reagents and equipment, silicon metal, zone purified silicon tetraiodide, and materials from various

stages of the purification process. AF CRC TN 56-156.

Titanium alloys for analytical standards, by H. W. Lownie, Jr., D. L. Chase, and W. M. Henry. Battelle Memorial Institute, Columbus, Ohio. May 1953. 26p tables. Order from OTS. 75 cents. PB 121107

Titanium alloys were prepared for tentative chemical standards. The alloys were melted, chipped, and analyzed. A detailed description is included of the chemical and spectrographic procedures for the analyses of sixteen 10-lb Ti ingots. Analytical results were close to the intended compositions and showed the individual samples to be uniform within the limits of accuracy of the analytical techniques. Contract AF 33(600)-6850. AF WADC TR 53-101.

Miscellaneous Chemicals

Cathodoluminescence of several alkaline earth oxides, by Harold W. Gandy. Missouri University, Dept. of Physics, Columbia, Mo. Mar 1955. 39p drawing, graphs, tables. Order from LC. Mi \$3, ph \$6.30. PB 120029

Spectrum and time-decay measurements have been made on the cathodoluminescence of MgO, SrO, and (BaSr)O samples in a sealed-off high vacuum tube over a temperature range from 90°K to above room temperature. MgO was studied in both polycrystalline and single crystal forms. Suggestions are made concerning the possible luminescence mechanisms of a number of the bands on the basis of their observed temperature dependence and types of afterglow. ONR TR 17. Contract N7onr-292, T. O. 5, NR 074-081.

Chemical effects of intense ultrasonic waves in liquids, by Alfred Weissler. U. S. Naval Research Laboratory. Jun 1949. 25p photos, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 120451

A detailed investigation has been made of three chemical effects of intense ultrasonic waves in liquids: Liberation of iodine from an aqueous solution of potassium iodide and carbon tetrachloride, delay in the formation of colloidal sulfur, and depolymerization of polystyrene in toluene and hydroxyethyl cellulose in water. Cavitation appears to be the mechanism responsible for these phenomena. NRL S 3483.

Chemical thermodynamics of materials at high temperatures. Technical report no. 15: Mechanisms of permeation of silver, copper and mercury gases of solid graphite walls, by Russel K. Edwards and James H. Downing. Illinois Institute of Technology. Dept. of Chemistry, Chicago, Ill.

Mar 1955. 21p drawings, graphs, table. Order from LC. Mi \$2.70, ph \$4.80. PB 120049

Volatilization measurements conducted with mercury, silver and copper liquids from National Carbon graphite containers of grade AGX show that mercury and silver may pass through the walls by the mechanism of capillary flow whereas copper passes through the walls by activated diffusion. The activation energy found in the latter case was 20.7 kcal. for the containers used. Contract Nonr-1406, T. O. II, Proj 358-070.

Properties of solutions in the neighborhood of the critical temperature of the solvent. Fourth technical report under Contract no. N6 onr-238-11, project no. NR 238-146, for period 1 Aug 1953-30 Nov 1954, by Sidney W. Benson, Charles S. Copeland, Peter E. M. Allen, and David Pearson. University of Southern California. Dept. of Chemistry, Los Angeles, Calif. Dec 1954. 43p graphs, tables. Order from OTS. \$1.25. PB 111839

Report is in 6 sections: 1st is an extension of the phenomenological approach discussed in the third report (PB 111422); 2d on H_2O -Hg systems at high temperatures; 3d on acetonitrile and acetonitrile-KI solutions; 4th and 6th on H_2O -NaCl system; and the 5th on conductivity of NaI-Et OH near the critical temperature of the alcohol. For 1st and 3rd technical reports see PB 105257 and PB 111422.

DETERIORATION STUDIES

Correlation of temperature-humidity tests, by Michael Frederick and Eugene Fornario. Newark College of Engineering, Newark, N. J. Contract AF 33(616)-261. Order parts described below from LC, giving FB number of each part ordered.

Part 1: Equipment and methods. Dec 1953. 52f photos, diagrs, graphs, tables. Mi \$3.60, enl pr \$10.80. PB 120688

Plastic and metal specimens were subjected to four different temperature-humidity tests to establish the degree of correlation, deterioration effects, and relative merits of these tests. The test facility, humidity cycles, specimens and test measurement procedures are described. AF WADC TR 53-107, Part 1.

Part 2: Phase I tests. Dec 1953. 134f photos, graphs, tables. Mi \$6.90, enl pr \$22.80. PB 120689

Three testing procedures are specified in MIL-E-5272. This testing program was undertaken to furnish basic data concerning these procedures, their use, and relative merits. This re-

port gives results of humidity test procedure I, which was performed twice on plastics (phenolite, lucite, terminal board) and metals (steel, zinc coated steel, 24S and 52S aluminum, and Harvel coated steel). AF WADC TR 53-107, Part 2.

Part 3: Phase II tests. Dec 1953. 134f photos, graphs, tables. Mi \$6.90, enl pr \$22.80. PB 120690

Gives data and results of Phase II tests on the same plastics and metals as those tested in Part 2. AF WADC TR 53-107, Part 3.

Part 4: Phase III tests. Dec 1953. 134f photos, graphs, tables. Mi \$6.90, enl pr \$22.80. PB 120691

Gives data and results of Phase III tests on the same plastics and metals as those tested in Parts 2 and 3. AF WADC TR 53-107, Part 4.

ELECTRICAL MACHINERY

Communication Equipment

Advantages of clipping the peaks of speech waves prior to radio transmission, by K. D. Kryter, M. I. Stein, and S. S. Stevens. Harvard University. Psycho-Acoustic Laboratory, Cambridge, Mass. Oct 1944. 34f photos, graphs, table. Order from LC. Mi \$3, enl pr \$7.80. PB 120541

1. Speech - Transmission 2. Speech - Intelligibility 3. Speech - Clipping 4. NDRC Div 17 IC-83.

Component reliability program. Bell Telephone Laboratories, Inc., New York, N. Y. Jul 1953. 58p photos, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 119902

Specific data, conclusions and recommendations resulting from the examination of 1763 failed component parts are set forth, together with a brief résumé of the program and recommendations for its continuation. Illustrations of typical component failures, and reports by the field engineers cooperating in this program are included as appendices. NAVSHIPS 92073. Contract NObsr-52480, Final report.

Handbook of design data on cable connectors for microwave use. Polytechnic Institute of Brooklyn. Microwave Research Institute, Brooklyn, N. Y. Jan 1948. 100p drawings, diagrs, graphs, tables. Order from LC. Mi \$5.40, ph \$15.30. PB 120075

Chief attention has been given to the design of dielectric structures and line size changes, since the ever increasing demand for low-reflection broadband microwave connectors requires the use of special methods for the elimination of these major sources of reflection. As design aids, methods of reflection summation for the simpler analytical handling of the transmission line problems and methods for evaluation of simple discontinuity capacitances are presented. The relation of various design factors to specifications and methods of testing are given. Typical data is introduced to illustrate the relative magnitude of the various sources of reflection which contribute to the overall reflection characteristics of the connector. Reprint of publication prepared by Dr. John W. E. Griemsmann under Contract NObs-28372, NAVSHIPS 900,136.

Instruction book for audio signal scrambling equipment navy model PF. Western Electric Co., Inc., New York, N. Y. Nov 1946. 270p photos, diags (part fold.), graphs, tables. Order from LC. Mi \$11.10, ph \$40.85. PB 119911

1. PF (Scrambling equipment) 2. Signals, Auditory - Scrambling equipment 3. NAVSHIPS 900,922.

Electronics

Antenna study for forward propagation ionospheric scatter. Final report for the period 16 Jun-30 Nov 1955 under Contract no. AF 19(604)-1528, Project no. 4603, Task no. 46039, by John Ruze. Radiation Engineering Laboratory, Maynard, Mass. 1955. 59p fold, drawings, diags, graphs, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 120222

A study of antennas suitable for forward ionospheric scatter indicate that a theoretically optimum antenna is of large size erected at great height, approximately 400'. Economic considerations appear to dictate practical antenna heights below this optimum height. Many antenna types are considered, most of which, because of their complexity or special characteristics are rejected as impractical. Two antennas, the horn or array of horns and the array of corners, show considerable promise and are recommended for model study. AF CRC TR 55-175.

Antenna system for ionospheric scatter propagation, by William T. Dickinson, Jansky and Bailey, Inc., Washington, D. C. Jan 1956. 54p fold, drawing, diags, graph, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 120220

This work considers the requirements of an antenna system for forward scatter propagation in the frequency range from 25 to 50 megacycles over path lengths for which the angle of departure to the scattering zone centers on approximately one de-

gree. An antenna array consisting of eight inverted-V antennas and a ground system is described. It has been found possible to obtain the required gain and directivity over a frequency range of nearly two to one. The proposed antenna system can be erected quickly and at relatively low cost. Final report under Contract no. AF 19(604)-1527. AF CRC TR 56-150.

Antennas for ionospheric "forward scatter" propagation. Final report for the period 1 Jul-31 Oct 1955 under Contract AF 19(604)-1531, by Robert E. Webster. Ohio State University, Dept. of Electrical Engineering, Antenna Laboratory, Columbus, Ohio. Nov 1955. 41p diags, graphs. Order from LC. Mi \$3.30, ph \$7.80. PB 120221

This report describes an investigation directed toward antenna designs for ionospheric "forward scatter" propagation. The present status of mechanism investigations relevant to antenna design is examined. Ideal antenna characteristics are then deduced. These remarks are followed by considerations of practicable antenna limitations and the effects of height and polarization. Six practicable antenna systems are finally suggested, and a detailed design of one of the least expensive types is discussed. Final report, 648-1. AF CRC TR 55-177.

Balanced, unregulated dual power supply, by K. N. Hemmenway. U. S. Air Force, Air Research and Development Command, Cambridge Research Center, Electronics Research Directorate, RF Components Laboratory, Bedford, Mass. Jul 1955. 10p photos, diagr, graphs. Order from LC. Mi \$1.80, ph \$1.80. PB 120223

This report describes a dual unregulated power source supplying both B+ and B- voltages from a single transformer. Since both voltages are derived from one unit, they vary simultaneously and by identical amounts for changes occurring in the a-c line and thus provide an ideal power supply for the Philbrick K2W amplifier, servo potentiometers requiring a physically fixed zero-voltage reference point, or any instrument requiring two voltages of equal amplitude and opposite polarity. AF CRC TR 55-125.

Debunching in UHF velocity-modulated high density electron beams, by Myron Weinstein. Illinois, Engineering Experiment Station, Electrical Engineering Research Laboratory, Urbana, Ill. Apr 1955. 112p diags, graphs, tables. Order from OTS. \$3. PB 111799

The complete understanding of electron tubes in the microwave frequency range has been delayed, due mainly to the lack of theories for (a) large modulating voltages and (b) large beam current densities. The latter problem of determining the role that the space charge of large beam current densities plays over field free drift regions of a velocity modulated electron beam is the subject of this investigation.

Technical report no. 4 under Contract no. AF 19-(604)-524. Appendix A. - Infinite beam treatment. - Appendix B. Solution of integral. - Appendix C. Radial debunching of a finite beam. - Appendix D. Experimental apparatus. - Appendix E. Fourier representation of the output current of a zero space charge, bunched beam. AF CRC TN 55-576.

Industrial preparedness study: Transistors and transistor manufacturing equipment, by H. D. Harmon, I. H. Kalish, A. E. Mohr and W. C. Wanbaugh. Radio Corporation of America, Tube Division, Harrison, N. J. Contract DA-36-039-sc-30241, Final report. Order parts described below from OTS, giving PB number of each part ordered.

Vol. I: Transistor development. May 1955.
200p photos, drawings, diagrs, graphs. \$5.
PB 111822

Reviews the engineering development work done and summarizes the design features of the point-contact switching type 2N72, and the general purpose junction-type 2N96. Pilot production problems are discussed and complete manufacturing instructions for both types are included.

Vol. II: Equipment development. May 1955.
43p photos. \$1.25. PB 111820

Contains descriptions and photographs of the following equipment: germanium reduction unit, zone melting furnace, single crystal furnace, resistivity test set, wafer polishing equipment, pellet and support machine, pellet etching machine, point contact machine, stem lead trimming machine, hermetic seal test equipment, pulser, aging rack for transistors, static characteristic test set, dynamic test set, noise and frequency response test set, alpha curve tracer, collector curve tracer, paint spray booth.

Interaction of electrons and R-F fields. Technical report no. 3 for the period Dec 1, 1953 to Dec 1, 1954 under Contract no. 1147-01, by J. C. Twombly, S. G. Andresen and W. G. Worcester. Colorado. Engineering Experiment Station, Boulder, Colo. Dec 1954. 40p graphs. Order from LC. Mi \$3.30, ph \$7.80. PB 119838

This report is intended to deal primarily with the progress of investigations into the behavior of low-voltage electron beams employed for detection of signals by cyclotron resonance. One chapter is devoted to the design and construction of the tubes which have been devised for these experiments. For 1st report see PB 115243.

Magnetic resonance in systems with spectral distributions, by A. M. Portis. Pittsburgh. Univer-

sity. Sarah Mellon Scaife Radiation Laboratory, Pittsburgh, Pa. Nov 1955. 47p diagrs, tables. Order from LC. Mi \$3.30, ph \$7.80. PB 119753

When the envelope of the magnetic resonance represents a spectral distribution in single-spin resonant frequencies, a number of unfamiliar effects take place. Rapid passage through such spectra is analyzed. It is found that the amplitude and shape as well as the phase of the resonance line depend on the rate of the relaxation to the lattice. Spin-spin relaxation for such systems is also considered. The theory is developed in terms of diffusion of spin excitation through the resonance spectrum. Contract AF 18(600)-892. AF OSR TN 56-7.

Measurement of interface impedance in oxide-coated cathodes, by David Zammatt, Cornell University. School of Electrical Engineering, Ithaca, N. Y. Mar 1955. 57p diagrs, graphs, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 119517

Research report EE233. Technical report no. 21. Based on his thesis.
1. Cathodes, Oxide - Impedance - Interface
2. Bridges, Impedance - Design 3. Contract DA 36-039-sc-15342.

High frequency crystals for frequency control lapping and polishing methods, by E. A. Gerber and H. P. Wasshausen. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Sep 1951. 17p photo, drawings, diagrs, graphs, tables. Order from OTS. 50 cents. PB 111936

A method is described for lapping and polishing round quartz crystals, in the frequency range 10 to 180 Mc, to a high degree of flatness and parallelism. The performance of crystals, made by this method, surpasses that of any other known crystals. Dept. of Army proj. nr. 3-99-11-021. Signal Corps proj. nr. 142A-1. SCEL ER E-1080.

The mirror: A proposed simplified symbol for magnetic circuits, by R. P. Mayer. Massachusetts Institute of Technology. Digital Computer Laboratory, Cambridge, Mass. Aug 1952. 6p diagrs. Order from LC. Mi \$1.80, enl pr \$3.30. PB 120799

A coil can be wound on a magnetic core in one of only two directions. There are several dot-conventions which can be used to indicate which direction is desired. A simpler symbol, which is quicker to draw and easier to follow, is proposed. Engineering note E-472. MIT DCL E-472.

Three junction diode, by Rolf K. Mueller. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Electronics Research Directorate. Communications Labora-

tory, Bedford, Mass. Oct 1955. 19p diagrs, graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 120224

It is shown in this paper that a sequence of three junctions can exhibit a negative resistance under certain conditions for the length, conductivity, and lifetime of the different regions. The calculations are carried through for the linear case and the conditions under which a negative resistance can occur are given. AF CRC TR 55-120.

Generators, Motors, Transmission

Industrial preparedness study for silicon power rectifiers. Quarterly progress report under Contract no. DA-36-039-sc-46638, by D. Bakalar, H. G. Rudenberg, R. Hall, and L. Huff. Order parts described below, giving PB number of each part ordered.

Jan 1, 1955-Apr 1, 1955. Apr 1955. 38p photos, drawing, diagrs, graphs. Order from OTS. \$1. PB 111819

The purpose of this contract is to perfect the development, engineering, and production of a new type silicon power rectifier developed by Transatron and to make this power rectifier available to meet the growing requirements of military equipment. This study has resulted in (1) process improvements giving greater product yield and reliability, (2) junctions permitting currents in excess of 500 ma at 2.5 volts, (3) development of automatic machinery for manufacture, and (4) high temperature stability with small temperature coefficients.

Apr 1-Jul 1, 1955. Jul 1955. 46p photos, diagrs, graphs. Order from LC. Mi \$3.30, ph \$7.80. PB 120305

For earlier reports under this contract see PB 117641-117642.

1. Rectifiers, Silicon - Design
2. Rectifiers, Silicon - Tests
3. Rectifiers, Silicon - Manufacture
4. Crystals, Silicon - Junctions
5. Crystals, Silicon - Preparation.

Pulse transformer design and test methods, by P. R. Gillette, K. W. Henderson, K. Oshima, and R. M. Rowe, Stanford Research Institute, Stanford, Calif. Final report under Project 782 and Contract DA-36-039-sc-42645. Order separate parts described below from LC, giving PB number of each part ordered.

Part I: Test procedures for pulse and broad-band transformers. Jul 1955. 117p diagrs, graphs, tables. Mi \$6, ph \$18.30. PB 120375

Part I describes appropriate test procedures by which the performance characteristics of high-voltage, high-power pulse transformers

can be determined without operating them in the systems for which they are intended.

Part II: Design procedures for pulse transformers. Jul 1955. 158p diagrs, graphs, tables. Mi \$7.50, ph \$24.30. PB 120376

Part II describes appropriate procedures for designing low-power pulse transformers. The design procedure consists of 3 basic steps: (1) the calculation of required values of various design parameters (including leakage inductance, distributed capacitance and open-circuit inductance) from performance specifications; (2) the choice of appropriate types of materials for the core, conductors, and insulation, and of an appropriate type of core shape and winding arrangement; and (3) the calculation of the required insulation thicknesses, wire sizes, numbers of turns, and core dimensions.

Part III: Description of research. Jul 1955. 351p photos, diagrs, graphs, tables. Mi \$11.10, ph \$54.35. PB 120377

This part, together with the Final report on Contract no. DA-36-039-sc-5447 (PB 113570), comprises a detailed description of the theoretical and experimental work required for the development of new and improved design and test procedures for pulse transformers. All of the necessary equations are derived in this report.

Research on temperature prediction and improved cooling of power transformers. Final report no. 24 for the period Feb 15, 1951-Apr 30, 1953 under Contract no. DA-36-039-sc-5470, by G. A. Forster. Armour Research Foundation, Chicago, Ill. Apr 1953. 149p drawings, diagrs, graphs, tables. Order from LC. Mi \$7.20, ph \$22.80. PB 119903

A method was developed for predicting transformer temperatures for ordinary air-cooled, dry or liquid filled, open or hermetically sealed power transformers in sizes of 10 to 1000 watts. The analysis makes use of an equivalent heat flow diagram for a transformer from which three temperature rises are found to be important; the surface rise, the impregnant rise, and the rise from the coil surface to the coil hot spot. Equations and graphs for predicting each of these rises were developed. S. C. Project no. 32-2006-3. D. A. Project no. 3-26-00-602. ARF Proj E 016-2.

Test of Hardwick, Hindle wire wound resistors, by R. B. Owens. U. S. Naval Research Laboratory. Dec 1937. 14p photos, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120455

1. Resistors, Wire-wound - Tests
2. NRL R 1414.

Annual report, 1955. National Research Council, Division of Engineering and Industrial Research, Conference on Electrical Insulation, Mar 1956, 75p photos, diagrs, graphs, tables. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. \$3.

PB 120367

For 1953 and 1954 reports see PB 115993 and 116943. Contents: On the electric breakdown of electronegative gases, by R. W. Crowe and J. C. Devins. - Electric breakdown of gases and vapors of chloro-fluoro-hydrocarbons, by C. N. Works and E. W. Lindsay. - Effect of solid and contaminants in gaseous insulation, by T. W. Liao and G. Camili. - Area effect - and its extremal basis - for the electric breakdown of insulating oil, by K. H. Weber and H. S. Endicott. - Effect of electrode configuration on the electric strength of hexane, by A. H. Sharbaugh, E. B. Cox, R. W. Crowe and P. L. Auer. - Effect of hydrostatic pressure and applied voltage duration on the breakdown strength of insulating oil, by P. K. Watson. - Non-tracking organic insulations and their application to electrical apparatus, by R. S. Norman, R. A. Pfunter and A. A. Kessel. - Group III dry-type transformers - functional temperature endurance tests on a silicone glass fiber insulation system - Part II, by M. L. Manning. - Fundamental description of the mechanical behavior of silicone resins, by J. R. McLoughlin. - Effect of thermal conditioning on high frequency ceramic dielectric insulation, by E. J. Smoke, A. V. Ilyn and J. H. Koenig. - Appraisal of the petrie dish method of evaluating the susceptibility of tubular plastic insulations to the growth of fungi, by J. F. Wohnus. - Considerations for corona test specifications, by C. W. Ross and E. B. Curdts. - Investigation of corona discharges in gases with a multiplier phototube, by Daniel Berg and Thomas W. Dakin. - Instrument for photoconductivity measurements in the presence of relatively large D-C currents, by Dean A. Powers. - Dynamic technique for studying the pyroelectric effect and its application to ferroelectrics, by A. G. Chynoweth. - Guanidine aluminum sulfate hexahydrate -- a new ferroelectric material, by A. N. Holden, B. T. Matthais, W. J. Merz and J. P. Remeika. - Molecular engineering, by A. R. von Hippel. - Dielectric effects produced by solidifying certain organic compounds in electric or magnetic fields, by W. McMahon. - Dielectric relaxation of some spheroidal molecules, by Robert C. Miller and Charles F. Smyth. - Electrical conductance in polyethylene terephthalate films, by Walter Dannhauser and Walter H. Cobbs, Jr. - Dielectric materials for the microwave antenna lens, by Charles L. Petze, Jr. - Dielectric measurements at extremely low frequencies, by I. R. Weingarten. - Aims and objectives of the AIEE committee on dielectrics, by L. J. Berberich. - Some recent studies of random noise between metals and dielectrics, by S. I. Reynolds. - Dielectric surface failure, by L. J. Frisco and J. J. Chapman. -

Effects of insulation thickness on the aging of organic insulation in air, by L. C. Whitman and A. L. Scheideler. NRC 396.

FUELS AND LUBRICANTS

Antioxidants for greases. Interim report no. 2, by S. Fred Calhoun. U. S. Arsenal, Rock Island, Ill. Nov 1955. 34p photo, graphs, tables. Order from OTS. \$1. PB 121017

Forty-five additional compounds or formulations have been tested for their ability to inhibit oxidation of greases at 210 F. Those inhibitors which were effective at 210 F were also tested at 250 F. All of them were tested in lithium soap - mineral oil greases and a number in calcium and lithium-calcium soap mineral oil greases. The amine type compounds, either alone or in combinations, and especially the phenylene diamine derivatives have proved to be the most successful at both temperatures. Copper corrosion tests were run on all successful inhibitors and the acidity or basicity of the grease determined. No deleterious effects due to the inhibitor were noticed after allowing the grease to stand for several months. Dept. of the Army project no. 593-21-053. Ordnance project no. TB5-4010E, Report no. 15. For Interim report no. 1 see PB 116739. RIAL R 55-4243.

Friction studies of graphite and mixtures of graphite with several metallic oxides and salts at temperatures to 1000° F., by Marshall B. Peterson and Robert L. Johnson. U. S. National Advisory Committee for Aeronautics, Feb 1956. 16p photos, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119872

Powdered graphite lubricated metal surfaces at temperatures in the vicinity of 1000° F when a metallic oxide film could be formed and maintained. Mixtures of soft metallic oxides such as lead oxide or cadmium oxide with graphite were effective lubricants at all temperatures from room temperature to 1000° F unless a chemical reaction occurred between the graphite and the oxide. NACA TN 3657.

High-pressure hydrogenation at Ludwigshafen-Heidelberg, by a staff of specialists of the Badische Anilin und Soda Fabrik, A. G., formerly I. G. Farbenindustrie, Ludwigshafen/Rh. Translated by W. M. Sternberg. Order separate parts described below from LC, giving PB number of each part ordered.

Vol. I, A: General section, Mar 1951. 186p photos, diagrs, graphs, tables. Mi \$8.40, ph \$28.80. PB 120607

This collection is a report on processes developed by the I. G. Farbenindustrie for the catalytic-pressure hydrogenation of coals, tars, and oils, and in particular about the development work of the high-pressure experiment sections under the leadership of Dr. Matthias Pier in Ludwigshafen/Rhein between 1925 and 1945. The engineering section (vols. 6-8) discusses construction materials for the coal hydrogenation plant, design and strength of high-pressure equipment and machinery, heat and flow engineering, instrumentation and its arrangement, and combining the operation into one organic whole. Contents: I. History of hydrogenation, by Maria Hoering. - II. Short description of the process, from carbon-containing raw materials to finished products, by W. Uttinger. - Appendix I. Bibliography. - Appendix II. Development of high-pressure technique in hydrogenation plants for fuel production, by L. Raichle. Jul 18, 1942. - Appendix III. Pictures of high-pressure installations in hydrogenation plants. FIAT FR 1317.

Vol. II. B: Chemical section. Aug 1950. 195p photos, diagr, graphs, tables. Mi \$8.70, ph \$30.30. PB 120660

Contents: I. Raw materials and testing methods. a. Organic raw materials, by F. Schiffmann. - b. Hydrogen, by H. F. von Hochstetter. - Scientific foundation of hydrogenation, by O. Reitz.

1. Hydrogenation, High pressure - Germany
2. Coal - Hydrogenation - Germany 3. Raw materials - Germany 4. Hydrogen - Production - Germany 5. Coal tar - Hydrogenation - Germany 6. Crude oil - Hydrogenation - Germany 7. FIAT FR 1318.

Vol. III. (vol. 3a and 3b of German original). B: Chemical section. Mar 1951. 217p diagrs, graphs, tables. Mi \$9.60, ph \$33.30. PB 120661

Contents: III. Liquid-phase hydrogenation. - a. High-pressure section by W. Jaekch and W. Schneider. - b. Processing of residues, by W. Gieg. - c. Products of liquid-phase hydrogenation, by F. Schiffmann and W. Jaekch. - IV. Liquid-phase hydrogenation with a small amount of hydrogen, by Th. Pfirrmann and H. J. Waldman.

1. Hydrogenation residues - Utilization - Germany 2. Hydrogenation, High pressure - Germany 3. Coal tar - Hydrogenation - Germany 4. FIAT FR 1319.

Vol. IV. B: Chemical section. Mar 1951. 133p diagrs, graphs, tables. Mi \$6.90, ph \$21.30. PB 120662

Contents: V. The TTH process, by W. Jaekch. - Va. Hydrogenation of heavy oils over fixed-bed catalysts, by W. Jaekch. - VI. Vapor phase hydrogenation, by W. Simon.

1. Coal - Hydrogenation - Germany 2. Coal

tar - Hydrogenation - Germany 3. Catalysts, Hydrogenation - Germany 4. Hydrogenation, High pressure - Germany 5. Hydrogenation, Catalytic - Methods - Germany 6. FIAT FR 1320.

Vol. V (vols. 3a and 3b of German original) B: Chemical section. C: Relation of hydrogenation to other processes. Mar 1951. 285p diagrs, graphs, tables. Mi \$11.10, ph \$37.80. PB 120663

Contents: VII. The D.h.p. (Dehydrogenation under hydrogen pressure) process, by H. Nonnemacher. - VIII. Liquid and solid final products of hydrogenation and methods of their testing, by W. Hirschberger, H. Engel, F. Schiffmann, and L. Boente. - IX. Gaseous products of hydrogenation and their use, by H. F. von Hochstetter. - C. Relation of hydrogenation to other processes. I. Propane process and hydrogenation, by H. Engel. - II. Pressure distillation and hydrogenation, by H. Engel. - III. Catalytic cracking and hydrogenation, by G. Free.

1. Hydrogenation, High pressure - Germany
2. Dehydrogenation, Catalytic - Germany
3. Cracking, Catalytic - Germany 4. Catalysts, Hydrogenation - Germany 5. Distillation, Pressure - Germany 6. FIAT FR 1321.

Vol. VI (German original vols. 6a and 6b). D: Engineering section. Sep 1951. 270p photos, graphs, tables. Mi \$11.10, ph \$37.80. PB 120664

Contents: I. Introduction, by H. Schappert. - II. Materials of construction in high-pressure hydrogenation, by J. Class.

1. Hydrogenation, High pressure - Germany
2. Hydrogenation plants - Equipment - Germany
3. Hydrogenation plants - Construction materials - Germany 4. FIAT FR 1322.

Vol. VII. D: Engineering section. Sep 1951. 195p photos, drawings, diagrs, graphs, tables. Mi \$8.70, ph \$30.30. PB 120665

Contents: III. Industrial size plants. A. Design and strength: a. High-pressure cylinders. - b. Preheater. - c. Gas coolers. - d. Tubes and fittings. - e. Arrangement and interconnection of equipment in a stall unit. - f. Special construction for D.h.p. (in German DHD) plants. - B. High-pressure machinery.

1. Hydrogenation plants - Equipment - Germany
2. FIAT FR 1323.

Vol. VIII. D: Engineering section. Oct 1951. 206p drawings, diagrs, graphs, tables. Mi \$9.30, ph \$31.80. PB 120666

Contents: III. Industrial size plants (continued). C. Heat and flow engineering, by H. Schappert and H. Wilde. - IV. Technique of measurements. a. Measuring processes and execution of measurements, by F. Hamacher. - b. Use of instru-

ments in high-pressure converters, by W. Egli.
1. Hydrogenation plants - Equipment - Germany
2. Converters, High pressure - Design - Germany
3. Temperature - Measuring equipment - Germany
4. Pressure - Measuring equipment - Germany
5. FIAT FR 1324.

Wear of typical carbon-base sliding seal materials at temperatures to 700°F, by Robert L. Johnson, Max A. Swikert and John M. Bailey. U. S. National Advisory Committee for Aeronautics, Feb 1956. 22p photos, drawing, graphs, table. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119859

Wear and friction studies were made with carbon-type seal materials sliding against tool steel, stainless steel, and chromium-plated steel at temperatures to 700° F and a sliding velocity of 10,000 feet per minute. Wear was several times greater at 500° F and above than with no heat added for all carbon materials. The mating material had more effect on wear and surface failure than did the use of various impregnants in the carbon. Chromium plate gave less wear than the other mating materials under all conditions of the experiment. NACA TN 3595.

HIGHWAYS AND BRIDGES

Design and testing of flexible pavement. Presented at the thirty-fourth annual meeting, Jan 11-14, 1955. Highway Research Board. 1955. 92p photos, drawings, diagrs, graphs, tables. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. \$1.65. PB 120373

Contents: Wheel-load-stress computations related to flexible pavement design, by Chester McDowell. - Discussion, by R. G. Ahlvin and Stuart M. Fergus. - Design, construction and evaluation of heavy duty-runways, by W. H. Campen and J. R. Smith. - Discussion, by Raymond C. Herner, Howard Nunez, and Charles W. Johnson. - Flexible-pavement design with cone device, by W. A. Wise. - Appendix: Method of determining bearing power of soil with cone device. - Discussion, by Charles W. Johnson and E. B. Bail. - Pavement deflections and fatigue failures, by F. N. Hveem. - Discussion, by Earl C. Sutherland, W. H. Campen, Stuart Williams, and A. W. Maner. HRB Bul 114. NRC 401.

Effects of chlorination and microorganisms and constituents of asphalts. Presented at the thirty-fourth annual meeting, Jan 11-14, 1955. Highway Research Board. 1956. 53p photos, diagrs, graphs, tables. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. 90 cents. PB 120363

Contents: Effect of chlorination on oxidizability of road asphalts, by Frederick C. Sanderson. - Constitution and characterization of paving asphalts, by James H. Havens and W. F. Daniels. - Action of microorganisms on petroleum-asphalt fractions, by S. J. Burgess. HRB Bul 118. NRC 405.

Effects of traffic control on street capacity. Presented at the thirty-fourth annual meeting, Jan 11-14, 1955. Highway Research Board. 1956. 57p photos, maps, diagrs, graphs, tables. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. 90 cents. PB 119904

Contents: Capacities of narrow streets with manual control and signal control, by Oscar Sutermeister. - Discussion, by Herbert S. Levinson. - Capacities of one-way and two-way streets with signals and with stop signs, by Alexander French. - Discussion, by Herbert S. Levinson. - Starting delay and time spacing of vehicles entering signalized intersection, by Richard M. Bartle, Val Skoro and D. L. Gerlough. - Effect of parked vehicle on traffic capacity of signalized intersection, by Richard M. Bartle. HRB Bul 112. NRC 365.

Experimental concrete pavements. Presented at the thirty-fourth annual meeting, Jan 11-14, 1955. Highway Research Board. 1956. 77p photos, drawings, graphs, tables. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. \$1.35. PB 120365

Contents: Report on pavement research project in Indiana, by Walter T. Spencer, Harold Allen, and Preston C. Smith. - Report on pavement research project in Ohio, by Charles W. Allen and L. D. Childs. - Appendix. HRB Bul 116. NRC 403.

Factors influencing travel patterns. Presented at the thirty-fourth annual meeting, Jan 11-14, 1955. Highway Research Board. 1956. 101p maps, graphs, tables. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. \$1.80. PB 120339

Contents: Trends in traffic diversion on Edens Expressway, by William J. Mortimer. - Objective and subjective correlates of expressway use, by E. Wilson Campbell and Robert McCargar. - Induced traffic on Chesapeake Bay bridge, by Ernest W. Bunting. - Intracity traffic movements, by F. Houston Wynn. - Discussion, by J. D. Carroll, Jr. - Evaluation of intercity-travel desire, by Willa Myroie. - Discussion, by J. D. Carroll, Jr. HRB Bul 119. NRC 406.

Factors related to frost action in soils, presented at the thirty-fourth annual meeting Jan 11-14, 1955. Highway Research Board. 1955. 117p photos, drawings, graphs, maps, tables. Order

from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. \$2.25.
PB 119766

Contents: Subgrade moisture conditions under an experimental pavement, by John W. Guinnee and Charles E. Thomas. - Frost penetration under bituminous pavements, by Miles S. Kersten and Rodney W. Johnson. - Climate in relation to frost action, by Carl B. Crawford and Donald W. Boyd. - Theoretical basis for frost-action research, by A. R. Jumikis. - Drainage index in correlation of agricultural soils with frost action and pavement performance, by Wilbur M. Haas. - Plate-bearing study of loss of pavement supporting capacity due to frost, by William C. Sayman. - Frost and permafrost definitions, by Frank Hennion. HRB Bul 111. NRC 364.

Land acquisition. Presented at the thirty-fourth annual meeting, Jan 11-14, 1955. Highway Research Board, 1956. 89p maps. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. \$1.80.
PB 120374

Contents: Report of committee on land acquisition and control of highway access and adjacent areas, by David R. Levin. - Highways for new urban patterns, by Tracy B. Augur. - Right-of-way problems on urban expressways, by Edward A. Bielefeld. - Roadside protection through nuisance and property law, by J. H. Beuscher. - Nebraska state zoning agency, by J. Edward Johnston. HRB Bul 113. NRC 366.

Statistical analysis of highway accidents. Presented at the thirty-fourth annual meeting, Jan 11-14, 1955. Highway Research Board, 1956. 37p graphs, tables. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. 75 cents. PB 120366

Contents: Accidents versus width of paved shoulders on California two-lane tangents - 1951 and 1952, by D. M. Belmont. - Discussion, by J. Al Head, W. R. Bellis, Karl Moskowitz, C. E. Billion; closure, by D. M. Belmont. - Application of statistical quality-control techniques to analysis of highway-accident data, by Monroe Norden, Jesse Orlansky, and Herbert Jacobs. HRB Bul 117. NRC 404.

Vertical sand drains for stabilization of embankments. Presented at the thirty-fourth annual meeting, Jan 11-14, 1955. Highway Research Board, 1955. 57p photos, drawings, diags, graphs, tables. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. 90 cents. PB 120364

Contents: Modification of sand-drain principle for pressure relief in stabilizing embankment foundation, by Ray Webber and W. C. Hill. - Sand

drains for embankment on marl foundation, by George W. McAlpin, Jr. and M. Nicholas Sinacori. - Stabilization of marsh deposit, by S. I. Tsien. - Economic aspects of vertical sand drains, by Walter C. Boyer. - Control of slide by vertical sand drains, by W. T. Parrott. HRB Bul 115. NRC 402.

INSTRUMENTS

Annual progress report under Contract N5 ori-07876, NR 025-164. Massachusetts Institute of Technology. Servomechanisms Laboratory. Electronic Nuclear Instrumentation Group. Mar 1955. 58p drawings, diags, graphs. Order from LC. Mi \$3.60, ph \$9.30. PB 119650

Efforts of the Electronic Nuclear Instrumentation Group during the past year have been directed chiefly toward completing the development of a rugged, wide range, fast responding, neutron flux measuring system that is free of fragile, short-life vacuum tubes. The first experimental model of the neutron-sensitive thermopile was completed and tested in the Brookhaven reactor. Likewise the components for amplifying the output of the thermopile, including the magnetic modulator and the tuned transistor amplifier, have been developed into a working system and tested. A new transistorized oscillator of extremely low second-harmonic output for use as a power supply for the modulator has been evolved. Meanwhile, a preliminary model of the acoustic ionization chamber was completed and tested in the Brookhaven reactor. The study of pulse height analysis systems was completed and the advantageous features of a system employing photographic film for data storage demonstrated. Statistical study of the fluctuations in period-meter indications viewed as a stochastic process have been continued, and analysis of multi-element logarithmic devices for use in period indicating systems has been started.

Elevation-azimuth servo system specifications for star tracking, by Charles F. White and James W. Titus. U. S. Naval Research Laboratory. Apr 1956. 34p diags, graphs. Order from OTS. \$1. PB 111711

Radio astronomy star tracking requirements are resolved into elevation and azimuth coordinates and related to servo system transfer function specifications. Time functions for angular position, velocity, and acceleration are derived and maximum values found. A block diagram is given for a servo system suitable for the azimuth coordinate. NRL R 4732.

Investigation of scintillation counters for the detection of soft X-rays. Final report for the period Jul 1-Oct 1, 1954 under Contract no. DA-36-039-sc-5599, by James T. Nelson and Raymond T.

Ellickson. Oregon. University. Dept. of Physics, Eugene, Ore. Oct 1953. 15p graphs, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120320

The work described in this and previous reports is the development of a scintillation counter for the efficient detection of soft x-rays in connection with the orientation of quartz crystals and powder diffraction. Dept. of the Army project no. 3-99-11-022. Signal Corps project no. 33-1428 (C-036401.1).

Multiple activating electronic synchronizer, by Robert G. Walden. Woods Hole Oceanographic Institution, Woods Hole, Mass. Mar 1955. 31p photos, diagr. Order from LC. Mi \$3, ph \$6.30. PB 119893

This report describes an instrument designed and built at the Woods Hole Oceanographic Institution for a specific application which required the simultaneous activation of a pair of airborne cameras located in separate aircraft. Physical and electrical specifications of the complete system are discussed. A detailed circuit description and schematic diagram of the activating unit is given. Unpublished manuscript. WHOI Ref 55-15. Contract Nonr-769(00).

Potassium iodide fast neutron detector, by Bernard Brown. U. S. Camp Evans Signal Laboratory, Belmar, N. J. Feb 1955. 7p graph. Order from LC. Mi \$1.80, ph \$1.80. PB 119848

A fast neutron scintillation detector has been developed which will give a response close to that of a hydrogenous radiator. The phosphor used consists of a KI and polystyrene cylinder. The detector has an efficiency of a few percent and is insensitive to gamma radiation. Dept. of the Army project no. 3-99-04-061. Signal Corps project no. 196A. SCEL TM M-1625.

Principles of computer simulators: Theory and maintenance. U. S. Office of Naval Research. Special Devices Center, Port Washington, N. Y. Sep 1955. 158p photos, diagrs, graphs, tables. Order from OTS. \$3. PB 121200

This is a basic reference book on analog computers. It covers principles of operation as well as suggestions for field maintenance personnel. Digital computer arithmetic processes are contained in the Appendix. A simple description of the binary system is included. Title on cover: Principles of computer simulation. NAVEXOS P-1248.

Regenerative heat exchanger. Final report under Contract no. W33-038-ac-17548(17871), by Stothe P. Kezios and Harold H. Sogin. Illinois Institute of Technology. Dept. of Mechanical Engineering. Jan 1951. 202f photos, drawings, diagrs, graphs,

tables. Order from LC. Mi \$9.30, enl pr \$33.30. PB 120494

This report contains a summary of the theory applicable to the experimental and practical regenerator, a review of some of the experimental work in the literature, description of the experimental apparatus, and some results that have been obtained thus far.

Study of long-period waves by instruments which record on ship. California. University. Scripps Institution of Oceanography. Aug 1955. 5p. Order from LC. Mi \$1.80, ph \$1.80. PB 119938

1. Waves, Ocean - Measurement 2. Contract AF 19(604)-1163, Final report 3. UC SIO Ref 55-26.

Test, evaluation, and analysis of a foam pump for fire fighting application, by H. B. Peterson. U.S. Naval Research Laboratory. Apr 1956. 17p photos, drawing, graphs, tables. Order from OTS. 50 cents. PB 121042

A foam pump submitted for Navy approval has been evaluated for use in Navy aircraft fire fighting vehicles, and its operating characteristics have been studied. Improvements made in the design of the ribs over the ports have materially decreased blade wear and eliminated the localized wear condition. Accurate determinations were made of the horsepower requirements against varied discharge pressures and pump efficiencies were calculated on both mechanical and volumetric bases. Internal pressures taken during full operation by means of a transducer and oscilloscope enabled the construction of pressure cards. Analysis of the data obtained has been used to recommend further changes in pump design to insure more efficient and reliable operation. NRL R 4723.

Tests of 6-inch hydraulic relief valve with amplifier ring, by James M. Langford. U. S. Air Force. Air Research and Development Command. Arnold Engineering Development Center, Tullahoma, Tenn. Jan 1955. 22p photos, drawings, graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 120219

Two designs of the 6-in. hydraulic relief valve were tested, the principal difference between the two designs being the type of seal used. The two designs performed equally well except that the design with an O-ring and groove-type seal proved superior to that with the flat-gasket type seal. The test results indicate that the 6-in. hydraulic relief valve tested will meet the requirements for an over-pressure relief device. Contract AF 18(600)-1233. AF AEDC TN 54-29.

Translation of arithmetic operations into switching operations in digital computer design, by Torben

H. Meisling. California, University. Div. of Electrical Engineering. Electronics Research Laboratory. Dec 1952. 116f diagrs, tables. Order from LC. Mi \$6, enl pr \$19.80. PB 120495

It is shown how the information concept of the mathematical theory of communication can be applied both to arithmetic operations on numbers and to switching operations. Examples of the application of the ideas and theorems discussed in the design of practical computing circuits are given. Appendix: A binary coded decimal adder. UC IER Series 25, Issue no. 4. Contract N7-onr-295, T. O. XIV.

MACHINERY

Preliminary studies leading to the development of a submerged-combustion boiler. Second annual status report under Contract no. NONr-1149(00) for the period Feb 1, 1954-Jan 31, 1955, by Gerald Golub. Experiment, Inc., Richmond, Va. Jan 1955. 12p photos, drawing. Order from LC. Mi \$2.40, ph \$3.30. PB 120027

An apparatus for studying the stability of a chloride eutectic consisting of 46.5, 42.5 and 11 mole percent lithium, potassium, and sodium chlorides, respectively, to ordinary combustion gases has been built. Details of the apparatus and some preliminary results with the chloride eutectic uncovered in last year's program are given. These initial results indicate that the chloride eutectic is chemically inert to the hot combustion gases under the reported limited evaluation. These initial results show the salt bath to be noncorrosive to the steel apparatus under certain conditions. For first report see PB 116138. EXP-131. TM-784.

Three-dimensional flow in axial-flow turbo-machinery, by Leroy H. Smith, Jr. Johns Hopkins University, Baltimore, Md. Aug 1955. 140p photos, drawing, diagrs, graphs. Order from OTS. \$3.50. PB 121052

In Chapter I a method for solving the direct and inverse axisymmetric problems is presented in such a way as to accommodate the secondary flow theories that follow. In the next chapter, the circumstances under which significant secondary flows are to be expected are presented, together with a method for their inclusion in design. Chapter III deals with the properties of the vortex sheets which trail from the vanes. Chapter IV is concerned with the determination of secondary vorticity and the integration of this vorticity to find the secondary velocities. It is shown that these velocities are compatible with the vortex sheets as determined in Chapter III. A single stage low Mach number test compressor was built to test the theory presented in Part I and to determine the feasibility of using flows which are highly rotational (far from a free

vortex) in an axial-flow turbomachine. Tests which have been carried out give the inlet guide vane and rotor performance over a range of operation varying from incipient stall to maximum throttle opening. The correlation between measured and design values was generally good, thus indicating that the axis-symmetric theory is a valid design method even with highly rotational flows. Project no. 3066. Contents: Part I. Theoretical determination of secondary flow. - Part II. Experimental investigations. Contract AF 33(616)-152. AF WADC TR 55-348, Vol. I.

MEDICAL RESEARCH AND PRACTICE

Application of research findings to training film production, by Edward P. McCoy. Pennsylvania State University, University Park, Pa. May 1955. 30p. Order from LC. Mi \$2.70, ph \$4.80. PB 120450

This report describes how film research findings were applied to the design and production of films. Research findings were incorporated in a series of films on marksmanship to make them maximally effective. These films were used effectively and resulted in a reduction in training time and expenditure of ammunition, as well as a considerable increase in training effectiveness. Instructional Film Research Program, SDC TR 269-7-44.

Physiologic principles underlying naval ventilation, by A. R. Behnke, F. C. Houghten, W. V. Consolazio, and Nello Pace. U. S. Naval Medical School, Dept. of Atmospheric Hygiene, Bethesda, Md. Nov 1942. 72p photos, diagrs, graphs, tables. Order from LC. Mi \$4.50, ph \$12.30. PB 120449

1. Ships - Ventilation 2. Body, Human - Temperature 3. Physiology - Research.

Quarterly report for the period Oct-Dec 1955 under Contract AF 19(604)-626, Massachusetts Institute of Technology, Acoustics Laboratory. Dec 1955. 31p. Order from LC. Mi \$3, ph \$6.30. PB 120226

1. Acoustic research 2. AF CRC TN 56-163.

METALS AND METAL PRODUCTS

Annual report to ONR on high pressure research, Institute for the Study of Metals, Chicago, Ill. Contract N6ori-20, T. O. XX. Order separate parts described below from LC, giving PB number of each part ordered.

First report, May 15, 1947-Jul 1, 1948. Jul 1948. 78f photos, drawings, diagrs, graphs, tables. Mi \$4.50, enl pr \$13.80. PB 120667

Contents: Press and bomb assembly, by N. A. Riley. - Proportioning pressure controller, by R. Stohlquist. - Practical absolute noise thermometer for high temperatures and high pressures, by J. B. Garrison and A. W. Lawson. - X-ray camera for obtaining powder pictures up to 15,000 atmospheres, by N. A. Riley, S. Mayburg, and A. W. Lawson. - Absolute measurement of linear compressibilities by radiographic techniques, by A. W. Lawson, N. A. Riley, and A. Smith. - Elastic behaviour of single crystals at high pressures, by D. Lazarus. - Some investigations on Li-Pb alloys, by D. Lazarus.

Second report, Jul 1948-Jul 1949. Jul 1949. 112f drawings, diagrs, graphs, tables. Mi \$6, enl pr \$19.80. PB 120668

Contents: Technique, by A. H. Smith. - X-ray camera for obtaining powder pictures, by A. W. Lawson and N. A. Riley. - Absolute noise thermometer for high temperatures and high pressures, by J. B. Garrison and A. W. Lawson. - Variation of the adiabatic elastic constants of KCl, NaCl, CuZn, Cu and Al with pressure to 10,000 bars, by D. Lazarus. - Effect of pressures on the low frequency dielectric constant of ionic crystals, by Sumner Mayburg. - Apparatus for measurement of anelastic effects at high pressures, by D. Lazarus. - Direct measurement of compressibility, by A. H. Smith, N. A. Riley, and A. W. Lawson. - Concerning the high pressure allotropic modification of cerium, by A. W. Lawson and Ting-Yuan Tang. - Effects of hydrostatic pressure on ionic conductivity, by S. W. Kurnick. - Ultrasonic velocities of sound in some liquid metals, by O. J. Kleppa. - On the relation between thermal expansion and thermal conductivity in one-dimensional lattices, by A. W. Lawson.

Third report, Jul 1949-Jul 1950. Jul 1950. 96f drawings, diagrs, graphs, tables. Mi \$5.40, enl pr \$16.80. PB 120669

Contents: Introduction, by A. W. Lawson. - Design of a high pressure gas system, by R. W. Keyes. - Ultrasonic velocity of sound at 12 MC in liquid sulfur, by O. J. Kleppa. - Thermal expansion in silver halides, by A. W. Lawson. - Effect of pressure on the low frequency dielectric constant of ionic crystals, by Sumner Mayburg. - Radiographic method of dilatometry, by A. H. Smith, N. A. Riley, and A. W. Lawson. - High temperature specific heat of Ag Br, by A. W. Lawson and R. W. Christy. - Ultrasonic velocities of sound in some metallic liquids. Adiabatic and isothermal compressibilities of liquid metals at their melting points, by O. J. Kleppa. - Diamond bomb for obtaining powder pictures at high pressures, by A. W. Lawson and Ting-Yuan Tang. - Effects of hydrostatic

pressure on ionic conductivity, by S. W. Kurnick. - On heat conductivity in liquids, by A. W. Lawson. - Heat conductivity apparatus for liquid argon, by A. Uhlir. - On free rotation in β - NH_4Cl , by A. W. Lawson.

Fourth report, Jul 1950-Jul 1951. Jul 1951. 72f photos, drawing, diagrs, graphs, tables. Mi \$4.50, enl pr \$13.80. PB 120670

Contents: Preface, by A. W. Lawson. - Analysis of the pressure dependence of the dielectric constant of polar liquids, by I. S. Jacobs and A. W. Lawson. - High pressure experiments on copper, by A. H. Smith. - Specific heat of silver bromide, by A. W. Lawson and R. W. Christy. - Liquid nitrogen quenching of high pressure phases in metals, by I. S. Jacobs. - High pressure gas system, by A. H. Smith. - Electrical conductivity of molten germanium, by R. Keyes. - Conductivity of ionic crystals, by S. W. Kurnick. - Self diffusion in sodium II. The effect of pressure, by N. H. Nachtrieb, J. A. Well, E. Catalano, and A. W. Lawson. - Heat conductivity of liquid argon, by A. Uhlir, Jr. - Variation of dielectric constants of ionic crystals with pressure, by S. Mayburg.

Fifth report, Jul 1951-Jul 1952. Jul 1952. 70f photos, drawings, diagrs, graphs, table. Mi \$3.90, enl pr \$12.30. PB 120671

Contents: Preface, by A. W. Lawson. - Alternating current measurements on silver bromide, by R. J. Friauf. - Change of curie point with hydrostatic pressure, by L. Patrick. - Phase equilibrium in the system calcite-aragonite, by J. C. Jamieson. - Effect of high pressure on the density of non-cubic metals, by R. J. Friauf. - Sound velocities in water as a function of temperature and pressure, by A. H. Smith. - Electrical conductivity of silicon-germanium alloys, by Robert Keyes. - Pressure dependence of F-centers in alkali halides, by I. S. Jacobs. - Resistance of manganese, by L. Patrick. - Creep of silver bromide at high temperatures, by R. Christy.

Sixth report, Jul 1952-Jul 1953. Jul 1953. 197f photos, drawings, diagrs, graphs, tables. Mi \$8.70, enl pr \$31.80. PB 120672

Contents: Preface, by A. W. Lawson. - Effect of diffusion currents on the hall voltage in semiconductors, by Robert W. Keyes. - Creep of silver bromide at high temperature, by R. W. Christy. - Polarization effects in the ionic conductivity of silver bromide, by Robert J. Friauf. - Change in curie point with hydrostatic pressure, by Lyle Patrick. - Velocity of sound in water as a function of temperature and pressure, by A. H. Smith and A. W. Lawson. - Electrical properties of black phosphorus, by Robert W. Keyes. - Irreversible compression of glass, by R. W. Keyes. - Effect of plastic deformation on the electrical conductivity of silver bromide, by Wm. G. Johnston. - Antiferromagnetism of man-

ganese, by Lyle Patrick. - Electrical conductivity of calcium fluoride crystals, by Roland W. Ure, Jr. - Effect of pressure on F-center absorption in alkali halides, by L. S. Jacobs.

Seventh report, Jul 1953-Jul 1954, Jul 1954.
116f drawings, diagr, graphs, tables. Mi \$6,
enl pr \$19.80. PB 120673

Contents: High pressure "O"-ring piston packings, by A. W. Lawson. - Effect of compressible stress on self-diffusion in zinc, by A. W. Lawson. - Effect of hydrostatic pressure on the electrical resistivity of metals, by A. W. Lawson. - Equilibrium thermal dissociation of dolomite, by Julian R. Goldsmith. - Progress report on an investigation of some carbonate solid solutions, by John C. Jamieson. - Preliminary notes on the origin of ultrabasic rocks, by Kenneth O. Bennington. - Thermo-electric power of pure and doped AgBr, by Lyle Patrick and A. W. Lawson. - Elastic constants of AgBr at 28°C, by D. S. Tannhauser and A. W. Lawson. - Effect of plastic deformation on the electrical conductivity of silver bromide, by William G. Johnston. - Effect of pressure on self-diffusion in white phosphorus, by Norman H. Nachtrieb and A. W. Lawson.

Ductile fracture of metals. Fatigue and anisotropy in copper, by Merrill L. Ebner, Walter A. Backofen and John Wulff, Massachusetts Institute of Technology, Dept. of Metallurgy, Metals Processing Division, Feb 1955. 29p photos, drawings, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 119978

Copper of commercial purity has been found to exhibit a mechanical anisotropy under fatigue loading. This anisotropy is explained by postulating the presence of a fibrous structure of crack-like flaws aligned parallel to the axis of the bar which supplied the test specimens. Technical report no. 5 under Contract N5 ori-07841, Project NR 031-356.

Durch sauerstoffzufuhr verursachte stromlieferung galvanischer elemente als mass für die oxydation und anfangskorrosion von metallen (The current delivery of galvanic cells caused by oxygen feed as a unit for the oxidation and initial corrosion of metals), by F. Tödt. Translated and edited by F. A. Raven, Nov 1955. 9p. Order from LC. Mi \$1.80, ph \$1.80. PB 119455

This report discusses the nature of oxygen-corrosion; reaction phenomena and reaction curve for oxygen corrosions; investigation of the reaction phenoma on Pt/Fe or Pt/Cd cells in solutions with varying O₂ content by means of quantitative current measurements; relationships between oxygen charge and current delivery. Translated from Werkstoffe und Korrosion, vol. 1, no. 2, Feb 1950, pp. 49-51. NAVSHIPS T 595, STS 223.

Effect of grain size and structural variables on the stabilization of titanium alloys, by Frank C. Holden, Horace R. Ogden, and Robert I. Jaffee, Battelle Memorial Institute, Columbus, Ohio, Jan 1956. 57p photos, graphs, tables. Order from OTS. \$1.50. PB 121156

This report is a summary report on a study of the effect of grain size and structural variables on the stability of titanium alloys. It covers the period from September 1, 1954, to June 1, 1955. The object of this research was to study the factors which affect the stabilization of titanium alloys. In this work, the evaluation of thermal stability was made by hardness, bend, and tensile tests on specimens before and after exposure at elevated temperatures. These data are presented graphically to supplement the text of the report. Complete tabular data are included in the Appendix. Project no. 7351, Task no. 73510. Contract AF 33(616)-412. AF WADC TR 55-310.

Elevated temperature properties of titanium, by W. Lee Williams, U. S. Naval Engineering Experiment Station, Annapolis, Md. Oct 1951. 17f graphs, tables. Order from LC. Mi \$2.40, enl pr \$4.80. PB 120591

Tensile, creep and stress-rupture properties are reported up to 900°F for both annealed and cold worked unalloyed titanium produced from a single ingot arc melted in graphite. Data indicated that the strengthening effects of cold working could be relied upon over very long periods at temperatures up to about 600°F. Project NS-013-118, NAV EES 4A(2)066876.

Elevated temperature properties of titanium and titanium alloys, by W. Lee Williams, U. S. Naval Engineering Experiment Station, Annapolis, Md. Mar 1951. 32f photos, drawings, graphs, tables. Order from LC. Mi \$3, enl pr \$7.80. PB 120590

Tensile, stress rupture and creep data are reported for temperatures up to 900°F. These data have been analyzed with respect to compositions and methods of production of the materials. Results of high pressure wet steam erosion tests on simulated turbine blade sections are also reported. Data are reported for titanium produced by arc melting and induction melting in graphite, and for a Cr-Fe titanium alloy arc melted in a water cooled copper crucible. Project NS-013-118, NAV EES 4A066876.

Increasing the ratio of modulus of elasticity to the density of titanium alloys, by William H. Graft, David W. Levinson, and William Rostoker, Armour Research Foundation, Chicago, Ill. Nov 1955. 74p photos, drawing, diagrs, graphs, tables. Order from OTS. \$2. PB 121151

This is the final report on Contract no. AF 33(616)-2355 summarizing the experimental progress made during the period Mar 15, 1954 to March 15, 1955, under Contract AF 33(616)-2355. The objective of this study was the investigation of the various factors which affect the ratio of elastic modulus (Young's modulus) to density of titanium alloys with the ultimate aim of developing an alloy of improved properties. Other phases of the study included the effect of elevated temperature, preferred orientation, and the relative amounts of α and β on Young's modulus (E) and the ratio of Young's modulus to density (E/ρ). Project 7351, AF WADC TR 55-147.

Influence of alloying upon grain-boundary creep, by F. N. Rhines, W. E. Bond and M. A. Kissel. U. S. National Advisory Committee for Aeronautics. Apr 1956. 16p graphs, table. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120258

Grain-boundary displacement, occurring in bicrystals during creep at elevated temperature (350°C), was measured as a function of the copper content (0.1 to 3 percent) in a series of aluminum-rich aluminum-copper solid-solution alloys. Because alloying effects alone were to be investigated, the conditions of observation were limited to a single temperature and range of stress. NACA TN 3678.

Investigation of the influence of boron and titanium on the high-temperature properties of Cr-Ni-Mo-Fe austenitic alloys, by C. L. Corey and J. W. Freeman, Michigan, University. Engineering Research Institute, Ann Arbor, Mich. Dec 1954. 72p photos, graphs, tables. Order from OTS. \$2. PB 121101

The mechanism by which boron, alone or with titanium, influences the high-temperature strength of a 13 Cr - 15 Ni - 2 Mo - 0.6 W - 0.6 Ti alloy has been studied. Solid solution strengthening, precipitation hardening, hot-cold working, and strain aging have been considered. The approach used to study the mechanism was to follow the response of a group of laboratory heats, covering a range of boron contents both with and without titanium, to different solution treatments, hot-cold working conditions and aging treatments. Project no. 7351. Contract AF 33(616)-173. AF WADC TR 54-583.

Investigation of the Ni_3Al phase of nickel-aluminum alloys, by Edward M. Grala. U. S. National Advisory Committee for Aeronautics. Apr 1956. 24p photos, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120254

The stoichiometric Ni_3Al intermetallic had an ascast room-temperature tensile strength of 28,650 psi with 1.0-percent elongation; after homogenization at 1800°F this strength decreased to 20,350 psi with 0.2-percent elongation. A 14-percent-

aluminum alloy in the same phase field had better tensile properties than the stoichiometric composition. The stoichiometric Ni_3Al had no hot-workability and only moderate impact strength. NACA TN 3660.

Investigation of various properties of NiAl. American Electro Metal Corporation, Yonkers, N. Y. Contract AF 33(038)-10716. Order separate parts described below from OTS, giving PB number of each part ordered.

Part I, by Richard L. Wachtell. Sep 1952. 45p photos, drawings, diagr, graph, table. \$1.25 PB 121021

Production of the alloy NiAl and a modified composition NiAl + 5% Ni has proved feasible as well as its subsequent fabrication by powder metallurgical technique. Properly hot-pressed bars of the NiAl + 5% Ni composition show strengths in modulus of rupture as high as 144,000 psi at room temperature and 68,000 at 980°C . The air oxidation and heat shock resistance of the modified NiAl + 5% Ni composition is excellent up to 1095°C . AF WADC TR 52-291, Part 1.

Part 2, by W. H. Herz. Aug 1954. 52p photos, drawings, diagr, graphs, tables. \$1.50. PB 121022

Work with (NiAl + 5% Ni) has been continued. Stress-to-rupture specimens 9-1/2 in. long have been prepared, and various methods of preparation are discussed. The addition of "stiffeners" to increase strength at high temperatures has been tried. These additions usually act to decrease the oxidation resistance considerably. A new aluminide, TiAl, is investigated. AF WADC TR 52-291, Part 2.

Part 3: Investigation of the intermetallic compounds of aluminum, by W. H. Herz. Apr 1955. 78p photos, diagrs, graphs, tables. \$2. PB 121023

Modification of NiAl by the addition of zirconium or titanium has produced products with improved high temperature properties without decreasing the oxidation resistance. NiAl + 4% Zr is so far the best, having an excellent oxidation resistance, transverse rupture strength, and stress rupture life of 100 hours at 1000°C and 12,000 psi. These materials can be handled by hot pressing, cold pressing and sintering, slip casting, and hydrostatic pressing, with machining in the presintered state making complicated shapes possible. A method of homogenizing and purifying gamma TiAl was developed, and the first physical tests were made with this improved material. AF WADC TR 52-291, Part 3.

New high-temperature intermetallic materials, by William Arbiter, American Electro Metal Corp., Yonkers, N. Y. Project no. 7350. Contract AF 33(616)-109. Order separate parts described below from OTS, giving PB number of each part ordered.

Part 2, Nov 1953. 55p photos, diagrs, graphs, tables. \$1.50. PB 121018

The details of the preparation and evaluation of a large number of intermetallic compounds, of some hard metal compounds and combinations of both are reported. Of the many compounds tested, those in the systems chromium-titanium and chromium-silicon show promise as potential high temperature materials in view of their excellent oxidation resistance at elevated temperatures, and particularly in the case of the chromium-titanium materials of their excellent stress-to-rupture behavior. A large number of properties have been evaluated including electrical resistivity, thermal expansion, heat shock resistance, oxidation resistance, corrosion resistance, modulus of rupture at room and elevated temperatures and stress-to-rupture behavior. For Part 1 see PB 111413. AF WADC TR 53-190, Part 2.

Part 3, Dec 1954. 98p photos, diagrs, graphs, tables. \$2.50. PB 121019

The average properties of a large number of compositions in the Cr-Ti-O and the Cr-Ti-O-N systems are given. A comparison of the properties of similar compositions in the two systems is made and this indicates that nitrogen additions increase brittleness while increasing high temperature strength. All of the silicide compositions tested showed brittle behavior and attempts to modify this behavior by the addition of metallic binders resulted in little, if any, improvement. Compositions in the Co-Cr-Mo systems consisting of substantial amounts of the sigma phase have shown some promise in high temperature applications. Despite the appreciable quantities of the sigma phase, the impact resistance has remained relatively high. AF WADC TR 53-190, Part 3.

Relaxation behavior of titanium alloys, by Ernest A. Sticha, Crane Co., Chicago, Ill. Feb 1946. 40p photos, graphs, tables. Order from OTS. \$1. PB 121068

Relaxation resistance of three titanium alloys in the temperature range 400 to 800F was determined to assist in evaluating possible use of titanium fasteners in aircraft for the purpose of saving weight. All three alloys suffered some loss of impact resistance during testing at 700 and 800F but the cause of embrittlement was not apparent in the microstructure. Heat treatment of the alpha-beta alloys and cold working of the all-alpha alloy to

higher strength properties failed to improve relaxation resistance at the higher temperature levels. Project no. 7351. AF WADC TR 55-458, Part I.

Report on precision steel castings for aircraft use, National Research Council. Division of Engineering and Industrial Research. Materials Advisory Board. Panel on Precision Steel Aircraft Castings. Apr 1956. 67p tables. Order from OTS. \$1.75. PB 121148

A survey of the present status and future possibilities of use of high-strength accurate castings (with particular emphasis on alloy steels) in aircraft construction. This includes an analysis of the problem, description of precision casting processes, present uses of castings and forgings in airframes and aircraft engines, current government and industry research projects, and recommendations for future programs in research and development. MMAB 106-M. Contract DA-49-025.

Research on treated magnesium surfaces, by Stanley E. Rohowetz, Bjorksten Research Laboratories, Inc., Madison, Wis. Jul 1955. 187p photos, diagrs, graphs, tables. Order from OTS. \$4.75. PB 121140

Research for the development of an accelerated performance test for treated magnesium alloys included the following corrosion resistance tests: (1) pH increase in 1.0N KCl. (2) Open circuit potential comparisons. (3) Short circuit current comparisons. (4) Hydrogen evolution rates in 1.0N KCl (gasometric method). The following tests of adhesion of zinc chromate primer (MIL-P-6889A) to the treated surfaces were also included: (1) Adhesion in shear (wrought alloy specimens). (2) Adhesion in tension (cast alloy specimens). (3) Impact, ultrasonic vibratory, and pressure-sensitive tape tests (qualitative). Project no. 7312. Covers work conducted from Mar 1953 to Oct 1954, under Contract AF 33(616)-2032. AF WADC TR 54-568.

Scrap yard handbook, U. S. Army, Navy, and Air Force. Oct 1955. 137p photos, diagrs, tables (1 fold). Order from OTS. \$2.50. PB 121093

The purpose of this handbook is to point out the most practical methods in the recovery and disposal of ferrous and nonferrous scrap and waste materials at military activities, and to provide information and assistance as to the means and methods of accomplishing this. WD TM 754-200. AF M 68-3. NAVSANDA 288. MC 1111-SD.

Self-diffusion in crystalline solids and in liquids, by N. H. Nachtrieb, Institute for the Study of Metals, Chicago, Ill. Dec 1954. 72p photos, diagrs, graphs, tables. Order from OTS. \$2. PB 121066

Self-diffusion studies are reported in the following pure substances at atmospheric pressure: solid and liquid sodium, α -white phosphorus, and single crystal high purity lead. The effect of high hydrostatic pressures on the kinetics of self-diffusion is described for three pure substances: solid sodium, α -white phosphorus, and liquid mercury. A very useful relation is found to exist between the activation energy for self-diffusion and the latent heat of fusion. An interpretation is given for this relationship in terms of the crystallite theory of the structure of liquids. A unified phenomenological theory of melting and of diffusion in both liquids and crystalline solids results. Project no. 7351. Contract AF 33(616)-2090. AF WADC TR 55-68.

Survey of the effect of austenitizing temperature and rate of continuous cooling on the structure and 700°F to 1200°F properties of three low-alloyed steels, by Kenneth P. MacKay, A. Phillip Coldren, Adron L. Rush, and James W. Freeman. Michigan, University. Engineering Research Institute, Willow Run, Mich. Jan 1956. 77p photos, graphs, tables. Order from OTS. \$2. PB 121149

The relationships between microstructures formed with various cooling rates and austenitizing temperatures and properties at 700° to 1200°F were surveyed for three low-alloyed steels. The steels were Ni-Cr-Mo (SAE 4340), 1.25Cr-Mo-V ("17-22-A"SS), and 3Cr-Mo-W-V (H-40). The results indicated that the fully bainitic structures which were predominantly upper bainite had maximum strength over the range of testing temperature used. In general, such structures were found in the larger, normalized sections and with the higher austenitizing temperature. Regarding the effect of varying the cooling rates of normalized bars, it was found that increases in strength occurred for all three steels as the effective bar diameter was increased from 1 inch to 6 inches. The effect of raising the austenitizing temperature from 1750° to 2100°F was to increase the strength, with the H-40 steel being affected the most. Ductility was lowered for all three steels as the heat-treating temperature was raised. Project no. 7351. Covers period of work from Mar 1954 to Mar 1955, under Contract AF 33(038)-13496. AF WADC TR 55-388.

United States Bureau of Mines zirconium alloy investigation, by E. T. Hayes, R. L. Carpenter, A. D. Cavett, H. Kato, W. L. O'Brien and O. G. Paasche. U. S. Bureau of Mines. Northwest Electrodevelopment Laboratory, Albany, Ore. Nov 1952. 33p graphs, tables. Order from LC. Mi \$3, ph \$6.30. PB 119891

The purpose of this program was to prepare and evaluate zirconium alloys with respect to corrosion resistance and mechanical properties at room temperature. An outline of phase diagrams was made for workable alloys, based on heat-treatment, X-ray analysis, resistivity, thermal analysis, metallographic structures and other metallurgical

studies. The salient features are presented for the alloy systems Zr-Ti, Zr-Cr, Zr-Ni, and Zr-Mn. Covers the period 15 Mar 1950 to 15 Mar 1952, under Contract AF 33(038)-50-1214-E. AF WADC TR 52-236.

METEOROLOGY AND CLIMATOLOGY

Activities in connection with project Blossom IV, by W. F. Gould; Franklin Institute. Laboratories for Research and Development, Philadelphia, Pa. Contract W19-122-ac-52. Order separate parts described below from LC, giving PB number of each part ordered.

Progress report no. 1 for the period 1 Aug-31 Aug 1948. Aug 1948. 19p table. Mi \$2.40, ph \$3.30. PB 119896

Project no. 2086.
1. Rockets, Upper air - Design 2. Rockets, Upper air - Equipment 3. Blossom IV (Rocket).

Progress report no. 4 for the period 1 Nov-30 Nov 1948. Nov 1948. 21p tables. Mi \$2.70, ph \$4.80. PB 119897

1. Blossom IV (Rocket) 2. Rockets, Upper air - Equipment.

Cold front modification in the Atlantic coastal region, by Emanuel M. Ballenzweig. Woods Hole Oceanographic Institution, Woods Hole, Mass. Jan 1955. 35p maps, graphs, tables. Order from LC. Mi \$3, ph \$6.30. PB 119846

For several years the Woods Hole meteorological group has been studying turbulent diffusion of heat, water vapor, and momentum over water surfaces. To date this work has been carried out in geographically restricted areas and primarily in continental air moving over warmer water surfaces. The present study is an attempt to broaden the scope of the work to include the effect of diffusion upon the synoptic weather situations. Unpublished manuscript. WHOI Ref 55-6. Contract N6onr-27702, NR 082-021, Technical report no. 34.

Development, instrumentation and firing of Blossom IV-G, by Stephen Brail. Ludwig Honold Manufacturing Co., Folcroft, Pa. Contract AF 19(122)-281. Project no. 6006. Order separate parts described below from LC, giving PB number of each part ordered.

Interim engineering report no. 1 for the period Jun 12-Aug 31, 1950. Sep 1950. 22p photos, fold diagr. Mi \$2.70, ph \$4.80. PB 119899

This report covers the preparation, servicing, firing and recovery of Blossom IV-G, Missile

no. 51, fired Aug 31, 1950. Except for parachute failure, the flight of the missile and instrument operation was very successful.

Interim engineering report no. 2 for the period Sep 1, 1950-Mar 15, 1951. Mar 1951. 9p fold diagr. Mi \$1.80, ph \$1.80. PB 119900

This report covers the preparation, servicing, firing and recovery of Blossom IV-E, Missile no. 57, fired March 8, 1951. Parachute recovery as one of the test objectives was eliminated, and an insulated section was substituted for the parachute compartment. The missile reached an altitude of approximately 10,000 feet.

Interim engineering report no. 3 for the period Mar 16-Nov 30, 1951. Nov 1951. 29p fold drawings, fold diagr. Mi \$2.70, ph \$4.80. PB 119901

This report covers the preparation, servicing, firing and recovery of Blossom IV-F, Missile no. 52, fired on June 28, 1951. A new ejection system was designed and installed. The missile reached an altitude of 18,500 feet in 48 seconds.

Mathematical analysis of some atmospheric dynamics and statistical prediction of surface pressure by linear and quadratic functions of pressure sequences at grid points, by G. P. Wadsworth, Massachusetts Institute of Technology. Division of Industrial Cooperation. Sep 1955. 111p diagrs, tables. Order from LC. Mi \$6, ph \$18.30. PB 119798

Contents: Part A. Mathematical analysis of some atmospheric dynamics, by Prescott D. Crout, - Part B. Statistical prediction of surface pressure by linear and quadratic functions of pressure sequences at grid points, by George P. Wadsworth and Joseph G. Bryan, - Appendix A. Construction of polynomials, - Appendix B. Prediction functions in raw and standard coefficients and incremental percent reductions. Contract AF 19(604)-991, Scientific report no. 1. AF CRC TN 55-853.

Results of balloon flights S-4, S-7 and S-12 through S-27. Progress report II for the period 12 Dec 1951-15 Mar 1952 under Contract AF 19(122)-63. Tufts College. Dept. of Electrical Engineering, Medford, Mass. Mar 1952. 387p tables. Order from LC. Mi \$11.10, ph \$58.85. PB 119895

1. Balloons, Meteorological - Flight tests 2. Balloons, Meteorological - Equipment.

Standard atmosphere: Tables and data for altitudes to 65,800 feet, by International Civil Aviation Organization, Montreal, Canada and Langley Aeronautical Laboratory, Langley Field, Va. U. S. National Advisory Committee for Aeronau-

tics. 1955. 117p photos, drawings, diagrs, graphs, tables. Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 75 cents. PB 120261

The physical constants and basic equations defining the International Civil Aviation Organization (ICAO) Standard Atmosphere are presented together with tables and diagrams of the properties of the ICAO Standard Atmosphere computed by the National Advisory Committee for Aeronautics in both metric and English units for altitudes from -5,000 meters to 20,000 meters and from -16,500 feet to 65,800 feet. NACA 1235.

Static test-firing of the Aerobee rocket model RTV-A-1 engines, serial nos. 17 and 18, by T. B. Walker. Aerojet Engineering Corporation, Azusa, Calif. Mar 1952. 11p photo, graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 119898

Report no. 582 (Special).

1. Rockets, Upper air - Firing - Tests 2. Rocket motors - Tests 3. RTV-A-1 (Rocket engine) 4. Contract AF 19(122)-50.

MINERALS AND MINERAL PRODUCTS

Aging in barium titanate ceramics, by Don Berlincourt. Brush Laboratories Co., Cleveland, Ohio. Mar 1955. 23p graphs. Order from LC. Mi \$2.70, ph \$4.80. PB 119933

Technical report no. 4 under Contract no. Nonr-1055(00).

1. Ceramics, Barium titanate - Aging.

Behavior of brittle-state materials. Part II, by Omar K. Salmassy, Edward G. Bodine, Winston H. Duckworth, George K. Manning. Battelle Memorial Institute, Columbus, Ohio. Jun 1955. 161p photos, drawings, diagrs, graphs, tables. Order from OTS. \$4.25. PB 121002

The fracture of brittle-state materials, primarily brittle ceramics, was studied. The principles for the selection, evaluation, and design of brittle materials from a statistical or probability viewpoint were set forth. The factors influencing the fracture of brittle ceramic materials were studied, including the effects of size, stress state, strain rate and delayed fracture, temperature, and flaws. Weibull's statistical theory of strength predicted the effect of size, and the effects observed in the simple stress states of tension, bending, and torsion. Weibull's theory was not adequate, however, for predicting the effects of combined stresses. Project no. 7350. For Part I (3d report) see PB 111987. For 1st-2d reports see PB 108095 and 111416. Fourth report, covering the period 21 Feb 1953 to 21 Sep 1954, under Contract AF 33(038)-8682. AF WADC TR 53-50, Part II.

Chromizing of titanium carbide cermets, by Richard L. Wachtell and Richard P. Seelig. Chromalloy Corp., New York, N. Y. May 1954. 10p tables. Order from LC. Mi \$1.80, ph \$1.80. PB 120267

Ni-Mo bonded and Fe-Si bonded TiC cermets can be chromized. The oxidation resistance of both compositions was markedly improved through chromizing by the Chromalloy process. The protective case is not disturbed by thermal cycling. Contract AF 33(616)-2232, AF WADC TR 54-329.

ORDNANCE AND ACCESSORIES

Taliani test for determination of stability of solid propellants. U. S. Bureau of Ordnance. May 1951. 14p photos, diagr, graph. Order from LC. Mi \$2.40, ph \$3.30. PB 120452

A modified Taliani test has been adopted as a convenient and rapid method for determining the relative stability of double-base propellants. The apparatus and test procedure outlined in this publication are, with minor modifications, those established by Pauling and co-workers at the California Institute of Technology. In this test, powder samples are heated at 110°C. in a closed system, at constant volume, under an atmosphere of nitrogen, and in contact with gaseous decomposition products. Pressure increases, which are a mathematical function of the quantity of liberated gas, are measured with a mercury manometer. The relative stability of different compositions can be correlated by comparing plots of pressure vs. time. NAVORD OD 7904.

Thick-walled cylinder handbook. Stresses and strains in elastic, thick-walled, circular cylinders resulting from axially symmetric loadings, by Peter P. Radkowski, Joseph I. Bluhm and Oscar L. Bowie. U. S. Arsenal, Watertown, Mass. Dec 1954. 178p diagrs, graphs, tables. Order from LC. Mi \$8.10, ph \$27.30. PB 119941

This report represents a systematic compilation of the basic data and information obtained at Watertown Arsenal for the mathematical prediction of the elastic stresses and strains in thick-walled cylinders. Apart from local end effects, the surface stresses and strains due to any axially symmetric load system applied to the inner and/or outer curved surfaces of a hollow, right circular cylinder can be determined by superposition of data presented in Part I. In Part II, several topics related to the thick-walled cylinder problem are discussed. Dept. of the Army project no. 501-01-006, O. O. project no. TR 3-3027. WAL R 893/172.

PACKING AND PACKAGING

Design guide for circuit packaging and integration of auto-sembed electronic equipment. Final report, Part II, 1 Jun 1952 to 30 Sep 1954, under Contract no. DA 36-039-sc-42468, by E. D. Aldred, L. G. Brodrick, C. W. Everhart, M. E. Minebaugh. Mallory, P. R. & Co., Inc., Indianapolis, Ind. Jun 1954. 144p photos, drawings, diagrs, graphs, tables. Order from OTS. \$3.75. PB 111714

A 5-step procedure (selection of a system, selection of techniques, design, fabrication, and analysis) to provide adequate auto-sembed systems with regard to circuitry, climatic protection, thermal adequacy, size and weight, maintenance, and integration methods of predicting the size and weight of a package are included and estimates of ruggedization and thermal adequacy procedures are presented. The estimate of adequacy procedure allows the designer to evaluate the proposed design prior to fabricating test samples. Dept. of the Army project no. 3-26-00-602, Signal Corps project no. 32-2006C. SIG Contract DA-36-039-sc-42468, Final report, Part II. For Part I see PB 121163.

Dynamics of package cushioning involving combined rotations and translations, by D. M. Chase and I. Vigness. U. S. Naval Research Laboratory. Mar 1956. 13p diagrs, graphs. Order from OTS. 50 cents. PB 121015

Equations of motion, describing the behavior of a rigid article flexibly mounted in a rigid container, have been formulated. These equations apply while the container has one edge, or a surface, in contact with the ground. They apply for any type of elastic system; however, no damping has been assumed. Assumptions of specific arrangements and types of elastic systems, from which their potential functions versus displacement can be determined, are required for the solution of the general equations. Useful solutions can be obtained for specified ranges of parameters and boundary conditions, through the use of computing machines. NRL R 4719.

Performance characteristics of cushioning materials impacted under a heavy weight high impact shock machine, by E. N. Sabbach. Lowell Technological Institute Research Foundation, Lowell, Mass. Feb 1956. 253p photos, graphs, tables. Order from OTS. \$5. PB 121145

The energy absorption characteristics of cushioning materials impacted under a heavy weight high

impact shock machine and analyzed by an analog computer system are reported. The dynamic performance curves in the form of graphs of energy versus maximum stress and maximum stress versus maximum strain are given for a wide variety of materials. Project no. 6077, Task no. 73295. Covers period of work from Dec 1954 to Jun 1955 under Contract AF 18(600)-127. For description of the machine see WADC TR 54-573. AF WADC TR 55-229.

PAPER AND ALLIED PRODUCTS

Application of feed back to fibre classifiers, by Olle Andersson and William Bartok. 1955. 7p diags, graphs, tables. Order from LC. Mi \$1.80, ph \$1.80. PB 119569

Feed-back systems for the classification of fibres by screen fractionation were studied, using a modified Bauer-McNett classifier. Stiff model rayon fibres of uniform length were investigated to verify the equations derived for the time-dependence of fibre concentrations. A correlation was established between the fibre length of a uniform sample and the weights of fractions collected after a given time interval in the classifier compartments. Assuming a Gaussian distribution of fibre lengths in a non-uniform sample, a correlation was obtained between the weights of fractions collected and the weight average fibre length, with the standard deviation as a parameter. Experimental results were in satisfactory agreement with the above correlations for model rayon fibres, groundwood and bleached sulphite pulp fibres. Reprinted from Svensk Papperstidning, nr. 10, 1955, p. 367-373. Contribution from the Pulp & Paper Research Institute of Canada. Abstract in German, Swedish, and English. Svenska Träforskningsinstitutet. Träkemi och Pappersteknik. Meddelande 187.

Theory of screening. 3: Screening at low particle concentrations, by Joseph Kubát and Börje Steenberg. 1955. 6p diags, graph, table. Order from LC. Mi \$1.80, ph \$1.80. PB 119566

Reprinted from Svensk Papperstidning, nr. 9, 1955. Part II in Svensk Papperstidning v. 57, p. 37 (1954). 1. Particles - Screening - Theory - Sweden 2. Svenska Träforskningsinstitutet. Träkemi och Pappersteknik. Meddelande 184.

PHOTOGRAPHIC AND OPTICAL GOODS

Key for the photoidentification of glacial landforms and associated landform patterns, by William E. Powers. Northwestern University, Dept. of Geography, Evanston, Ill. 105f photos, map. Order from LC. Mi \$5.70, enl pr \$18.30. PB 120546

This key is intended to provide the photointerpreter untrained in glaciation or geomorphology with a means of identifying landscape features in a region formerly occupied by continental glaciers. Contract N7onr 45-005, Project NR 089-005, Report no. 2.

New method of bathythermogram production, by Elizabeth H. Schroeder. Woods Hole Oceanographic Institution, Woods Hole, Mass. Feb 1955. 5p tables. Order from LC. Mi \$1.80, ph \$1.80. PB 119981

Unpublished manuscript.

1. Bathythermograph data - Processing 2. Ozalid process 3. Contract Nonr-683(00), NR 083-019 4. WHOI Ref 55-5.

PHYSICS

General

Akustika neodnorodnoi dvizhushcheisya sredy (Acoustics of a nonhomogeneous moving medium), by D. I. Blokhintsev. Translated by S. Reiss. Feb 1956. 198p photos, diags, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119881

Theoretical basis of the acoustics of a moving non-homogeneous medium is considered in this report. Experiments that illustrate or confirm some of the theoretical explanation or derivation of these acoustics are also included. Translated from his book published in 1946. NACA TM 1399.

Analytical treatment of the problem of triangulation by stereophotogrammetry, by Helmut H. Schmid. U. S. Aberdeen Proving Ground. Ballistic Research Laboratories, Aberdeen, Md. Oct 1955. 57p diags, graphs, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 119826

The most general case is defined as the problem of determining simultaneously the orientations of the two cameras, whereby all 18 unknown parameters of the orientation are considered with no limitations on the camera orientations. The process of triangulation is treated as the computation of spatial coordinates as functions of the elements of orientation and the corresponding plate measurements. The least squares solution derived is based on rigorous mathematical expressions which connect the plate measurements with the unknown parameters. Dept. of the Army project no. 5B0306011. Ordnance research and development project no. TB3-0538. APG BRL R 961.

Applications of the corona discharge for measurements of density and velocity transients in air flow, by Frank D. Werner and Robert L. Geronimo. Minnesota. University, Minneapolis, Minn. Jun 1953. 91p photos, diagrs, graphs, tables. Order from LC. Mi \$5.40, ph \$15.30. PB 119520

The applicability of the electrical corona discharge from the tip of a fine wire for measurements of density and velocity in air flow has been experimentally investigated in some detail. Density sensitivity of corona discharges for steady state and transient variations is covered in detail. Several velocity sensitive probe types are discussed and comparisons for transverse velocity components between the velocity sensitive corona probe and the hot-wire anemometer are given in a number of oscillograms for turbulence and for a reproducible velocity transient. A corona turbulence measurement at Mach number 3.1 is described. Background noise, rate of disintegration of the corona wire, and other associated investigations are reported. AF WADC TR 53-142. Contract AF 33-(038)-15833.

Decision theory for Polya type distributions case of two actions I, by Samuel Karlin. Stanford University. Dept. of Statistics. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Jan 1955. 29p. Order from LC. Mi \$2.70, ph \$4.80. PB 119525

1. Random distribution - Theory 2. Decision theory 3. Probability - Theory 4. Contract N6 onr-251, T. O. III, NR 042-993 5. SU AMSL TR 28.

Destination error problem, by Herman Rubin. Stanford University. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Mar 1955. 13p. Order from LC. Mi \$2.40, ph \$3.30. PB 120041

1. Flight path - Calculation 2. Mathematical equations and solutions 3. Contract N6 onr-25140, NR 342-022 4. SU AMSL TR 27.

Effect of the volute on performance of a centrifugal pump impeller, by R. D. Bowerman. California Institute of Technology. Hydrodynamics Laboratory, Pasadena, Calif. Mar 1955. 46p photos, drawings, diagrs, graphs, table. Order from LC. Mi \$3.30, ph \$7.80. PB 119749

An experimental study of volute influence on radial flow impeller performance was conducted by operating a single impeller with three different sets of volute vanes. The results show that at their respective design flow rates the influence of the volutes is least and the deviation of performance from the free impeller operation is small. CIT HL E-19.7.

Electrical cleanup of gases. Quarterly report for the period Oct-Dec 1955 under Contract no. AF 18(600)-1049, by L. J. Varnerin, Jr. and J. H. Carmichael. Westinghouse Electric Corp. Westinghouse Research Laboratories, East Pittsburgh, Pa. Dec 1955. 5p diagr. Order from LC. Mi \$1.80, ph \$1.80. PB 120232

This report discusses an extension of work on ionic pumping into metal surfaces as reported for Jan-Mar 1955. A tetrode pumping tube has been constructed and some preliminary measurements of the pumping of helium into molybdenum have been made. Research report 71F191-R7. For 1st-5th reports see PB 116569-116571, 117718, and 118391.

Example of error analysis of Gaussian quadrature, by E. T. Manos. U. S. Aberdeen Proving Ground. Ballistic Research Laboratories, Aberdeen, Md. Jun 1955. 36p. Order from LC. Mi \$3, ph \$6.30. PB 119493

In connection with some calculations of flutter characteristics of compressor and turbine blade systems performed on the ORDVAC for an Air Force contractor it became necessary to evaluate a set of two-dimensional definite integrals. Section I of this report describes the integrals, their properties, and the numerical method used to compute them on the ORDVAC. Section II applies the Cauchy integral formula to evaluate the error. Section III gives a more direct consideration of the error. Dept. of the Army project no. 5BO306002. Ordnance research and development project no. TB 3-0007. APG BRL M 898.

Elementary inequality for the traveling salesman problem, by Stephen P. Diliberto. Princeton University. Institute for Advanced Study, Princeton, N. J. Jun 1955. 5p. Order from LC. Mi \$1.80, ph \$1.80. PB 119751

An order of magnitude estimate for a polygonal path joining n points in a rectangle $R = L \cdot W$ of $n^{\frac{1}{2}} \sqrt{2} (\sqrt{L^2 + W^2})$ is obtained. Contract AF 18-(600)-1109, R-354-10-60. AF CSR TN 55-170.

Generalized tables of corrections to thermodynamic properties for nonpolar gases, by Harold W. Woolley and William S. Benedict. U. S. National Advisory Committee for Aeronautics. Mar 1956. 62p graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119851

Tables are presented based on the Lennard-Jones 6-12 potential for nonpolar molecules for use in representation of second and third virial coefficients and equation-of-state corrections for enthalpy, entropy, specific heats at constant pressure and volume, specific-heat ratio, isentropic expansion co-

efficient and sound velocity. A graphical correlation of ratios of these parameters with the critical constants is also shown. NACA TN 3272.

Generation of acoustic and hydromagnetic waves and the acceleration of cosmic rays, by Eugene N. Parker. Utah. University. Dept. of Physics, Salt Lake City, Utah. Jan 1955. 24p. Order from LC. Mi \$2.70, ph \$4.80. PB 119523

The hydrodynamic and hydromagnetic equations are investigated from the viewpoint of energy propagation. A consideration of the interaction of charged particles with hydromagnetic waves shows that it is the fluid velocity, and not the wave velocity, that is responsible for the acceleration of cosmic rays by Fermi's mechanism. Technical report no. 12 under Contract Nonr-1288(00): Earth's magnetism and magnetohydrodynamics.

Heats of adsorption of krypton on highly graphitized carbon black, by R. A. Beebe, C. H. Amberg and W. B. Spencer. Amherst College. Dept. of Chemistry, Amherst, Mass. Feb 1955. 19p drawing, graphs, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 119975

Calorimetric heats have been determined at 183°C and -195°C for the adsorption of krypton on a highly graphitized sample of the fine thermal black, P-33. This adsorption system is of particular interest because of the extreme step-wise nature of the isotherm. Both the heat-coverage curve and the isotherm appear to be indicative of a high degree of homogeneity of the adsorbing surface. An exploratory isotherm for the adsorption of krypton on the furnace black Spheron (27000) at -195°C was also determined. This too exhibited a marked step-wise character, though somewhat less pronounced than that of the P-33 isotherm. Contract N8 onr-66902, NR 358-151. ONR TR 6.

Lagrangians linear in the "velocities," by Ezra Newman and Peter G. Bergmann. Syracuse University. Institute of Industrial Research. Dept. of Physics, Syracuse, N Y. Feb 1955. 23p. Order from LC. Mi \$2.70, ph \$4.80. PB 119692

Technical report no. 12 under Contract Nt onr-24806, NR 010-201.
1. Lagrange equations 2. Dirac equation 3. Mathematical equations and solutions.

Least squares solution for paired comparisons with incomplete data, by Harold Gulliksen. Princeton University. Dept. of Psychology, Princeton, N. J. Mar 1955. 17p tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120038

"Mathematical techniques in psychology" project National Science Foundation. Grant G-642.
1. Least squares 2. Mathematical equations and solutions 3. Contract N6 onr-270-20, Project NR 150-088.

Magnetic properties of defects and impurities in solids, by C. V. Heer and C. J. Rauch. Ohio State University Research Foundation. Dept. of Physics and Astronomy, Columbus, Ohio. Jul 1955. 8p table. Order from LC. Mi \$1.80, ph \$1.80. PB 119542

The magnetic properties of defects in KCl, KBr, and NaCl crystals were studied at the temperatures of liquid helium. OSURF Proj 582, Technical note no. 1. OSR TN 55-187. Contract AF 18(600)-1003.

Moving striations in an argon glow discharge, by Orville B. Karge, B. W. Hooks, and Norman L. Oleson. U. S. Naval Postgraduate School. Dept. of Physics, Monterey, Calif. n.d. 64p photos, diagrs, graphs. Order from LC. Mi \$3.90, ph \$10.80. PB 119591

This is a preliminary report of a program currently being carried out at the U. S. Naval Postgraduate School for the purpose of investigating both the theoretical and experimental aspects of moving striations in glow discharges. The experimental data herein reported have been obtained during the first six months of 1955 and are the basis of a master's thesis in physics. Some of the observations of Dieke and Donahue concerning moving striations in argon have been carefully reexamined with particular reference to negative striations. Fixed probes were also inserted into the positive column and certain aspects of the work of Pupp were checked. ONR TR 1.

New approach to the solution of the linear second order partial differential equation in terms of definite integrals, by Edwin W. Titt. Oklahoma Agricultural and Mechanical College. Research Foundation, Stillwater, Okla. Mar 1955. 5p. Order from LC. Mi \$1.80, ph \$1.80. PB 119757

Adaptability of the method to computational techniques is considered. Final report under Contract no. Nonr-1550(01).

Normal-pressure tests of rectangular plates, by Walter Ramberg, Albert E. McPherson, and Samuel Levy. U. S. National Bureau of Standards. 1942. 27p photos, diagrs, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 119912

Normal-pressure tests were made of 56 rectangular plates with clamped edges and of 5 plates with freely supported edges. Pressure was applied and the center deflection and the permanent set at the center were measured. For some of the plates, strains and contours were measured in addition. NACA 748.

On some convex cones and associated monotone functions, by Donald P. Squier. Stanford Univer-

sity. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Jul 1955. 60p. Order from LC. Mi \$3.60, ph \$9.30. PB 119760

A concept of monotone function on a linear space S is defined in terms of convex cones in the space. This paper considers some spaces and convex cones which may be of importance in analysis, and some monotone functions associated with a few special convex cones. Contract AF 18(600)-680. SU AMSL TN 4.

On the theory of thin elastic shells, part II, by
P. M. Naghdi. Michigan. University. Engineering Research Institute, Ann Arbor, Mich. Mar 1955. 22p. Order from LC. Mi \$2.70, ph \$4.80. PB 119750

The basic equations of the axisymmetric deformation of shells of revolution, where the effect of the transverse shear deformation is included, are reduced to two simultaneous second order differential equations in two suitable dependent variables. These equations are then combined into a single complex differential equation which is valid for shells of uniform thickness as well as for a large class of variable thickness. Also, the solution of the complex differential equation by asymptotic integration is discussed. Includes addition to part I, Project 2150. MU ERI TR 2. Contract Nonr-1224-(01), NR 064-408.

Propagation of hydromagnetic waves and the acceleration of cosmic rays, by Eugene N. Parker. Utah. University. Dept. of Physics, Salt Lake City, Utah. Jan 1955. 22p. Order from LC. Mi \$2.70, ph \$4.80. PB 119578

The dissipation of hydromagnetic waves in the interstellar medium, and the variation of amplitude and wavelength of such waves with changes in ρ and β are calculated. It is then shown that the galaxy is no more than one percent efficient in the acceleration of cosmic rays because of the tremendous viscous losses in the interstellar medium, and that there is no hydromagnetic mechanism that can convert the observed large-scale low-velocity fluctuations in the interstellar medium to the required small-scale high-velocity motions. The conclusion is that cosmic rays are not accelerated through the galaxy at the rate corresponding to the observed spectrum, but must be locally concentrated. Technical report no. 13 under Contract Nonr-1288(00) on Earth's magnetism and magneto-hydrodynamics.

Propagation of pulses in cylindrical bars, an experimental study, by E. A. Ripperger. Stanford University. Division of Engineering Mechanics, Stanford, Calif. Aug 1952. 114f photos, diagrs, graphs, tables. Order from LC. Mi \$6, enl pr \$19.80. PB 119724

A solution of the general equations of elasticity for the type of initial conditions associated with the

application of a force of extremely short duration to the end of a bar, and the boundary conditions of a finite cylindrical bar, appears to be impractical. Consequently this experimental investigation has been carried out to answer a number of questions concerning the limitations of the "Hopkinson Pressure Bar," a measuring device for measuring forces of short duration. Photographs of the oscilloscope presentation of each of the pulses studied are included to illustrate the dispersive action, and the influence on this action of such factors as bar diameter and pulse duration. SU ME TR 13. Contract N6onr-251, T. O. 12 (NR 064-241).

Report of an informal conference on recent developments in the theory of games held at Fine Hall, Princeton University, Jan 31-Feb 1, 1955. Princeton University. Mathematics Dept. Feb 1955. 31p diagrs. Order from LC. Mi \$3, ph \$6.30. PB 119552

Logistics research project.
1. Games - Theory.

Report of an international conference on operator theory and group representations, Oct 20-23, 1955, Arden House, Harriman, N. Y. National Research Council. 1955. 40p. Order from NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. PB 120302

Contents: Report on subnormal operators, by J. Wermer. - Report on operator algebras, by R. V. Kadison. - Report on group representations, by I. M. Singer. - Contributed papers: On an inequality for linear operators in a Hilbert space, by Erhard Heinz. - Linearly perturbed operators, by Franz Rellich. NRC 387.

Solutions of a class of ordinary linear differential equations of the third order in a region containing a multiple turning point, by Rudolph E. Langer. Wisconsin. University, Madison, Wis. May 1955. 30p. Order from LC. Mi \$2.70, ph \$4.80. PB 119815

This report is concerned with the functional forms of the solutions of a differential equation in which λ appears as a complex parameter that is large in absolute value. Project R-354-10-59. For Report no. 1 see PB 119816. AF OSR TN 55-143. Contract AF 18(600)-1110, Report no. 2.

Solutions of the differential equation $\lambda^2 \frac{d^2 v}{dz^2} + 3\mu \lambda \frac{dv}{dz} = 0$, by Rudolph E. Langer. Wisconsin. University, Madison, Wis. Mar 1955. 30p. Order from LC. Mi \$2.70, ph \$4.80. PB 119816

This report gives a complete derivation of the forms of the solutions of the equation in a region that includes the point $Z = 0$. The equation plays

a basic role in the theory of more general equations having a turning point in which three roots of the auxiliary equation become coincident. AF OSR TN 55-70. Contract AF 18(600)-1110, Report no. 1.

Stacked-disk neutron thermopile, by Frank S.

Replogle, Jr. Massachusetts Institute of Technology. Servomechanisms Laboratory. Electronic Nuclear Instrumentation Group. Mar 1955. 118p diags, graphs, tables. Order from LC. Mi \$6, ph \$18.30. PB 120026

This report describes the theory, design, construction, and testing of a thermopile sensitive to slow neutrons. Design techniques are presented for a new, mechanically rugged configuration, which enables a fast or slow time response to be achieved with optimum electrical power input. Construction and testing details are given for a thermopile having a response time of 37 milliseconds, and an internal resistance of 0.7 milliohms. Technical report no. 5 under Contract N5 ori-07877, NR 025-164. Appendix: Study of spurious responses of a neutron thermopile, by Cyrus O. Harbourt.

Surface waves on a semi-infinite elastic solid, by

E. A. Ripperger. Stanford University. Division of Engineering Mechanics, Stanford, Calif. Aug 1952. 75p photos, graphs, tables. Order from LC. Mi \$4.50, enl pr \$13.80. PB 119723

This report verifies a mathematical analysis by Lamb of the tremors which pass over the surface of a semi-infinite solid following the application of a concentrated force of short duration which shows that they consist of two parts: a minor tremor and the main shock. The minor tremor travels at a greater velocity than the main shock and as a consequence the two parts are soon separated. Moreover, at a sufficient large distance from the origin the minor tremor has negligible amplitude compared to the main shock. Tremors generated by the impacts of small steel balls on the surface of a steel block 6 inches thick by 8 inches in diameter were measured by means of piezoelectric barium titanate strain gages. SU ME TR 15.

Theory of decision procedures for distributions

with monotone likelihood ratio, by Samuel Karlin and Herman Rubin. Stanford University. Applied Mathematics and Statistics Laboratory. Feb 1955. 50p. Order from LC. Mi \$3.30, ph \$7.80. PB 119983

This paper unifies and extends the findings of Allen, Sobel, and Chernoff and treats all possible statistical decision problems for which the densities have a monotone likelihood ratio. Contract N6 onr-25140, NR 342-022. SU AMSL TR 26.

Transformation of relativistic wave equations, by

Behram Kursunoglu. Yale University, New Haven,

Conn. Sep 1955. 22p. Order from LC. Mi \$2.70, ph \$4.80. PB 119546

Project R-357-40-8.

1. Mathematical equations and solutions 2. Dirac equation 3. Contract no. AF 18(600)-771. OSR TN 55-336.

Variable gain-lag circuit, by Gardner Sloan.

Massachusetts Institute of Technology. Instrumentation Laboratory. Jul 1955. 9p diags, graph. Order from LC. Mi \$1.80, ph \$1.80. PB 119792

E-480.

1. Circuits, Gain-lag - Mathematical analysis
2. Contract AF 33(616)-2039.

Nuclear

Effects of defects on the vibrations of an alternating diatomic lattice, by P. Mazur, E.W. Montroll

and R. B. Potts. Maryland. University. Physics Dept., College Park, Md. Nov 1955. 30p diags, graphs. Order from LC. Mi \$2.70, ph \$4.80. PB 119556

A detailed analysis is given of the effect of defects on the vibrations of a linear lattice of alternating light and heavy particles. The defect modes and frequencies are computed and a determination is made of the self energy of an isotope and the energy of interaction between two isotopes. Physics Dept. technical report no. 22. Task no. 77514. OSR TN 55-422.

Evaluation of molecular quadrupole moments from microwave special line breadths. I: Theoretical,

by William V. Smith. Delaware. University. Dept. of Physics, Newark, Del. Oct 1955. 24p diagr, graph. Order from LC. Mi \$2.70, ph \$4.80. PB 119408

The breadths of microwave spectral lines in gas mixtures may arise from several different interactions. It is shown that when the radiating molecule is the linear molecule OCS, polarizability interactions predominate, but when the radiating molecule is NH_3 undergoing inversion, quadrupole moment interactions predominate. Consequently, NH_3 is a particularly suitable molecule to use as a 'probe' to measure quadrupole moments of other molecules. An improved theoretical analysis leads to a revision of previously published molecular quadrupole moments. Technical note no. 4 under Contract no. AF 18(600)-449. Project no. R-357-10-4. AF OSR TN 55-348.

Self shielding in rectangular and cylindrical geometries, by Harold Schneider, Paul G. Saper, and

Charles F. Kadow. U. S. National Advisory Committee for Aeronautics. Apr 1956. 40p diags,

graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120255

The steady-state diffusion approximation and the P_3 approximation of transport theory have been applied for a comparison of the neutron flux distributions and self-shielding factors for multi-region cells of rectangular and cylindrical geometries. The effects of chemical binding in the water region of the cells were also studied and the results were compared with the cases where chemical binding was neglected. An electromechanical differential analyzer was used to solve the flux equations, NACA TN 3661.

PSYCHOLOGY

Effect on problem solving of success or failure as a function of cue specificity, by Ramon J. Rhine. Stanford University. Dept. of Psychology, Stanford, Calif. Feb 1955. 68p tables. Order from LC. Mi \$3.90, ph \$10.80. PB 119980

The present research is concerned with the effects of success and failure upon problem solving. Although a considerable number of studies dealing with the effects of stress, anxiety, fear and failure upon learning, retention and perception have appeared, little has been done to determine in what ways these variables influence the problem-solving process. This study was undertaken in order to fill this gap in the understanding of problem solving, an aspect of human behavior in which psychologists are exhibiting increasing interest. Technical report no. 8 under Contract N6 onr-25125, NR 150-149.

Index to Human Resources Research Center publications, by E. S. Ewart. U. S. Air Force. Air Research and Development Command. Human Resources Research Center, Lackland Air Force Base, San Antonio, Tex. Order separate parts described below from LC, giving PB number of each part ordered.

1949-1951. Dec 1951. 35p. Mi \$3, ph \$6.30. PB 120213

1. Personnel, Flying - Training - Bibliography
2. AF HRRC RB 5135.

1952. Dec 1952. 39p. Mi \$3, ph \$6.30. PB 120214

1. Personnel, Flying - Training - Bibliography
2. AF HRRC RB 52-43.

1953 publications. Dec 1953. 45p. Mi \$3.30, ph \$7.80. PB 120215

1. Personnel, Flying - Training - Bibliography
2. AF HRRC RB 53-69.

Social perception and group effectiveness. Technical reports no. 6-7 under Contract N6 ori-07135. Illinois. University. College of Education. Bureau of Research and Service, Urbana, Ill. Feb 1953. 43f diagr, tables. Order from LC. Mi \$3.30, enl pr \$9.30. PB 120506

Contents: Technical report no. 6. Assumed similarity measures as predictors of team effectiveness in surveying, by Fred E. Fiedler. - Technical report no. 7. Investigation of the character and properties of assumed similarity measures, by Lee J. Cronbach, Walter Hartmann, and Mary E. Ehart. - Supplement to Technical report no. 3. Correction and extension of the relationship of interpersonal perception to effectiveness in basketball teams, by Fred E. Fiedler, Walter Hartmann, and Stanley A. Rudin.

RUBBER AND RUBBER PRODUCTS

Resilient mountings for reciprocating and rotating machinery. Illinois Institute of Technology. Dept. of Mechanical Engineering, Chicago, Ill. Contract N7-onr-32904. Order separate parts described below from LC, giving PB number of each part ordered.

Engineering report no. 1, Jun 15, 1948 to Jun 15, 1949, by C. A. Arents. Jun 1949. 411f diagrs, graphs, table. Mi \$11.10, enl pr \$65.10. PB 120490

This report is divided into 4 sections: I. Basic theory of resilient mountings. II. Tabulation of material characteristics. III. Test setup. IV. Bibliography on vibration.

Engineering report no. 2, 15 Jun 1949 to 14 Jun 1950, by Douglas Muster and Chester A. Arents. Jun 1950. 425f photos, drawings, diagrs, graphs, tables. Mi \$11.10, enl pr \$68.10. PB 120491

A test procedure was developed to determine the static and dynamic characteristics of resilient mountings, 46 of which were tested. The dynamic stiffness and damping ratio of each mounting were determined. Test results indicated deviations from vibration isolation theory in that at certain high frequencies within the audio-frequency range some isolators do not give the degree of isolation expected and may even act as amplifiers. Metal spring types exhibited this phenomenon to a marked degree.

Engineering report no. 3, 15 Jun 1950 to 30 Jun 1951, by Douglas Muster. Jul 1951. 238f photos, drawings, diagrs, graphs, tables. Mi \$10.20, enl pr \$37.80. PB 120492

A laboratory method of testing resilient mountings is presented and its practical limits of frequency and static load are discussed. Several

suggested modifications of the method are given. Some of the pertinent mechanical properties of rubber are discussed with their effects upon the dynamic response of resilient mountings. Test results are given for 19 commercial resilient mountings, and their apparent lack of conformity with the response predicted by the lumped-constant model is discussed. An improved model of a resilient mounting, which uses a rubberlike material as its elastic element, is suggested.

Engineering report no. 4, by Chester A. Arents. 48f diags, graphs, table. Mi \$3.30, enl pr \$9.30. PB 120493

The motivation of the work in this particular phase was to develop a method of testing resilient mountings at only a fraction of their rated loading over a wide frequency range. An analysis of the problem is presented which introduces two new frequency-dependent response parameters, and corroborative data are presented. Only a single-element model, restricted to quasi-linear problems, is considered here.

U. S. and foreign patents appertaining to synthetic rubber, including patent summary cards. U. S. Office of Rubber Reserve. 1948. 5 reels. Limited supply available in microfilm at \$20 per set. PB 120575

The 1650 patents microfilmed consist of practically all of the German, British, and French patents, some of the basic Austrian patents, and U. S. patents of special interest, dated before 1948, mostly pertaining to the period of World War II and earlier. The 3200 patent summary cards included are abstracts of the more significant French and British patents. Contents: Reel 1. U. S. patents selected from no. 5,596 to 2,176,133. - Reel 2. U. S. patents selected from no. 2,176,153 to 2,327,975; abstracts of patents selected from no. 6,707 to 2,323,631; Alien Property Custodian patents selected from no. 202,011 to 440,948. - Reel 3. Patent summary cards selected from no. 272,786 to 276,775. - Reel 4. Patent summary cards selected from no. 276,775 to end. - Reel 5. British patents selected from no. 14,556 to 401,653; German patents selected from no. 235,423 to 702,210; French patents selected from no. 394,795 to 835,357; Austrian patents selected from no. 86,904 to 113,340.

STRUCTURAL ENGINEERING

Experimental investigation of the vibrations of a built-up rectangular box beam, by Eldon E. Kordes and Edwin T. Kruszewski. U. S. National Advisory Committee for Aeronautics. Feb 1956. 28p photos, drawings, diags, graphs, tables.

Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119866

Experimental modes and frequencies of a uniform built-up box beam are presented and comparisons are made between experimental and theoretical frequencies. For bending vibrations, frequencies obtained from an analysis of a substitute-stringer structure which includes the influence of transverse shear deformation and shear lag were found to agree very well with those obtained experimentally. In the case of torsional vibrations, the frequencies obtained from either an elementary or a four-flange beam analysis which includes the effects of restraint of warping were found to be in satisfactory agreement with the experimental frequencies. NACA TN 3618.

Snap-through and post-buckling behavior of cylindrical shells under the action of external pressure, by H. L. Langhaar and A. P. Boresti. Illinois. University. Dept. of Theoretical and Applied Mechanics, Urbana, Ill. Mar 1955. 142p photos, graphs, tables. Order from LC. Mi \$7.20, ph \$22.80. PB 119921

This report treats the buckling and post-buckling behavior of a cylindrical shell that is subjected to uniform external pressure p on its lateral surface, and an axial compressive force F . T. & A. M. report no. 80. Contract N6 ori-071(53), Project NR 064-413.

Systems engineering, by John N. Warfield. Pennsylvania State University. College of Engineering and Architecture, Ordnance Research Laboratory, University Park, Pa. Aug 1955. 30p diags. Order from OTS. 75 cents. PB 111801

The principal aim of this report is to provide the systems engineer with material that he can use to help himself in the engineering of a system. The purpose of systems engineering is stated, the systems engineer is defined, and the systems design process is outlined. The subject of system tests is treated, and a test check list is given. Contract Nord 7958-307.

TEXTILES AND TEXTILE PRODUCTS

Evaluation of antistatic agents on nylon parachute cloth, by James W. Sweeney. Lowell Technological Institute Research Foundation. Sep 1955. 71p photos, drawings, diags, graphs, tables. Order from OTS. \$2. PB 121141

A literature search covering instrumentation, antistatic agents, and theories of static electrification was conducted to provide a foundation for the evalu-

ation of antistatic treated nylon parachute cloth. An appraisal of the techniques employed by other investigators, in the evaluation of the static behavior of materials, justified the utilization of fabric surface resistance as the measurable parameter. Special instrumentation was developed to provide the desired test conditions of -30°F and 10% RH and permit the required range of resistance measurements. While no permanent antistatic agent studied was found to be effective at the low temperature test conditions, specific non-permanent agents gave the treated material a surface resistance at the test conditions which was comparable to the resistance of untreated nylon fabric at standard test conditions of 70°F and 65% RH. Project no. 7320. Covers work conducted from Mar 1953 to Mar 1955 under Contract AF 33-(616)-458. AF WADC TR 54-513.

Factors affecting the efficiency of cordage. Final report under Contract N7 onr-421-I, by Milton M. Platt, Fabric Research Laboratories, Inc., Boston, Mass. Jan 1955. 6p. Order from OTS. 50 cents. PB 121044

The work performed on this project is the first systematically planned and executed research activity which attempted to measure, analyze, and define the mechanical properties of cordage fibers, the geometry of the cordage structures into which these fibers are placed and the quantitative influence of the effects of such geometry on the mechanical performance of the cordage structure. In addition to the development of new and precise test data, physical-mathematical analyses have been developed which serve a dual purpose: (a) the explanation of the mechanical performance of cordage structures and (b) the quantitative prediction of cordage performance in terms of fiber properties and the structural geometry of the cordage product. Case number C 47736.

Handbook of parachute textile materials and properties, by James W. McCarty. Georgia Institute of Technology, Atlanta, Ga. Feb 1956. 171p graphs, tables. Order from OTS. \$4.50.

PB 121100

This report contains the summarized and consolidated information extracted from several WADC Technical Reports covering several phases of parachute-textile research. The information is arranged to make the results of these reports more readily available and more useful to parachute designers and others interested in the parachute-textile phase of Air Force work. The report is divided into sections covering the pertinent facets of parachute-textile information. Fairly complete information is supplied on elongation, elastic recovery, energy absorption, porosity and air permeability, strength properties, and temperature properties of numerous different textile yarns, cords, and fabrics. Some information is also supplied on aging properties, basic design data, and impact loading. Task no. 73201. Contract AF 33-(616)-2473. AF WADC TR 55-264.

Improvement of colorfastness properties on United States Air Force fabrics, by Robert J. Peirent, Roland E. Derby, Jr. and George O. Langlais. Lowell Technological Institute Research Foundation, Feb 1956. 70p diags, graphs, tables. Order from OTS. \$1.75. PB 121051

Dye formulae to provide improved colorfastness on wool serge and gabardine, satin nylon and rayon nylon fabrics were developed. The development of the dye formulae, the problems encountered in establishing them properly in fabric manufacture, and the test measurements of the properties of the fabrics produced are presented. Project no. 7320, Task no. 73202. Covers period from Mar 1952 to Mar 1955, under Contract AF 18(600)-182. AF WADC TR 54-611.

Infrared microspectroscopic study of orientation in fibers, by Richard G. Quynn. Textile Research Institute, Princeton, N. J. Feb 1955. 146p photos, diags, graphs, tables. Order from LC. Mi \$7.20, ph \$22.80. PB 119979

A reflecting microscope has been designed and constructed for use in conjunction with a Perkin-Elmer infrared spectrometer. The instrument allowed measurement of the infrared spectra of specimens as narrow as 20 microns in width and as small as 1 microgram in weight. The use of spherical Schwarzschild-type mirrors permitted the design of a well-corrected microscope objective of numerical aperture 0.78 and obscuration ratio 0.38. Details are given of the design, construction, and performance of the microscope-spectrometer combination with fibers and a single crystal. Technical report no. 14 under Contract no. Nonr-09000 and Nonr-09001. Thesis - Princeton University.

TRANSPORTATION EQUIPMENT

Aeronautics

Aircraft

Comparison of landing-impact velocities of first and second wheel to contact from statistical measurements of transport airplane landings, by Eziaslav N. Harrin. U. S. National Advisory Committee for Aeronautics. Feb 1956. 22p photos, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119862

1. Loads, Landing - Impact 2. Landing gear - Wheels 3. Airplanes - Landing impact 4. NACA TN 3610.

Decontamination of radioactive aircraft external surfaces, U. S. Air Force, 9p. Order from LC, Mi \$1.80, ph \$1.80. PB 119651

Includes supplement dated Dec 1954.

1. Aircraft - Surfaces - Decontamination 2. AF TO 00-110A-3.

Hovering-flight tests of a model of a transport vertical-take-off airplane with tilting wing and propellers, by Powell M. Lovell, Jr., and Lysle P. Parlett, U. S. National Advisory Committee for Aeronautics, Mar 1956. 23p photos, drawings, diagrs, graphs, table, Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120111

1. Airplanes, Transport - Flight tests 2. Airplanes - Models - Tests 3. Airplanes - Stability - Testing methods 4. NACA TN 3630.

Summary of research by Forest Products Laboratory on sandwich construction for aircraft, by Donald G. Coleman, U. S. Forest Products Laboratory, Madison, Wis. Nov 1955. 17p. Order from OTS. 50 cents. PB 121152

Developments in the program of research in sandwich construction for aircraft conducted by the U. S. Forest Products Laboratory during fiscal year 1955 are summarized. The approach has been in general to derive design criteria mathematically and then to check by test. Eight technical reports issued during the fiscal year are abstracted. Project no. 7340, Task no. 73402. Covers work from Jun 1954 to Jun 1955. Fourth annual report. 1st-3d issued as WADC TR 52-184 and its suppl. 1 and 2. AF WADC TR 52-184, Supplement 3.

Theoretical study of the lateral frequency response to gusts of a fighter airplane, both with controls fixed and with several types of autopilots, by James J. Adams and Charles W. Mathews, U. S. National Advisory Committee for Aeronautics, Mar 1956. 46p diagrs, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120102

1. Airplanes, Fighter - Stabilization - Theory 2. Controls, Automatic - Gust effects 3. NACA TN 3603.

Instruments

Analysis of a vane-controlled gust-alleviation system, by Robert W. Boucher and Christopher C. Kraft, Jr. U. S. National Advisory Committee for Aeronautics, Apr 1956. 45p diagrs, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120247

1. Gust loads - Alleviation systems. 2. NACA TN 3597.

Completion report on development of an ice indicator with a piezoelectric sensing element, by E. T. Maciag, M. G. Kullin, V. T. Tsui and E. G. Thurston, Clevite-Brush Development Co., Cleveland, Ohio. Feb 1955. 98p photos, fold. drawings, fold, diagrs, graph. Order from LC. Mi \$5.40, ph \$15.30. PB 120154

The system which we have developed is designed to quantitatively measure the actual deposited mass per unit area as a primary variable. This is done by causing accumulated ice mass to change the equivalent mass of a vibrating system and thus to alter its frequency of vibration. By noting electronically the degree of change in the system resonant frequency a quantitative measure of the amount of deposited mass per unit area is obtained. Project no. 60054-G. Contract Nonr-1494(00).

Discharge coefficients for combustor-liner air-entry holes. I. Circular holes with parallel flow, by Ralph T. Dittich and Charles C. Graves, U. S. National Advisory Committee for Aeronautics, Apr 1956. 39p photos, drawings, diagrs, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120256

1. Combustion chambers - Liners - Openings - Discharge coefficients 2. Flow, Compressible - Measurement 3. Flow, Subsonic - Measurement 4. NACA TN 3663.

Design manual for thermal anti-icing systems, by Harold H. Sogin, Illinois Institute of Technology, Dept. of Mechanical Engineering, Chicago, Ill. Dec 1954. 302p diagrs, graphs, tables. Order from OTS. \$5.50. PB 121135

This manual deals with the thermal anti-icing of aircraft wing and tail surfaces which are protected by double-skin heaters. After a brief introduction, reference material is presented for pressure drop of duct components, water impingement on airfoils, and coefficients of heat and mass transfer by convection. The last parts of the manual are devoted to mass and heat balances on airfoils and to a design procedure presented from the viewpoint of performance analysis. Project no. 6066. AF WADC TR 54-313.

Flight investigation of the effectiveness of an automatic aileron trim control device for personal airplanes, by William H. Phillips, Helmut A. Kuehnelt and James B. Whitten, U. S. National Advisory Committee for Aeronautics, Apr 1956. 42p photos, diagrs, graphs, table. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120251

1. Airplanes - Controls, Automatic 2. Stability, Directional - Dynamic tests 3. NACA TN 3637.

Impingement of water droplets on a rectangular half body in a two-dimensional incompressible flow field, by William Lewis and Rinaldo J. Brun. U. S. National Advisory Committee for Aeronautics, Feb 1956. 27p diags, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119873

1. Drops, Liquid - Impingement on aircraft
2. Trajectories, Water droplet - Calculation
3. NACA TN 3658.

Initial results of a flight investigation of a gust-alleviation system, by Christopher C. Kraft, Jr. U. S. National Advisory Committee for Aeronautics, Apr 1956. 19p photos, drawings, diagr, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120249

1. Gust loads - Alleviation systems 2. NACA TN 3612.

Measurement of local turbulent skin friction by means of surface pitot tubes, by E. Y. Hsu. U. S. David W. Taylor Model Basin, Washington, D. C. Aug 1955. 19p photos, diagr, graphs, table. Order from LC. Mi \$2.40, ph \$3.30. PB 119936

The surface pitot tube technique for the determination of local skin friction has been extended for boundary-layer flow with adverse pressure gradients. The calibration of round tubes on flat surfaces with zero pressure gradient and with adverse pressure gradient gave results which check almost identically with those obtained in Preson's pipe experiments. It was concluded that the performance of the surface pitot tubes can be calculated by using simplified assumptions. In addition, the ratio of the inner to outer diameter of the tube was shown analytically and experimentally to have a negligible effect on the results. DWTMB 957.

Method of calculating core dimensions of cross-flow heat exchanger with prescribed gas flows and inlet and exit states, by E. R. G. Eckert and Anthony J. Diaguila. U. S. National Advisory Committee for Aeronautics, Apr 1956. 25p diagr, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120253

1. Heat exchangers - Design 2. Heat exchangers - Theory 3. NACA TN 3655.

Summary of scale-model thrust-reverser investigation, by John H. Povolny, Fred W. Steffen and Jack G. McArdle. U. S. National Advisory Com-

mittee for Aeronautics, Feb 1956. 49p photos, diags, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119875

1. Thrust reversers - Design 2. Thrust reversers - Performance 3. NACA TN 3664.

Theoretical analysis of linked leading-edge and trailing-edge flap-type controls at supersonic speeds, by E. Carson Yates, Jr. U. S. National Advisory Committee for Aeronautics, Mar 1956. 40p diags, table. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120104

1. Flow, Supersonic - Theory 2. Airplanes - Controls - Theory 3. Control surfaces - Hinge moments 4. NACA TN 3617.

Use of perforated inlets for efficient supersonic diffusion, by John C. Evvard and John W. Blakey. U. S. National Advisory Committee for Aeronautics, Revised, Apr 1951. 36p photo, drawings, diags, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119741

1. Diffusers, Supersonic 2. Ducts, Air - Supersonic 3. NACA RM E 51B10.

Engines and Propellers

Development of fire protection for Aircsearch model GTP70-2 gas-turbine auxiliary-power unit. U. S. Civil Aeronautics Administration, Technical Development and Evaluation Center, Indianapolis, Ind. Apr 1956. 29p photos, diags, graphs, tables. Order from OTS. 75 cents. PB 111831

The objectives of the investigation were: 1. To determine the adequacy of the present provisions for fire protection and control in the GTP70-2 unit. 2. To test some proposed fire-control systems which were suggested for this auxiliary-power plant by several aircraft manufacturers. 3. To determine minimum provisions necessary to provide adequate fire protection and control for this type of gas-turbine auxiliary-power plant. 4. To provide information which would be useful to designers of these and similar auxiliary-power plants. Prepared for Air Navigation Development Board under project no. 6.2.4. CAA TDR 277.

Investigation of the effects of ground proximity and propeller position on the effectiveness of a wing with large-chord slotted flaps in redirecting propeller slipstreams downward for vertical takeoff, by Richard E. Kuhn. U. S. National Advisory Committee for Aeronautics, Mar 1956. 38p photos, drawings, diags, graphs. Order from National Advisory Committee for Aeronautics,

1512 "H" St., N. W., Washington 25, D. C.
PB 119868

1. Airplanes - Take-off 2. Propellers - Slipstream
- Deflection 3. Wings - Lift 4. NACA TN 3629.

Performance and operational studies of a full-scale jet-engine thrust reverser, by Robert C. Kohl. U. S. National Advisory Committee for Aeronautics. Apr 1956. 38p photos, drawings, diagrs, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington, 25, D. C. PB 120257

1. Thrust reversers - Performance 2. Thrust reversers - Design 3. NACA TN 3665.

Theoretical and experimental investigation of mufflers with comments on engine-exhaust muffler design, by Don D. Davis, Jr., George M. Stokes, Dewey Moore and George L. Stevens, Jr. U. S. National Advisory Committee for Aeronautics. 1954. 51p photos, diagrs, graphs, tables. Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 40 cents. PB 119883

Supersedes NACA TN 2893 (PB 108901) and NACA TN 2943 (PB 109580).

1. Mufflers, Exhaust - Design 2. Mufflers, Exhaust - Attenuation 3. Helicopters - Noise
4. NACA 1192 5. NACA TN 2893, Revised 6. NACA TN 2943, Revised.

Aerodynamics

Arrangement of fusiform bodies to reduce the wave drag at supersonic speeds, by Morris D. Friedman and Doris Cohen. U. S. National Advisory Committee for Aeronautics. 1955. 10p diagrs, graphs. Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 15 cents. PB 119886

Supersedes NACA TN 3345 (PB 115780).

1. Sears-Haack minimum-drag bodies 2. Airplanes - Protuberances - Drag - Theory 3. Flow, Supersonic - Theory 4. Bodies of revolution - Theory
5. NACA 1236 6. NACA TN 3345, Revised.

Bodies of revolution having minimum drag at high supersonic airspeeds, by A. J. Eggers, Jr., Meyer M. Resnikoff and David H. Dennis. U. S. National Advisory Committee for Aeronautics. Feb 1956. 38p photos, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119876

Appendix A. Estimated effect of centrifugal forces on surface pressure coefficients. - Appendix B. Calculation of minimum-drag bodies, with considera-

tion of centrifugal forces in the disturbed flow field.

1. Bodies of revolution - Drag, Viscous - Theory
2. Bodies of revolution - Drag, Viscous - Wind tunnel tests 3. Impact - Theory 4. Centrifugal force - Theory 5. NACA TN 3666.

Cross flows in laminar incompressible boundary layers, by Arthur G. Hansen and Howard Z. Herzig. U. S. National Advisory Committee for Aeronautics. Feb 1956. 50p photos, diagr, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119869

1. Boundary layer, Laminar - Flow 2. NACA TN 3651.

Effect of thickness, camber, and thickness distribution on airfoil characteristics at Mach numbers up to 1.0, by Bernard N. Daley and Richard S. Dick. U. S. National Advisory Committee for Aeronautics. Mar 1956. 75p photos, drawings, graphs, table. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119861

1. Mach number - Effect 2. Airfoils - Wind tunnel tests 3. Airfoils - Thickness - Effect on drag
4. Airfoils - Thickness - Effect on pitching moment
5. Camber, Aerodynamic 6. NACA TN 3607.

Effect of transverse body force on channel flow with small heat addition, by Simon Ostrach and Franklin K. Moore. U. S. National Advisory Committee for Aeronautics. Feb 1956. 31p diagrs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119858

1. Mach number - Effect 2. Froude number - Effect 3. Flow, Compressible - Thermodynamics
4. Aerodynamics, Internal 5. NACA TN 3594.

Effect of wall interference upon the aerodynamic characteristics of an airfoil spanning a closed-throat circular wind tunnel, by Walter G. Vincenti and Donald J. Graham. U. S. National Advisory Committee for Aeronautics. 1946. 24p diagrs, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 119913

Also with Annual report, 1946 (PB 110132). Appendix A: Transformation of series of Bessel functions. - Appendix B: Constancy of lift over an airfoil spanning a closed-throat tunnel.

1. Wind tunnels - Walls - Effects 2. Bessel functions 3. Flow, Subsonic - Theory 4. Airfoils - Aerodynamics 5. NACA 849.

Effects of wing position and fuselage size on the low-speed static and rolling stability characteristics of a delta-wing model, by Alex Goodman and David F. Thomas, Jr. U. S. National Advisory Committee for Aeronautics. 1955. 31p photos, diagrs, graphs, tables. Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 30 cents. PB 120126

Supersedes NACA TN 3063 (PB 113258).
1. Wings, Triangular - Interference 2. Damping derivatives - Stability 3. Stability, Lateral - Static tests 4. NACA TN 3063 Revised 5. NACA 1224.

Experimental investigation of the flow around lifting symmetrical double-wedge airfoils at Mach numbers of 1.30 and 1.41, by Paul B. Gooderum and George P. Wood. U. S. National Advisory Committee for Aeronautics. Mar 1956. 86p photos, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120109

1. Mach number - Effect 2. Airfoils, Double-wedge - Lift coefficient 3. Airfoils, Double-wedge - Drag coefficient 4. Airfoils, Double-wedge - Pitching moment 5. Flow, Supersonic - Measurements 6. NACA TN 3626.

Flat wing with sharp edges in a supersonic stream, by A. E. Donovan. (Translated by R. Shaw). Mar 1953. 48p diagrs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120118

Translated from Akademiia NAUK USSR. Izvestiia, 1939, p. 603-626.

1. Flow, Supersonic - Theory - Russia 2. Wings, Flat - Pressure distribution - Russia 3. NACA TM 1394.

Flight evaluation of the longitudinal stability characteristics associated with the pitch-up of a swept-wing airplane in maneuvering flight at transonic speeds, by Seth B. Anderson and Richard S. Bray. U. S. National Advisory Committee for Aeronautics. 1955. 14p photo, drawings, graphs, table. Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 20 cents. PB 120260

1. Stability, Longitudinal - Static 2. Wings, Swept - Pitching moment coefficient 3. Flow, Transonic - Theory 4. Control surfaces - Wind tunnel tests 5. Mach number - Effect 6. NACA 1237.

Free-flight wind tunnel for aerodynamic testing at hypersonic speeds, by Alvin Seiff. U. S. National Advisory Committee for Aeronautics. 1955. 19p photos, diagrs, graphs. Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 20 cents. PB 120125

Supersedes NACA RM A52A24.

1. Wind tunnels, Supersonic - Equipment 2. Aerodynamics - Research 3. NACA 1222.

General potential theory of arbitrary wing sections, by T. Theodorsen and I. E. Garrick. U. S. National Advisory Committee for Aeronautics. 1933. 38f diagrs, graphs, tables. Order from LC. Mi \$3, enl pr \$7.80. PB 120311

Based on NACA 411 (PB 120310)

1. Airfoil theory 2. Flow, Two-dimensional - Theory 3. Flow, Incompressible - Velocity distribution 4. Wings - Aerodynamics 5. NACA 452.

Generalized indicial forces on deforming rectangular wings in supersonic flight, by Harvard Lomax, Franklyn B. Fuller and Loma Sluder. U. S. National Advisory Committee for Aeronautics. 1955. 29p photos, drawing, diagrs, graphs, tables. Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 30 cents. PB 120262

Supersedes TN 3286 (PB 115712).

1. Wing theory 2. Wings, Rectangular - Aerodynamics 3. Flow, Supersonic - Theory 4. Equations of motion 5. NACA 1230 6. NACA TN 3286 Revised.

Interim report on fatigue characteristics of typical metal wing, by J. L. Kepert and A. O. Payne. Australia. Dept. of Supply. Research and Development Branch. Aeronautical Research Laboratories. Mar 1956. 81p photos, diagrs, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119880

Originally published as Report ARL/SM 207, Jan 1955.

1. Wings - Fatigue tests - Australia 2. Wings - Vibration - Theory - Australia 3. Naca TM 1397.

Linearized lifting-surface and lifting-line evaluations of sidewash behind rolling triangular wings at supersonic speeds, by Percy J. Bobbitt. U. S. National Advisory Committee for Aeronautics. Mar 1956. 63p diagrs, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120103

Submitted as a thesis to the University of Virginia.
1. Flow, Supersonic - Theory 2. Wings, Triangular - Wake 3. Sidewash - Damping effects 4. NACA TN 3609.

Method for calculating the contour of bodies of revolution with a prescribed pressure gradient at supersonic speed with experimental verification, by Paige B. Burbank. U. S. National Advisory Committee for Aeronautics. Mar 1956. 64p photos, drawings, diagrs, graphs, tables. Order

from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120101

1. Flow, Supersonic - Theory
2. Bodies of revolution - Pressure distribution
3. Bodies of revolution - Contour - Calculation
4. NACA TN 3555.

Papers presented at the joint session of the flight test techniques and wind tunnel and model testing panels, Ottawa, Canada. Advisory Group for Aeronautical Research and Development. Jun 1955. 153p photos, drawing, diagrs, graphs (Text in French and English). Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120348

Contents: Modern trends in dynamic stability analysis and experiment, by H. Guyford Stever, James T. Van Meter, Elmer E. Larrabee, Joseph Bicknell and Thomas R. Parsons. - An investigation of some longitudinal stability and control troubles at high subsonic speeds, by E. Billon. - Interpretation of wind-tunnel data in terms of dynamic behavior of aircraft at high angles of attack, by Ralph W. Stone, Jr. - On-line automatic data reduction at the Arnold Engineering Development Center, by David F. Taylor. - Comparaison de mesures en vol et en souffleries portant sur les caractéristiques d'un avion dans le subsonique e'leve, by F. Vinsonneau. - Some comparisons between wind tunnel model and flight test results on aircraft at high angles of attack, by R. R. Duddy. - Icing experiments in flight and comparisons with wind tunnel testing, by D. Fraser. AG 18/P8.

Proceedings of the fifth AGARD general assembly, 15 and 16 Jun 1955. The Canadian AGARD conference 10-17 Jun 1955. Advisory Group for Aeronautical Research and Development. Jun 1955. 156p photos, diagrs, graphs, tables (Text in French and English). Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120133

Contents: Foreword, by Theodore von Karman. - Part I: Address of welcome: Canada, by Ralph Osborne Campney. - Greetings: Royal Canadian Air Force, by C. R. Slemon. - Standing group, North Atlantic Treaty Organization (NATO), by John Whiteley. - Supreme Headquarters, Allied Powers Europe (SHAPE), by Hugh Maxwell. - United States Air Force, by H. B. Thatcher. - History of aeronautical research and development in Canada, by J. H. Parkin. - Part II: RCAF development of automatic navigation system, by J. G. Wright. - Advancing temperature frontiers: Round table discussion, by Arnold A. Hall. - Aerodynamic heating versus speed: Thermodynamic aspect of the struggle, by Maurice Roy. - Structural effects of kinetic heating in supersonic flight, by P. B.

Walker. - Man's response to temperature extremes, by A. P. Gagge. - Where are the limits of combustion intensity?, by J. J. Broeze. - Aeroelastic effects of aerodynamic heating, by H. L. Dryden and J. E. Duberg. - General discussion. - Increasing the NATO research and development potential: Round table discussion, by Theodore von Karman, H. L. Maxwell, H. P. Robertson, George E. Valley, Jr., and Lowell P. Weicker. - Part III: Reports of panel chairmen: Aeromedical panel, by T. C. Macdonald. - Combustion panel, by B. P. Mullins. - Flight test techniques panel, by A. J. Marx. - Wind tunnel panel, by Maurice Roy. - Structures and materials panel, by L. Broglio. - Documentation committee, by R. G. Thorne. - Secretariat report, by F. L. Wattendorf. - List of panel papers. AG 20/P10.

Theory of wing sections of arbitrary shape, by Theodore Theodorsen. U. S. National Advisory Committee for Aeronautics. 1931. 16f photo, diagrs, graphs, tables. Order from LC. Mi \$2.40, enl pr \$4.80. PB 120310

1. Wings - Aerodynamics
2. Flow, Two-dimensional - Theory
3. Flow, Incompressible - Velocity distribution
4. Airfoil theory
5. NACA 411.

Wing-body combinations with certain geometric restraints having low zero-lift wave drag at low supersonic Mach numbers, by Harvard Lomax. U. S. National Advisory Committee for Aeronautics. Feb 1956. 32p diagrs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119877

1. Airplanes - Drag - Effect of fuselage
2. Mach number - Effect
3. Flow, Supersonic - Theory
4. NACA TN 3667.

Rockets and Jet Propulsion

Correlation of supersonic convective heat-transfer coefficients from measurements of the skin temperature of a parabolic body of revolution (NACA RM-10), by Leo T. Chauvin and Carlos A. deMoraes. U. S. National Advisory Committee for Aeronautics. Mar 1956. 38p photo, drawing, diagrs, graphs, tables. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119865

1. Heat - Transference - Aerodynamics
2. Rockets - Heat transfer
3. Flow, Supersonic - Heat transference
4. NACA TN 3623.

Guided missile kinematics, by Homer E. Newell, Jr. U. S. Naval Research Laboratory. May 1945.

150p diags, graphs (part fold.). Order from LC.
Mi \$7.20, ph \$22.80. PB 120338

A kinematic study of various trajectories which have been proposed as courses for guided missiles, is made in this report. A general discussion of the subject is given, containing a digest of facts and conclusions which are established in a separate technical portion of the report. Specific consideration is given to pursuit, line of sight, constant bearing, and partial navigation courses. Except for the partial navigation courses, general formulas are obtained for missile accelerations and rates of turn in terms of the target motion. Graphs of these accelerations are given for important special cases. For the line of sight and constant bearing courses, formulas are derived giving the angle made by the missile velocity vector with the line joining the missile to the target. A considerable part of the analysis of partial navigation courses is graphical, supplementing the more general mathematical considerations. NRL M 117-46.

Study of the effects of porosity-hole erosion in cast-steel rocket chamber parts, by A. Kitzmiller and J. Hodges. U. S. Allegany Ballistics Laboratory. Jan 1955. 11p photos, drawings, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 119892

To determine the degree of erosion through porosity holes in cast steel rocket components, five cast steel plugs, each with a drilled hole of known diameter, were inserted in the wall of a rocket motor and subjected to eight firings. Comparison of photomicrographs of the drilled holes made before and after firing indicates that erosion does not occur in holes up to 0.006-inch in diameter. Hydrostatic testing to determine the rate of leakage through small holes shows that the rate of leakage diminishes with successive firings. ABL/X-3.

Marine Transportation

Adsorption coefficients of supersonic sound in open sea water, by E. B. Stephenson. U. S. Naval Research Laboratory. Aug 1939. 72p photos, graphs, tables. Order from LC. Mi \$4.50, ph \$12.30. PB 120445

During the period 30 January to 9 March the USS SEMMES and the USS S-20 operated in the Panama area to determine the absorption, or "loss", coefficients of supersonic sounds in sea water and, if possible, to correlate these coefficients with temperatures, salinities, sea, sky and wind conditions. The wide variations of the loss coefficient with locality, season and weather warrant the conclusion that accurate planning for the tactical use of sound equipment must be based on a knowledge of the water conditions obtained, preferably by echo ranging, at the particular time and place. NRL S-1549.

Breakers and surf, principles in forecasting. U. S. Hydrographic Office, Washington, D. C. Nov 1944.

72p photos, diags, graphs, tables. Order from LC. Mi \$4.50, ph \$12.30. PB 120134

H. O. no. 234.

1. Waves, Ocean - Forecasting 2. Photography, Aerial.

Supplement. Nov 1950. 19p diags, graphs, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120134s

Supplement to PB 120134.

Comparative study of conventional versus unitized systems of subsistence cargo transportation from U. S. depots to the North East Air Command. Maritime Cargo Transportation Conference. 1956. 155p photos, graphs, tables. Order from Director, Maritime Cargo Transportation Conference, NAS-NRC Publications Office, 2101 Constitution Ave., N. W., Washington 25, D. C. \$2. PB 120346

This is a study of the performances of conventional versus unitized systems of preparing and moving subsistence from military depot storage in the United States to include receipt and storage in the overseas military warehouse at Goose Bay, Labrador. The study attempts to project its findings in such a way as to provide methodology which may assist the military or commercial planner in determining choice of system over world supply routes of varying distances. The United States-Labrador pipeline is described in terms of its operational segments and the comparative performances of the conventional and unitized systems are expressed as dollar costs, manpower investment and time consumption. NRC 389.

Downstream increase in volume of the Florida current, by L. V. Worthington. Woods Hole Oceanographic Institution, Woods Hole, Mass. Jan 1955. 13p diags, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 119845

Unpublished manuscript.

1. Currents, Ocean - Mathematical analysis
2. Currents, Ocean - Velocity - Measurement
3. Flow, Hydrodynamic - Measurement 4. WHOI Ref 55-3.

Effect of carriage mass upon the loads and motions of a prismatic body during hydrodynamic impact, by Melvin F. Markey. U. S. National Advisory Committee for Aeronautics. Mar 1956. 45p diags, graphs. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 120105

The purpose of this investigation is to determine the effect of carriage mass upon the general theoretical equations of motion for the prismatic body during a hydrodynamic impact and to indicate under what conditions the effect is important. NACA TN 3619.

Experimental investigation of the scale relations for the impinging water spray generated by a planing surface, by Ellis E. McBride. U. S. National Advisory Committee for Aeronautics. Feb 1956. 42p photos, graphs, table. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 119863

Two models, one five times the linear dimensions of the other, were tested. The collector plate was located above, and aft of, the spray generator where spray could strike it. Lift and drag force coefficients for both the spray generator and spray collector are presented. Comparisons are made between the large and small models by the Froude scaling relations. An empirical method is presented for correcting the spray friction drag coefficients on a Reynolds number basis. NACA TN 3615.

Hydrography of Alligator Harbor, Franklin County, Florida, by F. C. W. Olson. Florida State University. Oceanographic Institute, Tallahassee, Fla. Feb 1955. 171p photos, graphs, maps, tables. Order from LC. Mi \$8.70, ph \$23.30. PB 119977

A study of the geology, salinity, temperature, light transmission, currents, tide, and wind at Alligator harbor, Florida. FSU OIC 28.

Kinetics of the underwater corrosion of magnesium powder, by Eli S. Freeman. U. S. Picatinny Arsenal. Samuel Feltman Ammunition Laboratories, Dover, N. J. Sep 1955. 29p drawings, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 119532

Kinetics of the underwater corrosion of atomized and ground magnesium powder was investigated in the presence of nitrogen, helium, carbon dioxide, hydrogen, and oxygen. The course of the reaction was followed by observing changes in volume and pressure, resulting from the formation of hydrogen, as a function of time. Such factors as pH, nature of the film coating the particles, specific surface, gaseous atmosphere, pressure, and temperature were found to effect the rate process. Dept. of the Army project 504-01-027. Ordnance project TA2-9201. PA TR 2202.

Influence of field of view on the transmission of light through turbid water, by A. G. Rockman and W. B. Fussell. U. S. Naval Research Laboratory. Mar 1956. 9p diags, graphs. Order from OTS. 50 cents. PB 111979

The transmission through a seven-foot-diameter tank of turbid water was measured in two ways: (1) with collimated light and a narrow field of view receiver, and (2) with uncollimated light and a wide field of view receiver. The transmission through clear water, measured with the illuminometer, was arbitrarily taken as 100 percent. Upon analysis of

the photographs of the lamp bulb, it was found that the results did not agree with the semi-empirical equation of Stewart and Curcio. These experiments indicate that the aureole around the immediate vicinity of an extended source contains more of the radiant energy of the source than would be the case for a point source. NRL R 4708.

Momentum, heat, and moisture flux over water, by Arnold H. Glaser. Texas. Agricultural and Mechanical Research Foundation, Dept. of Oceanography, College Station, Tex. Feb 1955. 7p. Order from LC. Mi \$1.80, ph \$1.80. PB 119976

A rotating arm anemometer was developed to measure the vertical turbulent fluxes in the atmosphere over water; and a thermistor thermometer for rapid measurement of temperature. The humidity bridge has not yet been satisfactorily insulated. Final report under Contract N7 onr-48705, NR 082-111. A. & M. project 59, Final report. Reference 55-10F.

Oceanography in the tongue of the ocean, Bahamas, B.W.I., by John C. Armstrong. American Museum of Natural History. Dept. of Fishes and Aquatic Biology, New York City, N. Y. Oct 1953. 38f photos (part fold), fold map, graphs (part fold), tables. Order from LC. Mi \$3, enl pr \$7.80. PB 120508

1. Oceanography - Bahama Islands 2. Ocean bottom - Measurement - Bahama Islands 3. Sea water - Salinity - Measurement - Bahama Islands 4. Sea water - Temperature - Measurement - Bahama Islands 5. Contract Nonr-04501.

MISCELLANEOUS

Comparative protein and nucleic acid analysis of strains of tobacco mosaic virus. Annual progress report for the period Apr 1, 1954-Dec 31, 1954 under Contract no. Nonr-233(23), by William Ginoza, D. E. Atkinson, and S. G. Wildman. California. University, Los Angeles, Calif. Jan 1955. 8p graphs, table. Order from LC. Mi \$1.80, ph \$1.80. PB 119243

1. Tobacco mosaic - Virus - Analysis 2. Tobacco mosaic - Infrared absorption 3. Contract Nonr-233(23).

Evolution of drainage systems and slopes in Badlands at Perth Amboy, New Jersey, by Stanley A. Schumm. Columbia University. Dept. of Geology, New York, N. Y. 1954. 169p photos, diags, graphs, map (fold), tables. Order from LC. Mi \$7.80, ph \$25.80. PB 119785

Technical report no. 8 under Contract N6 onr-271, T. O. 30, Project NR 389-042.
1. Topography, Erosional - Development 2. Geomorphology - Research 3. Soil erosion - Badlands, Perth Amboy.

Glossary of arctic and subarctic terms. U. S. Air Force, Air University, Research Studies Institute, Arctic, Desert, Tropic Information Center, Maxwell Air Force Base, Ala. Sep 1955. 97p. Order from LC. Mi \$5.40, ph \$15.30. PB 119915

1. Arctic regions - Terminology 2. AF ARDTIC A-105.

Morphology of middle lamella of Swedish spruce (Picea excelsa), by Saara Asunmaa. 1955. 3p photos. Order from LC. Mi \$1.80, ph \$1.80. PB 119567

Reprinted from Svensk Papperstidning, Nr. 8, 1955. 1. Picea excelsa - Diseases and pests 2. Spruce - Diseases and pests 3. Svenska Traforskningsinstitutet, Trakemi och Pappersteknik, Meddelande 185.

Rate of fall of urediospores of Puccinia graminis tritici erikss. and henn. as affected by humidity and temperature, by Albert R. Weinholt. Colorado Agricultural and Mechanical College, Botany and Plant Pathology Dept., Fort Collins, Colo. Mar 1955. 101p photos, drawing, graphs, tables. Order from LC. Mi \$5.70, ph \$16.80. PB 120033

Gives methods of research, analysis of data, a discussion of findings with suggestions for further study, and a review of the literature. Contract N9-onr-82400, T. O. 82402.

Report of NRL progress. U. S. Naval Research Laboratory. May 1956. 55p. Order from OTS. \$1.25. PB 121201

Contents: Articles: Atmosphere analyzer for atomic-powered submarines, by F. S. Thomas, A. J. Andreatch, and J. C. White. - Atmospheric transmission in the infrared, by J. H. Taylor and H. W. Yates. - NRL researchers pinch-hit for science teachers, by W. W. Mutch. - Scientific program: Problems accepted. - Problem notes. -

Astronomy and astrophysics: Horizontal attenuation ultraviolet radiation by the atmosphere up to 44 kilometers. - Chemistry: Properties of desoxycholic acid at the air/water interface. - Mathematics: Rectilinear flow of non-Newtonian fluids. . . . Tabular, Fourier analysis routine prepared for the NRL electronic digital computer (NAREC). . . . Computer scheme for graphical integration of first and second order nonlinear equations. . . . Solutions to basic problems in chemistry, radio, and solid-state physics obtained with analog computers. - Mechanics: New facility for studies of fracture strength. . . . Investigations of glazing materials for aircraft. . . . Dynamic responses in three dimensions of elastic structures to independent motions of multiple supports. . . . Quantitative description of the self-generated voltage of a wire subjected to longitudinal strain. - Metallurgy and ceramics: Notch ductility of malleable irons. . . . Dimensioning of risers for nodular iron castings. . . . Mechanical properties of aluminum alloy castings. . . . Anomalous electron emission from metallic surfaces. . . . A new high load tear test assembly. . . . Cathodic protection of naval vessels. - Nuclear and atomic physics: Energy spectra of filtered X-rays measured with NaI scintillation spectrometer. . . . Experiments on a mockup of NRL nuclear research reactor. - Radio: Electromagnetic waves in a magnetized ferrite sphere of finite radius. . . . Investigations of sea clutter and terrain return phenomena. . . . Microwave tube research with possible applications in the field of microwave spectroscopy. - Solid-state physics: Low-temperature photoluminescent modulation in ZnS phosphors. . . . Superconductivity of uranium. . . . Crystalline electric field effects in magnetic assemblies in temperatures below 1°K. . . . Lattice dynamics of body-centered and face-centered cubic metallic elements. - Sound: Vernier timer uses magnetic disk recording and is capable of measuring in true time the position of a shaft when the position is proportional to time. - Published reports. - Papers by NRL staff members. - Patents.

Research on calcification in mollusks. Annual progress report for the period Jun 30, 1954-Jan 30, 1955 under Contract no. Nonr-995(00), NR 163-159, by Gerrit Revelandor. New York. University, New York, N. Y. Jan 1955. 4p. Order from LC. Mi \$1.80, ph \$1.80. PB 119229

Will not reproduce well.

1. Mollusks - Calcification 2. Mollusks - Shells - Growth 3. Contract Nonr-995(00), NR 163-159.

ATOMIC ENERGY REPORTS OF INTEREST TO INDUSTRY

The following Atomic Energy reports are listed here because of their interest and usefulness to general industry.

Reports may be purchased in accordance with instructions on the inside front cover of the U. S. GOVERNMENT RESEARCH REPORTS. As PB numbers are not indicated, order by series and number. These reports may also be consulted at any AEC Depository Library. A list of these libraries may be obtained from the U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C.

Reproduction in whole or part of any report listed herein is encouraged by the U. S. Atomic Energy Commission, subject to the approval of authors or originating sites. General inquiries from the industrial press about AEC-developed information should be directed to the Industrial Information Branch, Atomic Energy Commission, Washington 25, D. C.

Biology and Medicine

Study of the biological effects of irradiation. Progress report for period of January 16, 1954 to January 15, 1955, by Frank H. Bethell and others. University of Michigan, Ann Arbor, Mich. Mar 1956. Contract AT(11-1)-75. 161p. Order from OTS. \$1. AECU-3139

Mar 1942. Decl. Jan 1956. 9p. Order from LC. Mi \$2.40, ph \$3.30. A-129

Preparation of uranic oxide of high purity, by Harry Matheson and Harold R. Mullin. National Bureau of Standards, Washington, D. C. Jun 1942. Decl. Jan 1956. 9p. Order from LC. Mi \$1.80, ph \$1.80. A-193

Report on biological, medical and biophysics program. Part I. Semiannual report of radiological physics division. Part II. Quarterly report of biological and medical research division. Argonne National Lab., Lemont, Ill. Jan 1956. Contract W-31-109-eng-38. 223p. Order from OTS. \$1. ANL-5518

Silicic acid plugs, by Charles A. Kraus. Brown Univ., Providence. Aug 1942. Decl. Jan 1956. Contract OEMSR-290. 9p. Order from LC. Mi \$1.80, ph \$1.80. A-213

Relative acute toxicological effects of uranium²³³ and uranium²³⁸, by John B. Storer, Phyllis Sanders, John Furchner, and Julia Wellnitz. Los Alamos Scientific Lab., Los Alamos, N. Mex. Jun 1952. Decl. Dec 1955. Contract W-7405-eng-36. 37p. Order from OTS. 30 cents. LA-1423

Investigations relating to the use of polyethers for the extraction of R (U) and Fe from aqueous solution, by Charles A. Kraus. Brown Univ., Providence. Sep 1944. Decl. Jan 1956. Contract W-7405-eng-73. 37p. Order from LC. Mi \$3, ph \$6.30. A-1099

Determination of traces of uranium in blood, by George Welford and John Alercio. New York Operations Office, N. Y., N. Y. Jun 1952. Decl. Jan 1956. 14p. Order from OTS. 15 cents. NYO-4000

Analysis of pure crystalline boron, by C. M. Judson. Columbia Univ., New York. Div. of War Research. Feb 1944. Decl. Dec 1955. Contract W-7405-eng-50. 19p. Order from LC. Mi \$2.40, ph \$3.30. A-1240

The transport of calcium and other cations in submerged aquatic plants, by Benjamin Lowenhaupt. California. Univ., Berkeley. Radiation Lab. Nov 1955. Contract W-7405-eng-48. 40p. Order from LC. Mi \$3, ph \$6.30. UCRL-3247

The determination of R (U) by extraction methods, by Charles A. Kraus. Brown Univ., Providence. Nov 1944. Decl. Jan 1956. Contract W-7405-eng-73. 28p. Order from LC. Mi \$2.70, ph \$4.80. A-2301

Chemistry and Chemical Engineering

Spectrographic determination of boron in uranium oxide by the pyroelectric concentration method, by Bourdon F. Scribner and Harold R. Mullin. National Bureau of Standards, Washington, D. C.

Chambers Works process for the manufacture of silver difluoride (from silver chloride) at Blue Products Area (M. W. 145.9), by W. F. Huxtable Du Pont de Nemours (E. I.) & Co., Wilmington,

Del. Jan 1945. Decl. Jan 1956. Contract W-7412-eng-2. 4p. Order from LC. Mi \$1.80, ph \$1.80. A-2586

The identification of the by-products from the reaction of tuballoy trioxide with hexachloropropene. Summary report, by E. T. McBee and L. R. Evans. Purdue Univ., Lafayette, Ind. Dec 1945. Decl. Dec 1955. Contract W-7405-eng-74. 20p. Order from LC. Mi \$2.70, ph \$4.80. A-2704

Chlorination of tuballoy (U) oxides with thionyl chloride. Summary report, by E. T. McBee, D. W. Pearce, and R. Mezey. Purdue Univ., Lafayette, Ind. Feb 1946. Decl. Jan 1956. Contract W-7405-eng-74. 20p. Order from LC. Mi \$2.70, ph \$4.80. A-2706

A modified mercury cathode cell for the purification of uranium solutions and the reduction of uranium, by E. S. Gantz, W. S. Barnhart, T. DeVries, and M. G. Mellon. Purdue Univ., Lafayette, Ind. Mar 1946. Decl. Dec 1955. Contract W-7405-eng-74. 10p. Order from LC. Mi \$2.40, ph \$3.30. A-2707

The alkaline peroxide colorimetric determination of uranium, by B. F. Rider, C. V. St. John, and M. G. Mellon. Purdue Univ., Lafayette, Ind. Mar 1946. Decl. Dec 1955. Contract W-7405-eng-74. 14p. Order from LC. Mi \$2.40, ph \$3.30. A-2708

A system of methods for the spectrochemical analysis of uranium-base materials, by Bourdon F. Schriber and Harold R. Mullin. National Bureau of Standards, Washington, D. C. Sep 1945. Decl. Jan 1956. 110p. Order from LC. Mi \$5.70, ph \$15.30. A-2907

Manual of analytical methods. Volume I. Analysis of ores, by Lewis G. Bassett, Daniel J. Pflaum, Robert J. Rutman, Clement J. Rodden, and N. H. Furman. Madison Square Area, Manhattan District, New York, N. Y. Jan 1946. Decl. Sep 1955. 169p. Order from OTS. \$1. A-2912(Vol. I)

Manual of analytical methods. Volume III. Analysis of purified materials, by Lewis G. Bassett, Daniel J. Pflaum, Robert J. Rutman, Clement J. Rodden, and N. H. Furman. Madison Square Area, Manhattan District, New York, N. Y. Jan 1946. Decl. Sep 1955. 358p. Order from OTS. \$1.75. A-2912(Vol. III)

The colorimetric determination of tuballoy (uranium) with sodium alizarinsulfonate, by E. V.

Sayre and A. M. Mitchell. Carbide and Carbon Chemicals Corp. Substitute Alloy Materials Labs., N. Y. Feb 1945. Decl. Jan 1956. 11p. Order from LC. Mi \$2.40, ph \$3.30. A-3205

T₄F₁₇, a new tuballoy fluoride, by A. Grenall, P. A. Agrom, R. Kunin, and S. Weller. Carbide and Carbon Chemicals Corp. Substitute Alloy Materials Labs., N. Y. Jun 1945. Decl. Dec 1955. 8p. Order from LC. Mi \$1.80, ph \$1.80. A-3271

Methods of controlling bulk density of C-108 (UO₃) produced from non-ether-extracted C-106. UO₂(NO₃)₂·6H₂O, by C. W. Maynard, Jr. Du Pont De Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del. Dec 1945. Decl. Dec 1955. Contract W-7412-eng-151. 6p. Order from LC. Mi \$1.80, ph \$1.80. A-3505

Recovery of uranium from vitro leach liquors by ion exchange. Part II. Cyclic column tests comparing IRA-400 and XE-75 resins and cyclic testing of a resin-in-pulp system, by Norman N. Schiff and Hans I. Viklund. Raw Materials Development Lab. Atomic Energy Division. American Cyanamid Co., Winchester, Mass. May 1954. Decl. Sep 1955. Contract AT(49-1)-533. 55p. Order from OTS. 40 cents. ACCO-46

Process development studies for Lukachukai ores, by Daniel C. McLean. Raw Materials Development Lab. Atomic Energy Division. American Cyanamid Co., Winchester, Mass. Apr 1955. Contract AT(49-1)-533. 62p. Order from OTS. 40 cents. ACCO-64

A summary report on the ion exchange process for the recovery of uranium, by David Kaufman and George W. Lower. Raw Materials Development Lab. Atomic Energy Division. American Cyanamid Co., Winchester, Mass. 1954. Contract AT(49-1)-533. 52p. Order from OTS. 35 cents. ACCO-68

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KLX-63

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Mi \$2.40, ph \$3.30. AECD-3900

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LC. Mi \$3.90, ph \$10.80. AECD-4017

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Ridge National Lab., Y-12 Area, Tenn. n.d.
Decl. Dec 1955. Contract W-7405-eng-26. 33p.
Order from LC. Mi \$3, ph \$6.30. AECD-3901

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August, and September 1951, by W. E. Dreeszen,
Ames Lab., Ames, Iowa. Nov 1951. Decl. with
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AECD-4023

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Grimaud, Phillips Petroleum Co. Atomic
Energy Div., Idaho Falls, Idaho. Jan 1955. Decl.
Jan 1956. Contract AT(10-1)-205. 16p. Order
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A report on an empirical relation between the
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Mallinckrodt Chemical Works, St. Louis. Nov
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Nov 1946. Decl. Jan 1956. 16p. Order from LC.
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Materials handbook. Part III-low tin zirconium
alloys, by H. Majors, Jr., R. T. Webster, G. E.
Wendell and R. H. Wallace. California Research
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AECD-3949

Thermal conductivity of uranium-chromium and
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Jr. Nuclear Development Associates, Inc., White
Plains, N. Y. Apr 1953. Decl. Jan 1956. 26p.
Order from LC. Mi \$2.70, ph \$4.80.
AECD-4059

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Part III. Grain coarsening method. Final report,
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ANL-5021

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Bayside, N. Y. Apr 1952. Decl. Jan 1956. Con-
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ANL-5084

Progress report in metallurgy, April 1, 1949 to
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Nov 1949. Decl. with deletions Jan 1956. Con-
tract W-7405-eng-82. 25p. Order from LC. Mi
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Grain size chart of uranium, by H. A. Saller, R. F. Dickerson, and G. E. Lind. Battelle Memorial Inst., Columbus, Ohio. Jun 1951. Decl. Nov 1955. Contract W-7405-eng-92. 14p. Order from OTS. 15 cents. BMI-66

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The effect of neutron bombardment on the specific heat of graphite at low temperatures. Report for period Aug. 1, 1944, to June 30, 1945. ("A" report no. 13), by I. Estermann and G. I. Kirkland. Carnegie Inst. of Tech., Pittsburgh. Sep 1945. Decl. Dec 1955. Contract W-7405-eng-277. 31p. Order from LC. Mi \$3, ph \$6.30. CC-3161

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Autoclave tests of tuballoy uranium slugs and alloys, by N. Bensen, R. P. Straetz, and J. E. Draley. Chicago, Univ., Metallurgical Lab. Jun 1945. Decl. Jan 1956. Contract W-7401-eng-37. 20p. Order from LC. Mi \$2.40, ph \$3.30. CT-3043

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Progress report for March 1952, by R. H. Bailes, Research Dept. Dow Chemical Co. Western Div., Pittsburg, Calif. Apr 1952. Decl. Sep 1955. Contract AT-30-1-gen-236. 96p. Order from LC. Mi \$5.40, ph \$15.30. DOW-74

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Mechanical properties of striated uranium slugs, by M. L. Holzworth, E. I. duPont de Nemours & Co. Savannah River Lab. Nov 1955. Contract AT(07-2)-1. 27p. Order from OTS. 25 cents. DP-139

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Report of inspection trip to Iowa State College, Ames, Iowa, by E. W. Fielding and T. W. Stricklin, Jr., November 11, 1942, on the manufacturing process for the production of tubealloy from tetra. Report no. 2, by T. W. Stricklin, Jr. Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del. Decl. Jan 1956. 13p. Order from LC. Mi \$2.40, ph \$3.30. M-3009

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