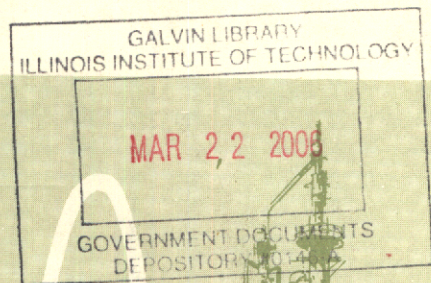


U. S. Government
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February 15, 1957

Vol. 27, No. 2

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Dynamic Systems Studies

Investigation of the Shelf Life of Liquids in Polyethylene Bottles

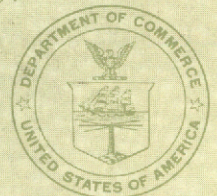
Vibratory Compacting of Metal and Ceramic Powders

Guide to Design of Electronic Equipment for Maintainability

Method for Measuring the Solvent Resistance of Crystal-to-Crystal Adhesive Bonds

Selection of Materials for High-Temperature Application in Airframes

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U. S. DEPARTMENT OF COMMERCE

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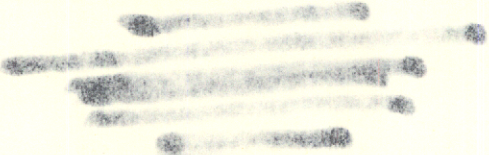
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CHEMICALS AND ALLIED PRODUCTS

Organic Chemicals

Determination of the mechanism of the increase of viscosity of organosilicon compounds at high temperatures, by Edward E. Ryskiewicz. Stanford Research Institute, Stanford, Calif. Oct 1956. 30p graphs, tables. Order from OTS. 75 cents PB 121717

A study of the oxidation of the tetrapentoxysilanes at 120°C (248°F) has revealed an apparent correlation between oxidation rate and chemical structure. Antioxidants could not be studied effectively at 120°C (248°F) because of the prolonged protection afforded by all the compounds studied. Ionol in a 0.1% concentration protected tetra (2-pentoxo)-silane against oxidation at 120°C (248°F) for 408 hours. Hydrolysis of the tetrapentoxysilanes was shown to be markedly affected by products which could form during oxidation. An apparent relation between chemical structure and rate of hydrolysis has been found for the tetrapentoxysilane isomers. AD 110426. Project 7340. Covers work from Sep 1954 to Aug 1955 under Contract AF 33(616)-168. AF WADC TR 54-339, Part 2.

Development of dyeing formulations for wool/synthetic blends for USAF shade blue 84, by Robert J. Peirent and Adolph Katz. Lowell Technological Institute Research Foundation. Oct 1956. 110p graphs, tables. Order from OTS. \$2.75. PB 121756

Dyeing formulae were developed for viscose, nylon, Dacron, Dynel, Acrilan and Orlon fibers to obtain suitable Blue Shade #84 wool/synthetic fabrics for U. S. Air Force uniforms. At the time that the development phase was terminated, no formulae were found which would give the desired colorfastness properties for Dynel and Acrilan. Consequently, these fibers were eliminated from the production phase of the project. (Subsequent developments have demonstrated that new techniques will afford adequate fastness on these fibers. However, the project had progressed to a point which precluded reconsideration of these fibers). A comprehensive study of the properties of the wool and the wool/synthetic fabrics reveals that they meet the physical requirements desired and have adequate colorfastness as well as high resistance to fading. AD 110419. Project 7320, Task 73202. Covers work from Apr 1952 - Dec 1954 under Contract AF 33(600)-16396. AF WADC TR 54-612.

Mechanism of the homogeneous thermal reaction between ethylene and deuterium, by Robert E. Varnerin and John S. Dooling. Catholic University of America. Chemistry Dept., Washington, D. C. Oct 1955. 18p graph, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 122415

The reaction $C_2H_4 + D_2$ has been studied and the initial rates of formation of the products have been measured at a series of temperatures. Initially $CH_2 = CHD$ is formed predominantly accompanied by smaller quantities of HD and C_2H_5D and still smaller quantities of C_2H_6 , $C_2H_4D_2$, and H_2 . The results are interpreted on the basis of a free radical mechanism. Technical note 7. AF OSR TN 55-407. Contract AF 18(600)-64, Task 2, Technical report 7.

Synthesis of halothioamides, by Boris Weinstein and J. F. X. O'Brien. U. S. Air Force. Air Research and Development Command. Wright Air Development Center. Materials Laboratory, Wright Patterson Air Force Base, Dayton, Ohio. Apr 1955. 17p drawing, tables. Order from OTS. 50 cents. PB 121764

An evaluation has been made of the formation of thioacetamide through the following methods: heating acetamide and phosphorus pentasulfide in a suitable solvent; fusion of ammonium acetate or acetamide with aluminum sulfide and hydrated sodium sulfate; and fusion of acetamide with phosphorus pentasulfide. The first method gave the highest yield of thioacetamide. These studies were used unsuccessfully in an attempt to synthesize halothioacetamides (for evaluation as potential lubrication additives). Two reaction mechanisms are proposed for the observed results. AD 75510. Project 7340, Task 73404. AF WADC TR 54-614.

Thermal decomposition of ethane, by Robert E. Varnerin and John S. Dooling. Catholic University of America. Chemistry Dept., Washington, D. C. Nov 1955. 13p graphs, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 122416

The authors have shown that, in the thermal decomposition of 50-50 mixtures of C_2H_6 and CD_4 , the CD_3H/CD_4 ratio is approximately independent of the concentration of nitric oxide. They have also shown that, in the thermal decomposition of 50-50 mixtures of C_2D_6 and CH_4 , the D_2/CH_4 ratio is approximately independent of the concentration of nitric oxide but the CD_3H/CH_4 ratio increases strongly with increasing concentration of nitric oxide. They have proposed and discussed mechanisms for these decompositions. Technical note 8. AF OSR TN 55-408. Contract AF 18(600)-64, Technical report 8.

Thermal decomposition of simple nitrite esters, by Joseph B. Levy. U. S. Naval Ordnance Laboratory, White Oak, Md. Nov 1954. 44p graphs, tables. Order from LC. Mi \$3.30, ph \$7.80. PB 122058

The thermal decomposition of ethyl nitrite, t-butyl nitrite, 1-propyl nitrite and n-propyl nitrite has been examined using infrared spectroscopic techniques. The nature of the reaction products has been established for all four esters and the kinetic behavior for ethyl nitrite has been studied in detail.

A mechanism has been proposed for the reaction and the results discussed in terms of it. NAVORD 3833.

Plastics and Plasticizers

Annual report on research for use in ANC-17 bulletin "Plastics for aircraft", by Donald G. Coleman. U. S. Forest Products Laboratory, Madison, Wis. Sep 1956. 14p. Order from OTS. 50 cents. PB 121695

This annual report by the U. S. Forest Products Laboratory covers developments in the program of research in plastics for aircraft conducted by the Laboratory during fiscal year 1956. Glass fiber, in woven or other form, has become the principal reinforcement for laminates for use in military aircraft because of its high strength and desirable electrical properties. The data in this report are therefore related principally to glass-reinforced plastics. AD 97329, Project 7340. Covers work from Aug 1955 - Aug 1956 under Contract AF 33-(616)-56-9. AF WADC TR 52-183, Suppl. 4.

Identity test for plasticizers of the type used in polyvinyl chloride plastics, by A. Russell Jones, Luther B. Lockhart and Myron A. Elliott. U. S. Naval Research Laboratory. Apr 1944. 48p photos, diags, graphs, table. Order from LC. Mi \$3.30, ph \$7.80. PB 120583

1. Plasticizers - Insulation 2. Plastics, Polyvinyl chloride - Tests 3. NRL P 2292.

Investigation of the shelf life of liquids in polyethylene bottles. Plax Corporation, West Hartford, Conn. Contract AF-33(616)-112. Project 7312. Order separate parts described below from OTS, giving PB number of each part ordered.

Part 3: Investigation of the effects of molecular weight, chain branching and irradiation on polyethylene with regard to shelf life in bottles, by Jules Pinsky, A. R. Nielsen and J. H. Parliman. Sep 1956. 85p tables. \$2.25. PB 121696

Part 1 of this Contract was concerned with the shelf life of liquids and solids in blown Plax 4-ounce bottles made from Bakelite's DE-2400. For this investigation, Part 3, the effects of higher molecular weight (Bakelite's DE-2450), side chain branching (Alathon 10, Alathon S-1439, and Alathon S-1447), irradiation by electron bombardment (high voltage irradiated DE-2450) were studied. The changes in permeability factors occasioned by the above variations are presented and are tabulated in comparison with the previous results on Bakelite's DE-2400. It can be seen from this report, that while there are considerable differences in permeability, the packageability status is not generally changed. For Parts 1 and 2 see

PB 111546 and PB 121194. AD 97334. AF WADC TR 53-133, Part 3.

Part 3, Suppl. 1: Theoretical investigation of the effects of molecular weight, side chain branching, and irradiation on the mechanism of transfer of materials through polyethylene, by Henry A. Bent and Jules Pinsky. Sep 1956. 43p diagr, tables. \$1.25. PB 121696s

In this study P-factors and absorption tests reported in Part 3 are analyzed and discussed, together with some data on aqueous solutions from Part 1. The theory of mass transfer through polyethylene is extended, particularly with regard to the $\log P_0$ vs E_p plot, and the results applied to recent data on carbon tetrachloride. It is found that chain branching and irradiation increase swelling coefficients and diffusion constants at low temperatures, but decrease them at very high temperatures. The importance of placing room temperature P-factors in this perspective is stressed. AD 97335. AF WADC TR 53-133, Part 3, Suppl. 1.

Plastic materials for vision devices. Final report under Contract no. DA-20-089-ORD-36437, by Edwin A. Swire. Armour Research Foundation, Chicago, Ill. Jun 1954. 14p photos. Order from OTS. 50 cents. PB 121028

The objective of this project has been to investigate the potentialities of producing a plastic periscope with a resistance to abrasion approaching that of glass. Experimentation has shown that this can be accomplished with one of three materials: (1) silicon monoxide applied as a coating by vacuum deposition, (2) an optically clear elastomer such as methyl polyacrylate, or (3) a commercial abrasion-resistant plastic such as allyl diglycol carbonate (CR39). This report describes the application of these materials to the preparation of two types of periscopes. For Formal report no. 1 see PB 121027. ARF Proj C-054, Final report.

Paints, Varnishes and Lacquers

Finishes for plywood aircraft and gliders. Third progress report, by John M. Leonard, Robert L. Benemelis and Harriet F. Kessler. U. S. Naval Research Laboratory. Jun 1944. 22p photo, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 123321

For 1st - 2nd reports see PB 109447 and PB 120574. 1. Coatings, Protective - Tests 2. Paints, Aircraft - Tests 3. Plywood - Coatings, Protective - Tests 4. NRL P 2311.

Method of test for deep drying insulating varnishes. Progress report, by M. A. Elliott. U. S. Naval Research Laboratory. Nov 1941. 42p photos,

drawing, graphs, tables. Order from LC. Mi \$3.30, ph \$7.80. PB 122673

1. Insulating varnishes - Tests 2. NRL P 1805.

Progress in the study of protective finishes for plywood airplanes and gliders. Second report, by M. Leonard and Robert L. Benemelis. U. S. Naval Research Laboratory. Nov 1943. 13p tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120574

For 1st report see PB 109447.

1. Coatings, Protective - Tests 2. Plywood - Coatings, Protective - Tests 3. Paints, Aircraft - Tests 4. NRL P 2188.

Substitutes for toluidine red pigment. Final report, by W. H. Stewart. U. S. Naval Research Laboratory. Nov 1943. 19p tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120576

For 1st report see PB 120548.

1. Pigments, Toluidine red - Substitutes 2. NRL P 2181.

Three-layer reflection-reducing coatings for optical elements, by L. B. Lockhart. U. S. Naval Research Laboratory. May 1946. 25p graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 120770

Unclassified 15 Dec 1953.

1. Coatings, Optical 2. Coatings, Reflection reducing 3. Films, Reflection reducing 4. Films, Optical 5. NRL P 2829.

Inorganic Chemicals

AC resistance of sintered titanates, by M. C. Andrews and E. K. Weise. Illinois. Engineering Experiment Station. Electrical Engineering Research Laboratory, Urbana, Ill. May 1956. 6p diags, graphs, table. Order from OTS. 50 cents. PB 121421

The AC resistance of sintered reduced titanate samples was measured, as a function of frequency from 0 to 30 mc. The titanate materials studied were TiO_2 , Mg_2TiO_4 , $MgTi_2O_5$, $CaTiO_3$, $SrTiO_3$, and $BaTiO_3$. AD 87521. Technical note no. 6. AF OSR TN 56-207. Contract AF 33-038-12644.

Study of complex ions of zinc and mercury. Final report covering the period 1 Feb 1952-31 Aug 1955 under Contract no. DA-04-200-Ord-65, by C. J. Nyman. Washington. State College of Washington, Pullman, Wash. Sep 1955. 8p tables. Order from LC. Mi \$1.80, ph \$1.80. PB 123723

Projects completed during the quarter include: a complex ion formed between mercury (II) and thiourea, and complex ions formed between mercury

(II) and triethylenetetramine. Summary of results of the entire project includes: complex ions of zinc with polyamines, complex ions of mercury with polyamines, complex ions of zinc and pyridine, complex ions of zinc and hydroxylamine, complex ion of mercury and thiourea, and a list of publications resulting from the project. AD 72886. Includes Report no. 14, 1 Jun - 31 Aug 1955.

Study of the absorption spectra and ignition limits of exploding mixtures of carbon disulfide and oxygen, by Albert L. Myerson, Francis R. Taylor, Phillip L. Hanst and Donald H. Trevethan. Franklin Institute. Laboratories for Research and Development, Philadelphia, Pa. Mar 1956. 115p photos, diags, graphs, tables. Order from OTS. \$3. PB 121030

An extensive study has been made of exploding mixtures of carbon disulfide and oxygen by means of their ultraviolet absorption spectra and explosion boundaries. The absorption spectra were obtained on photographic plates at various times during the explosion by triggering a flash source of ultraviolet continuum by means of the chemiluminescence emitted from the reacting gases in the very early stages of the explosion. Ignition studies showed the existence of three pressure-temperature limits, all of which were observed as a function of mol ratio of $CS_2:O_2$, flask size, and coating. Two techniques employed in these experiments: (1) gases were mixed prior to their addition to the heated flasks and (2) they were mixed successively in the heated ignition flask. Long induction times were noted and studied as a function of temperature and pressure. They were interpreted mathematically, in terms of a chain-branching reaction. Ignition temperatures were lowered and induction times shortened by excess oxygen. Numerous conclusions were reached, from these data, concerning the elementary chemical reactions that are involved in these experiments. Bibliography included. Project R474-0000, Task R474-330. Released by the author for publication in Oct 1954. Appendix A. Theory for non-steady state chain-branching reactions with one or more carriers, by George Peter Wachtell. - Appendix B. Thermochemical calculations. AF WADC TR 54-377. Contract AF 33(038)-20863.

Miscellaneous Chemicals

Proceedings of the symposium on fire extinguishment research and engineering, 16, 17, 18, November 1954. U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif. Apr 1955. 512p photos, drawings, diags, graphs, tables. Order from OTS. \$8.50. PB 121770

Contents: Why, research?, by Richard L. Tuve. - Army fire extinguishment research program for field operations, by T. B. Edwards. - Arctic temperate and equatorial zone fire protection problems, by W. D. Stump. - Fire extinguishment requirements for advanced Naval bases, by L. Duhkoop. - Air-

craft carrier fuel and operational hazards, by Richard A. Murdoch. - Air Force fire extinguishment requirements, by Gifford T. Cook. - Catastrophe planning and large-scale emergency fire extinguishment problems, by Lloyd Layman. - Extinguishment of large fires (Operation FIRE-STOP), by R. Keith Arnold. - Fire prevention and fighting - ammonium nitrate fires, by Herbert F. Walsh. - Airport crash rescue problems, by George H. Tryon. - Development and technical aspects of the aircraft-engine nacelle fire extinguishing system, by Daniel Mapes. - Aircraft fire fighting, extinguishment, and crash rescue, by W. R. Smith. - New fuel extinguishment research, by J. E. Malcolm. - Developments in fire extinguishers, by Harry E. Moran, Jr. - Aircraft fire protection, by Harvey L. Hansberry. - Research on mechanical foams for fuel fire extinguishment, by Richard L. Tuve. - High pressure foam, by A. G. Sheppard. - Some research problems on fire extinguishment, by A. F. Robertson. - Solid fuels as extinguishment expellants, by J. A. Grand. - Aircraft fire extinguishment studies, by F. W. Thompson, Jr. - Development of fire protection for arctic prefabricated buildings, by Stuart Giles. - Tank farm fire protection methods, by James E. Hill. - Dry chemical extinguishment development, by Arthur B. Guise. - Applying laboratory results to field problems, by Henry B. Peterson. - Setting standards for fire extinguishment. - The function of the National Fire Protection Association, by Horatio Bond. - Aircraft crash-rescue problems, by B. V. Frank. - New aircraft crash fire and rescue equipment, by Carl Dreesen. - Total flooding with carbon dioxide, by H. V. Williamson. - Wartime fire fighting, by Horatio Bond.

ELECTRICAL MACHINERY

Electronics

Accelerations and displacements during drop tests of radio-like gear, by Perry T. Egbert, Jr. and Sherwood G. Hoyt. U. S. Naval Research Laboratory. Oct 1945. 42p photos, graphs, tables. Order from LC. Mi \$3.30, ph \$7.80. PB 122778

Unclassified 15 Dec 1953.

1. Radio, Airborne - Equipment - Impact tests
2. Radio, Airborne - Packaging
3. NOL O-2684.

Analysis and evaluation of model RDR radio receiving equipment characteristics for Naval service, by W. E. W. Howe. U.S. Naval Research Laboratory. Oct 1946. 61p photos, graphs, tables. Order from LC. Mi \$3.90, ph \$10.80. PB 122763

Unclassified 15 Dec 1953.

1. RDR (Radio receiver)
2. Radio receivers - Performance
3. Radio receivers - Tests
4. NRL R 2960.

Antenna pattern measurements on USCGC Spencer, by W. B. Burgess, R. C. Guthrie, and John P. Hagen. U. S. Naval Research Laboratory. Nov 1944. 53p tables. Order from LC. Mi \$3.80, ph \$9.30. PB 120713

Unclassified 15 Dec 1953.

1. Antennas, Shipborne - Radiation patterns - Measurement
2. NRL R-2400.

Approximation method for high-energy potential scattering, by L. I. Schiff. Stanford University. Dept. of Physics, Stanford, Calif. Apr 1956. 25p. Order from LC. Mi \$2.70, ph \$4.80. PB 122225

An approximation method for high-energy potential scattering is developed that expresses the scattered amplitude in terms of a quadrature, similar to the Born approximation but superior to it in accuracy. Both the Schrödinger and Dirac equations are treated, and it is expected that the method can be extended to the scattering theory of other wave equations. The relation of the present work to previous work of others is discussed, and the limitations of WKB or eikonal-type approximations are explored. The method is expected to be especially useful for calculating the scattering of fast electrons, neutrons, and protons from non-spherical nuclei. Project R-357-40-3. AF OSR TN 56-162. Contract AF 18-(600)-545, Technical report 16.

Characteristic impedance and attenuation of transmission line at frequencies of 30 and 40 mcs, by L. C. Young and R. A. Gordon. U. S. Naval Research Laboratory. Jan 1935. 9p diagr, table. Order from LC. Mi \$1.80, ph \$1.80. PB 120485

1. Transmission lines - Attenuation
2. Transmission lines - Impedance - Mathematical analysis
3. NRL R 1115.

Description of Naval Research Laboratory vacuum tube capacitance measuring equipment, range - 0.003 to 100 $\mu\mu\text{f}$, by K. M. Soukaras. U. S. Naval Research Laboratory. Jul 1938. 22p photos, diagrs (2 fold), tables. Order from LC. Mi \$2.70, ph \$4.80. PB 120459

1. Vacuum tubes - Capacitance - Measuring equipment
2. NRL R-1461.

Development and testing of the terminal VHF omnirange, by S. R. Anderson and T. S. Wonnell. U.S. Civil Aeronautics Administration. Technical Development and Evaluation Center, Indianapolis, Ind. Apr 1954. 35p photos, map, graphs. Order from LC. Mi \$3, ph \$6.30. PB 123579

The performance of terminal VHF omnirange installations at Indianapolis, Indiana; Traverse City, Michigan; Augusta, Maine; Oklahoma City, Oklahoma; Toledo, Ohio; and Washington, D. C., airports are

discussed with special emphasis on the effect of nearby hangars and all other large obstructions. The result of extensive tests which used a large surface to simulate a hangar face are presented and are compared with predicted results, based on wave-reflection theory, in order to explain the characteristics of such surfaces as a source of omnirange-course scalloping. It is concluded that the terminal VHF omnirange can be extremely useful as an aid for obtaining an accurate fix, as a holding aid, or in the guidance of aircraft to or from an airport during low approaches to the field for landing. CAA TDR 225.

Development of a magnetron transmitter for jamming in the range of 80 to 380 megacycles, by John H. Markell. U. S. Naval Research Laboratory. Nov 1944. 27p photos, (fold diags), graphs. Order from LC. Mi \$2.70, ph \$4.80. PB 120712

Unclassified 15 Dec 1953.

1. Jamming transmitters 2. Transmitters, Magnetron 3. NRL R-2398.

Development of a transmissometer for determining visual range, by C. A. Douglas and L. L. Young. U. S. Civil Aeronautics Administration. Technical Development and Evaluation Center, Indianapolis, Ind. Feb 1945. 28p photos, diags, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 123583

This report presents a discussion of the problem of determining visual range from measurements of the transmission of the atmosphere between two fixed points, a description of the development of an instrument for measuring atmospheric transmission, and a study of the correlation between the measurements of transmission obtained with this instrument and the prevailing visual range. CAA TDR 47.

Forward scattering of high-frequency plane waves by a sphere, by George Kear. New York University. Institute of Mathematical Sciences. Division of Electromagnetic Research. Nov 1955. 31p diags, tables. Order from LC. Mi \$3, ph \$6.30. PB 122223

An expression for the scattered wave as an expansion in terms of radial eigenfunctions is obtained. The total wave may be expressed in terms of radial eigenfunctions directly but the incident wave cannot. Instead, the incident wave is first expressed by a contour integral. Then a change of variable is introduced and the resulting integral is approximated by the Euler-Maclaurin sum rule. This results in a series for the incident wave in terms of radial functions plus an integral and correction terms. When this is subtracted from the total wave a finite series in terms of radial functions is obtained, and the integral and correction terms are easily evaluated. NYU RR EM-86. AF CRC TN 55-971. Contract AF 19(122)-42.

Guide to design of electronic equipment for maintainability, by John D. Folley, Jr. and James W. Altman. American Institute for Research, Pittsburgh, Pa. Apr 1956. 180p drawings, diags. Order from OTS. \$4.50. PB 121439

A major problem faced by the military services is effective maintenance of complex electronic equipments despite shortages of highly skilled maintenance technicians. This guide is intended to help alleviate this problem by recommending design practices which will maximize the ease with which electronic equipments can be maintained. Factors to be considered in planning for maintainability are briefly reviewed. A schedule of steps to be taken in designing a maintainable system is presented. Specific characteristics are recommended for equipment and maintenance procedures. RADC project no. 7502, WADC task no. 71502. AF WADC TR 56-218.

Initial tests of the ANDB L-band secondary radar system in typical terminal-area traffic operations, by David S. Crippen, Tiley K. Vickers and Marvin H. Yost. U. S. Civil Aeronautics Administration. Sep 1956. 26p photos, diags, graphs, tables. Order from OTS. 75 cents. PB 121688

This report presents the results of initial operational tests of the ANDB L-band secondary radar system, also called the radar safety beacon and the ATC radar-beacon system. These tests were aimed at evaluating the operational importance of certain compromises involved in the selection of ground-antenna aperture and other system options. It was found that coverage of both antennas was satisfactory for terminal-area operations within a radius of 30 nautical miles. A considerable portion of the flight tests was devoted to the investigation of decoder garble. Spurious targets in certain areas of the indicator were caused by reflections of signals from a nearby building. It is apparent that secondary radar systems are more susceptible than primary radar systems to the effects of ground reflections. Therefore, in the choice of ground-antenna sites, it is believed that thought must be given to the possible detrimental effects of large vertical reflecting areas in the vicinity. Additional investigation of the interference problem was made after the flight tests were completed. For these tests, an additional 1-R unit was operated in conjunction with a remotely sited transponder. CAA TDR 229.

Interim report on type test of AN/APS-20A, by C. B. Barnes and I. W. Fuller. U. S. Naval Research Laboratory. Aug 1946. 13p graph, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 122780

Unclassified 15 Dec 1953.

1. AN/APS-20A (Radar) 2. Radar - Tests 3. Radar, Airborne - Tests 4. NRL R-2957.

Modal analysis and synthesis of electromagnetic fields, by L. B. Felsen and N. Marcuvitz. Poly-

technic Institute of Brooklyn. Microwave Research Institute, Brooklyn, N. Y. Feb 1956. 42p diags. Order from LC. Mi \$3.30, ph \$7.80.
PB 123162

The report is concerned with the problem of radiation from prescribed current sources in a region whose geometrical symmetry is such that it may be regarded as some form of waveguide. A waveguide region may be classified as uniform or nonuniform, depending on whether or not cross sections transverse to a given symmetry axis are identical. PIB R 446-55. AF CRC TN 56-198. Contract AF 19-(604)-890.

One method for measuring the solvent resistance of crystal-to-crystal adhesive bonds, by B. J. Faraday and D. J. G. Gregan. U. S. Naval Research Laboratory. Nov 1956. 8p photos, graphs, tables. Order from OTS. 50 cents.
PB 121582

In the course of research on butt-joined ammonium dihydrogen phosphate (ADP) crystal plates, a test having a wide range of application has been developed for the investigation of the solvent resistance of adhesive bonds. Its chief advantage is the elimination of supplementary mechanical tests required in the conventional method of testing. The test showed that, for the cases investigated, the solvent resistance of adhesive bonds is inversely proportional to the bond thickness. NRL R 4872.

Operational performance of special radio facilities aboard air rescue boat C-36263, by Maxwell K. Goldstein and Albert Brodzinsky. U. S. Naval Research Laboratory. Sep 1944. 34p photos, diags (part fold), graphs, tables. Order from LC. Mi \$3, ph \$6.30. PB 120703

Unclassified 15 Dec 1953.
1. C-36263 (Aircraft rescue boat) 2. Rescue equipment, Air-sea 3. Radio, Marine - Performance 4. NRL R-2367.

Operational tests of special "Chaff" developed by Radio Research Laboratory, Harvard University, by L. V. Blake and L. R. Philpott. U. S. Naval Research Laboratory. Apr 1943. 11p tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120694

Unclassified 15 Dec 1953.
1. Radar - Countermeasures - Tests 2. "Chaff" (Radar countermeasure) 3. NRL R-2081.

Paralleled multimode cavity filters, by Irving C. Tang. California. University. Division of Electrical Engineering. Electronics Research Laboratory. Antenna Group, Berkeley, Calif. Oct 1955. 28p drawing, diags, graphs. Order from LC. Mi \$2.70, ph \$4.80. PB 123427

The possible use of degenerate modes in a single cavity for the production of a paralleled-cavity

filter (as contrasted to the ladder type) was studied. A qualitative design with single iris coupling at input and output to three degenerate modes, in a particular cylindrical cavity was obtained and such a cavity built. Arrangements were provided for individually tuning the two TE modes, and for rotation of input and output cavities to vary the coupling to the individual modes. Best operation of this cavity yielded a filter with a pass band of approximately 40 mc/sec at 8970 mc/sec with insertion loss of about 3 db in the pass band. UC IER Series 60, Issue 150. Contract N7onr-29529, Report 51.

Perturbation theory of anisotropic wave guides, by George Jeromson. California. University. Division of Electrical Engineering. Electronics Research Laboratory, Antenna Group, Berkeley, Calif. Jul 1955. 80p diags, table. Order from LC. Mi \$4.50, ph \$12.30. PB 123152

It is the object of this report to analyze various problems involving propagation of electromagnetic waves in anisotropic media. Two independent perturbation theories are developed in order to determine, at least approximately, the nature of the fields propagating through a perfectly conducting cylindrical waveguide filled with ferrite, and having a dc magnetizing field impressed in the longitudinal direction. These methods are then applied to specific examples. The first of the two approaches originates with the coupled, simultaneous partial differential equations for the longitudinal components of the electric and magnetic field vectors and the associated mixed boundary conditions satisfied by these components. The second technique demonstrated is the determination of the exact analytical form of the anisotropic modes, and the derivation of the characteristic equation which determines their propagation constants. A perturbation method is then applied to this characteristic equation, which is in general transcendental in nature, in order to indicate the variation in propagation constant as the magnetizing dc field is applied. This technique is applied to the parallel plane waveguide and the results obtained are compared with those found using the first method. Report no. 45 under Contract N7 onr-29529. UC IER Series 60, Issue 141.

Plot room television system. Preliminary report, by Densil M. Cooper and John B. Trevor, Jr. U. S. Naval Research Laboratory. Jun 1943. 29p photos, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 120696

Unclassified 15 Dec 1953.
1. Plotting equipment - Tests 2. Television - Scanning 3. NRL R-2059.

Prevention of mechanical vibrations in electronic chassis. Design manual, by W. F. Stokey, C. F. Zorowski and F. C. Appl. Carnegie Institute of Technology. Dept. of Mechanical Engineering, Pittsburgh, Pa. Sep 1955. 96p photos, drawings, graphs, tables. Order from OTS. \$2.50.
PB 121564

This manual describes a method for computing, approximately, the lowest material frequency of vibration of an electronic chassis that is constructed in the conventional manner. It discusses: Part I. Solution of the frequency equation. Part II. Simplified solutions for special cases. Part III. Weights having large bases. Part IV. Reinforced chassis. Appendix A. Free vibrations of plates with weights mounted on them. Appendix B. Eigenfunctions for plates with partly clamped edges. Appendix C. Eigenvalues of unloaded chassis. Appendix D. Moments of inertia. Appendix E. Equivalent spring constants for stiffening effect of weights mounted at corner or on edge of chassis. Appendix F. Deflection at center of plate under central load. Appendix G. Test methods. Appendix H. Matrix iteration. AD 90565. AF RADC TR 56-21. Contract AF 30(602)-913.

Propagation of elastic waves in cylindrical shells, including the effects of transverse shear and rotatory inertia, by P. M. Naghdi and R. M. Cooper. Michigan. University. Engineering Research Institute, Ann Arbor, Mich. Aug 1955. 18p graphs, tables. Order from LC. MI \$2.40, ph \$3.30. PB 123056

Two systems of equations of motion for thin elastic cylindrical shells are derived which include the effects of both transverse shear deformation and rotary inertia. Both systems are employed in a study for propagation of axisymmetric waves in an infinite cylindrical shell. The agreement between the predictions of the two systems of equations, in all modes of motion, for phase velocities of propagated waves in the complete range of wave lengths is found to be excellent. Project 2150-4-T. Contract Nonr-1224(01), NR 064-408. MU ERI TR 4.

Quarterly progress report under Contract N7onr-29529, California. University. Division of Electrical Engineering. Electronics Research Laboratory, Berkeley, Calif. Order separate reports described below from LC, giving PB number of each part ordered.

No. 9, for the period Apr 1-Jun 30, 1955. Jul 1955. 39p diagrs, tables. MI \$3, ph \$6.30. PB 123153

For 6th - 8th reports see PB 118246, 119194, 117511.

1. Electronics - Research 2. Wave guides, Broadband - Components 3. Waves, Electromagnetic - Scattering 4. Waves, Electromagnetic - Diffraction 5. Ferrite - Electromagnetic properties 6. Wave guides - Radiation patterns 7. UC IER Series 60, Issue 9.

No. 10, for the period Jul 1-Sep 30, 1955. Oct 1955. 29p. MI \$2.70, ph \$4.80. PB 123424

These reports summarize research carried on under Contract N7-onr-29529 and under the Boeing Airplane Co. research grant. Includes

reports of progress of research on: Scattering from a prolate spheroid, diffraction by cylindrical reflectors, propagation in gyromagnetic media, multi-dimensional arrays, properties of ferrites in broadband microwave systems, radiation pattern from a ferrite-terminated rectangular TE₁₀ waveguide, microwave cavity filters using degenerate modes, and reports of other current research. UC IER Series 60, Issue no. 10.

Radar type propagation survey experiments for communication systems, by R. E. Lacy and C. E. Sharp. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Oct 1955. 38p photos, maps. Order from LC. MI \$3, ph \$6.30. PB 123422

Dept. of the Army project no. 3-99-12-021. Signal Corps project no. 132A. Unclassified 17 Jul 1956.
1. Radio waves - Propagation - Tests 2. Radar, PPI - Tests 3. Radio communication, UHF
4. SCEL TM M 1760.

Radiation from a flush-mounted scanning antenna on the nose section of a supersonic aircraft, by James K. Shimizu and Tetsu Morita. Stanford Research Institute, Menlo Park, Calif. Dec 1955. 28p photos, diagrs, graphs. Order from LC. MI \$2.70, ph \$4.80. PB 123442

As part of a program to study the feasibility of flush-mounted antennas for radar applications, an experimental investigation has been made of the radiation patterns of a flush-mounted, scanning, end fire antenna on the under surface of a full-scale model of a supersonic aircraft nose section. Experimental pattern data are presented to illustrate the effect of the aircraft on the beam tilt, beam width, and side lobe level in the elevation plane of the antenna. It is shown that the influence of the aircraft on the pattern can be predicted in an approximate manner from the pattern of a slot radiator mounted at the same location on the aircraft as the end-fire antenna. AF CRC TN 56-199. SRI TR 55. SRI Proj 1197. Contract AF 19(604)-1296.

Removal of moisture from crystal unit holders. Final report under Contract no. AF 18(600)-157, by Paul Goldsmith. Armour Research Foundation, Chicago, Ill. Nov 1952. 36p photos, graphs, table. Order from LC. MI \$3, ph \$6.30. PB 123919

Techniques for sealing crystal unit holders free from moisture have been investigated. Correlation between experimental and theoretical data relating change in crystal resistance to the amount of moisture sealed in the crystal holder has been obtained. Relationship between resistance change and frequency variation has been obtained for crystals in different frequency ranges. From these data, the maximum amount of allowable moisture has been determined. The effect of variations in crystal heating rate during the dewpoint test is

analyzed. Several crystal unit sealing methods are evaluated. Modifications of the crystal testing procedure are recommended. AD 11621. ARF Proj 90-1193E, Final report.

Report on audio-frequency sweep equipment, by Robert G. Mills. U. S. Naval Research Laboratory. Sep 1944. 36p photos, diags, tables. Order from LC. Mi \$3, ph \$6.30. PB 120702

The audio-frequency sweep equipment has been developed at the Naval Research Laboratory for use in jamming enemy c-w signals. This report describes in detail the functional theory, the method of operation, and the results of the tests performed on this equipment. Unclassified 26 Sep 1955. NRL R 2368.

Self-excited hydrodynamic oscillators, by John V. Bouyoucos. Harvard University. Acoustics Research Laboratory, Cambridge, Mass. Jul 1955. 326p photos, drawings, diags, graphs, tables. Order from LC. Mi \$11.10, ph \$49.85. PB 122969

This report is concerned with the conversion of liquid-flow energy to acoustic energy, as achieved through a self-excited, flow-interruption process. Certain conditions exist for which flow variations through a variable-area orifice act quasistatically, or as a succession of slowly changing equilibrium states. In this case, the acoustic circuit representation of a pressure-actuated orifice assembly closely resembles the equivalent circuit of a vacuum tube, or electron valve. The similarities and differences between these analogous structures are investigated. Furthermore, various types of "interterminal coupling" that exist in practical valving structures are analysed, and expressed in circuit form. A number of self-excited hydrodynamic oscillators are devised, some of whose circuit diagrams resemble well-known electronic systems. The properties of these oscillators are investigated from the standpoint of linear circuit instability, using methods due to H. Nyquist. In a concluding chapter the results obtained with a group of experimental oscillators are compared with the performance predicted by the linear theory. In one particular case, the large signal operation has been investigated, using a graphical analysis borrowed from the electronics field and applied to the static characteristic curves of orifice discharge. Contract N5ori-76, NR 014-093, Proj. X. HU ARL TM 36.

Submerged reception of radio frequency signals, by Oscar Norgorden. U. S. Naval Research Laboratory. Dec 1940. 46p diagr, graphs, tables. Order from LC. Mi \$3.30, ph \$7.80. PB 123320

The report discusses (1) the propagation of radio waves from the transmitting antenna to the point at which the radio wave penetrates the sea water, (2) the refraction of the radio waves at the boundary between the air and the sea water, (3) the propaga-

tion of radio waves in sea water, (4) the voltage induced in a loop submerged in sea water, (5) the "Q" of a loop submerged in sea water, and (6) the r-f input voltage to a receiver. NRL R 1669.

Test of loss factor and high frequency flash-over of phenolic insulating materials, by J. D. Wallace and A. H. Moore. U. S. Naval Research Laboratory. Jan 1935. 56p drawings, diags, graphs, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 120486

1. Insulating materials, Phenolic - Tests 2. NRL R 1117.

Test of model AN/URQ-1 stop-watch equipment, by C. J. Black. U. S. Naval Research Laboratory. Oct 1946. 37p fold. diagr, graphs, tables. Order from LC. Mi \$3, ph \$6.30. PB 122779

Unclassified 31 Aug 1955.

1. AN/URQ-1 (Jamming equipment) 2. Radio - Jamming equipment - Tests 3. NRL R-2952.

Test of model CXCA radar equipment, by R. C. Guthrie and T. McL. Davis. U. S. Naval Research Laboratory. Sep 1943. 75p photos, diagr, graphs, tables. Order from LC. Mi \$4.50, ph \$12.30. PB 120699

Unclassified 15 Dec 1953.

1. CXCA (Radar equipment) 2. Radar, Portable - Tests 3. NRL R-2171.

Test of model TBK transmitting equipment (preliminary model), by R. B. Meyer and O. C. Dresser. U. S. Naval Research Laboratory. Oct 1934. 77p photos, tables. Order from LC. Mi \$4.50, ph \$12.30. PB 122748

Unclassified.

1. TBK (Transmitter) 2. Radio transmitters - Tests 3. NRL R 1087.

Tests with ultra-high-frequency radio transmitting and receiving equipment for itinerant aircraft communication, by W. E. Jackson and A. E. Harrison. U. S. Civil Aeronautics Administration. Technical Development and Evaluation Center, Indianapolis, Ind. Jul 1939. 9p graphs. Order from LC. Mi \$1.80, ph \$1.80. PB 123558

Reprinted 1941. Formerly Report no. 7, Technical Development Division, Civil Aeronautics Authority.

1. Communications, Airborne - Equipment - Tests 2. Radio receivers (UHF) - Tests 3. Radio transmitters (UHF) - Tests 4. CAA TDR 22.

Vertical plane antenna field patterns; by A. E. Harrison. U. S. Civil Aeronautics Administration. Technical Development and Evaluation Center, Indianapolis, Ind. Jun 1940. 14p graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 122251

Note 25.

1. Antennas, Vertical - Radiation patterns 2. CAA N 25.

VHF omnirange wave reflections from wires, by S. R. Anderson and H. F. Keary. U. S. Civil Aeronautics Administration. Technical Development and Evaluation Center, Indianapolis, Ind. May 1952. 21p diags, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 123569

This report presents data obtained both by measurements made on the ground and during flights of a very-high-frequency omnidirectional radio range (VOR) with horizontal wires, metallic fences, and wooden fences located near the station for the purpose of determining their effect on the performance of the omnirange. The phenomena of wave reflections from wires are treated mathematically. CAA TDR 126.

Generators, Motors, Transmission

Final report for the period Mar 1, 1952-Jul 31, 1955 under Contract no. N5 ori-07876, NR 025-164, by T. S. Gray and A. B. Van Rennes. Massachusetts Institute of Technology. Dept. of Electrical Engineering. Servomechanisms Laboratory. Jul 1955. 38p drawing, diags, tables. Order from LC. Mi \$3, ph \$6.30. PB 123026

The purpose of the research under Contract N5ori-07876 was to study the design factors of nuclear instrumentation systems, in particular, instrumentation systems for measurement of neutron flux; and to conduct research directed toward the evolution of rugged, long-life components for use in such systems. System components considered as having the most promise for use in the high-level system are: a rapid-response thermopile sensitive to neutrons; a low-impedance magnetic-modulator preamplifier suitable for use with the thermopile; a transistor carrier amplifier to follow the modulator; and an output amplifier suitable for driving a conversion transducer. Two alternative neutron sensitive detectors have been studied, one in which the neutron beam is modulated, or chopped, so that an alternating detector voltage is developed and a second in which electro-acoustic properties of an ionization chamber are utilized to produce a carrier-suppressed output signal. A description of a high-level neutron flux measuring system using particular components selected during the research is given in the body of this report. AD 70741, D.I.C. Project 6986. Review of work from Mar 1, 1952 to Jul 31, 1955.

Investigation of methods for improving the temperature compensation of the Eclipse, type 1001 and 1317 a.c. carbon pile voltage regulator, by A. H. Barauck. U. S. Naval Research Laboratory. Jul 1946. 12p tables. Order from C. Mi \$2.40, ph \$3.30. PB 123325

Unclassified 15 Dec 1953.

1. Voltage regulators, Carbon pile - Temperature compensation 2. NRL E 2901.

Studies of grid alloys for submarine storage batteries, by R. H. Canfield and H. F. Kaiser. U. S. Naval Research Laboratory. May 1934. 27p photos, drawings, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 120484

1. Batteries, Storage 2. Submarines - Batteries 3. Lead alloys 4. NRL M 1052.

Miscellaneous

Submarine mine cable and associated test sets for use with controlled mines, by D. F. Sheets. U. S. Naval Ordnance Laboratory, White Oak, Md. Jun 1952. 20p graphs, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120833

1. M6 (Submarine mine cable) 2. Telemicroscopes - Tests 3. Cables, Submarine - Testing equipment 4. Cables, Submarine - Tests 5. Telemicroscopes - Tests 6. NAVORD 2552.

Submarine storage batteries: Relation of current and voltage during the gassing phase of charge, by E. G. Lunn. U. S. Naval Research Laboratory. Nov 1934. 10p diagr, tables. Order from LC. Mi \$1.80, ph \$1.80. PB 120496

1. Submarines - Batteries 2. Batteries, Storage - Charging characteristics 3. NRL P-1100.

FOOD AND KINDRED PRODUCTS

Ionizing radiations, their production, effects, and utilization (with special reference to food and packaging technology). Supplement no. III and subject index. U. S. Quartermaster Food and Container Institute, Chicago, Ill. Jun 1956. 119p. Order from OTS. \$3. PB 111636s3

Subject index to PB 111636. For supplement see PB 111636s2.

1. Food - Radiosterilization - Bibliography 2. Radiation, Ionizing - Biological effects - Bibliography 3. QMC TL BS 4 Index.

FUELS AND LUBRICANTS

Characteristics of benzol blends and aromatic gasolines, by Dan Fore, Jr. U. S. Naval Research Laboratory. May 1941. 10p graph, tables. Order from LC. Mi \$1.80, ph \$1.80. PB 122681

Unclassified.

1. Fuels, Aviation - Aromatization - Tests
2. Fuels, Aviation - Effect of benzol
3. NRL P-1741.

Cooperative fuel testing. Progress report (c), by Parry Borgstrom. U. S. Naval Research Laboratory. Apr 1934. 4p tables. Order from LC. Mi \$1.80, ph \$1.80. PB 120634

Unclassified.

1. Oil fuel - Tests
2. NRL P-1049.

Literature survey of low molecular weight polynuclear aromatic compounds, by Charles F. Raley, Jr. Southwest Research Institute, San Antonio, Texas. May 1955. 300p table. Order from OTS. \$4.75. PB 121664

A literature search was carried out covering the field of low molecular-weight polynuclear aromatic compounds with the object of determining the usefulness of such compounds as high-temperature lubricants. The highest literature boiling-point, melting point, calculated atmospheric boiling point, and literature reference are given. Recommendations are made as to the compounds or types of compounds which appear promising as high-temperature lubricants. AD 80025. Project no. 7340. AF WADC TR 55-90. Contract AF 33(616)-276.

HIGHWAYS AND BRIDGES

Proceedings of the 1955 Northwest Conference on Road Building. Oregon. Engineering Experiment Station, Corvallis, Oregon. Jun 1955. 112p photo, diagr, table. Order from Oregon State College, Engineering Experiment Station, Corvallis, Oregon. 60 cents. PB 123661

For 1953 Proceedings see PB 113081.

1. Roads - Construction - Congresses
2. Northwest Conference on Road Building
3. O EES C 18.

INSTRUMENTS

Ballistic pendulum air drag measurement technique, by G. R. Irwin, A. B. J. Clark, and F. F. Iskovitz. U. S. Naval Research Laboratory. Oct 1946. 56p photos, diagrs, graphs, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 120772

Unclassified 15 Dec 1953.

1. Ballistics, Projectile - Measuring equipment
2. Ballistic pendulum - Use
3. Projectiles - Drag - Measurement
4. NRL O-2851

Comparison-type receivers for white noise radiation at 0.86 cm wavelength, by J. E. Gibson. U. S. Naval Research Laboratory. Dec 1956. 32p photos, diagrs, graphs. Order from OTS. \$1. PB 121571

Two KA-band versions of the comparison receiver, together with facilities for calibration and measurement of received signal power, are described. The derivation of the output response characteristic is traced in analytical form, and it is shown to be parabolic for linear i-f detection. Optimum receiver gain stability is shown to be obtained with linear detection. Techniques used to suppress troublesome spurious emissions from the receiver input are discussed. Two methods of determining receiver noise figure are considered; the noise figure obtained with selected mixer crystals is 12 to 13 db. Expressions are derived for the absolute sensitivity of the single-detection and the comparison (double-detection) receivers, and the observed sensitivity of the subject type of receiver is found to be in reasonable agreement. NRL R 4864.

Conversion of viscosity determinations using the Saybolt viscosimeter with Universal, Furol, and Asphalt tubes, by Parry Borgstrom. U. S. Naval Research Laboratory. Jan 1935. 14p graphs, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120487

1. Viscosity - Measurements
2. Viscosity - Measuring equipment
3. Viscometers, Calibration
4. NRL P-1119.

Introduction to FLAC coding, by R. J. Konig. U. S. Air Force. Air Research and Development Command. Missile Test Center, Patrick Air Force Base, Fla. Jul 1954. 122p photo, drawing, diagrs, graph, tables. Order from LC. Mi \$6.30, ph \$19.80. PB 123150

This manual is intended primarily as an introduction to the subject of programming and coding for the Florida Automatic Computer. It presupposes very little in the way of background information on modern high speed digital computers. As such, it is aimed at two groups of readers: those prospective users of the machine who, although they may not be interested in becoming proficient coders, would like to familiarize themselves with the general characteristics of the machine and the possibilities it affords, and those new employees of the Data Reduction Group whose duties will require an intimate knowledge of FLAC programming and coding techniques but whose previous experience has involved no encounter with electronic digital computers. AF MTC TR 56-8.

Military application of evaporative cooling, by R. F. Law and W. R. Nehlsen. U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif. May 1955. 29p photos, diagrs, graph, table. Order from OTS. 75 cents. PB 111712

This report is a summary of design, operation, and maintenance information obtained from field and in-service tests, resulting from an investigation to 1) define the fundamental problems encountered in the application of evaporative cooling, 2) develop suitable operating and maintenance procedures, and 3) develop procurement specifications. Project VD 512-37. NCEREL TM M-101.

Multipole sampled-data control systems, by Herbert Freeman, Columbia University. Dept. of Electrical Engineering. Electronics Research Laboratories, New York, N. Y. Sep 1955. 45p diags. Order from LC. Mi \$3.30, ph \$7.80. PB 122228

This report gives a detailed discussion of a method for eliminating the coupling inherent in complex control systems in order to permit application of well-known single-input, single-output system techniques. The treatment is from the sampled-data point of view because of the ease with which complicated transfer functions may be realized with a digital computer. The method may, however, be readily extended to continuous-data systems. Limitations of the method are discussed, and an example is given of the design of a controller for a system having three inputs and two outputs. ASTIA no. 81534. Project no. R-357-50-3. CUN ERL T-12/B. Contract AF 18(600)-677. AF OSR TN 56-81.

Radiation and recovery corrections and time constants of several chromel-alumel thermocouple probes in high-temperature, high velocity gas streams, by George E. Glawe, Frederick S. Simmons and Truman M. Stickney. U.S. National Advisory Committee for Aeronautics. Oct 1956. 25p photo, diags, graphs, tables. Order as NACA TN 3766 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington, 25, D. C. PB 123699

Radiation and recovery corrections and time constants were experimentally determined for several designs of shielded and unshielded thermocouple probes using chromel-alumel wire. A review of the theory of gas temperature measurements and an analysis of the data show that simple empirical formulas may be used to correlate corrections for various gas-stream conditions. NACA TN 3766.

Research and development studies for a low-level wind-measuring system. Final report covering the period Dec 1, 1953-Nov 30, 1955 under Contract no. DA-36-039-sc-56691, by John F. Ripken and John M. Killen. Minnesota. University. St. Anthony Falls Hydraulic Laboratory. Dec 1955. 78p photos, drawings, diags, graphs. Order from LC. Mi \$4.50, ph \$12.30. PB 123104

This report describes the research and development effort involved in creating an instrument capable of measuring the speed and direction of winds ranging from 1 to 50 ft per sec at any

selected point between 0 and 1000 ft above the earth's surface. The sensitive instrument element was an electrically heated thermistor rod producing an electrical signal variation as a result of the convective cooling action of the measured wind. The electrical signal from the elevated instrument station was conveyed to the ground indicator station by a transmission cable. The instrument was stably supported and selectively positioned in the wind by a tethered kite-type balloon. Dept. of the Army project no. 3-99-07-022. Signal Corps project no. 172-B. Project report no. 49. Contract DA 36-039-sc-56691, Final report.

Scatulator, by James E. Bartow. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Feb 1956. 15p photos, graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 123075

The purpose of this report is to bring together information necessary to determine tropospheric scatter circuit performance, and to present a simple method of applying this information to obtain rapid solutions to the equations involved. The formulae for determining the performance of tropospheric scatter systems are presented. A method of applying these formulae using a circular slide rule is presented and explained. Dept. of the Army project no. 3-24-01-072. Signal Corps project no. 807B. Unclassified 25 Jun 1956. SCELE-1174.

Study of the Dwyer and Friez zero to five percent carbon dioxide indicators to determine their suitability, by Myron H. Boyer, and Franklin S. Thomas. U. S. Naval Research Laboratory. May 1942. 23p diagr, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 120627

See also PB 120628 and PB 120568. Unclassified. 1. Indicators, Carbon dioxide - Tests 2. NRL P-1877.

Study of the Friez zero to five percent carbon dioxide indicator to determine its suitability for naval use, by Myron H. Boyer, and Franklin S. Thomas. U. S. Naval Research Laboratory. Jul 1942. 23p diagr, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 120268

Unclassified. See also PB 120627 and PB 120568. 1. Indicators, Carbon dioxide - Tests 2. NRL P-1877-B.

Survey of magnetic drum memory systems for electronic computers, by Martin H. Welk. U. S. Aberdeen Proving Ground. Ballistic Research Laboratories, Aberdeen, Md. Aug 1954. 12p diags, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 122119

Dept. of the Army project 503-06-002. Ordnance research and development project TB 3-0007. 1. Computers, Electronic - Storage systems 2. Data storage systems 3. APG BRL M 819.

Synchronous commutator. Final report under Contract Nonr-1576(00). Peerless Instrument Co., Inc., Elmhurst, N. Y. Aug 1955. 21p fold drawing. Order from LC. Mi \$2.70, ph \$4.80.

PB 122981

Electrically, the equipment is straightforward in design and dependable, requiring only such maintenance and servicing as is normal with such electronic equipment. In spite of the fact that commercial components were required, JAN components and construction were used, and very little electronic servicing should be required. The mechanical design of the commutator was approached with the object of making it as rugged and dependable as required by the use of the equipment. Since the rotational speed required is 3000 RPM, it was decided to rotate the commutator segments and slip rings rather than the brush assembly since it made for a better balanced rotating member. The brush assembly was much simplified in spite of the fact that more brushes were required.

Tests of a high-frequency large amplitude magnetostrictive vibration generator and theoretical and experimental investigation of the feasibility of mode shape analysis from driving point impedance measurements, by R. W. Gretter. Massachusetts Institute of Technology, Cambridge, Mass. Mar 1956. 49p photos, diags, graphs. Order from OTS. \$1.25. PB 121252

Tests of a high frequency vibration exciter consisting of a magnetostrictive stack and Mason probe are described. It is shown that simulated gas turbine blades having a cross sectional area of one quarter square inch can be failed near the resonant frequency of the exciter. Failure of an actual gas turbine blade having a resonant frequency 1500 cycles above that of the exciter is described. Theory of a magneto-magnetostrictive force-velocity pickup is described and results of experimental sensitivity measurements are presented. An effort is made to relate driven mode shapes to mechanical driving point admittance. The problem is formulated as an integral equation and a solution is obtained for the static case. The static result is the kernel of the integral equation for the dynamic problem. The method of solution is outlined. Project no. 3066, Task no. 70511. AF WADC TR 55-300. Contract AF 33(616)-378.

Theory of the thickness vibrations of a barium titanate cylindrical transducer, by Samuel Globe. U. S. Naval Ordnance Laboratory, White Oak, Md. Jan 1951. 22p. Order from LC. Mi \$2.70, ph \$4.80. PB 120913

A transducer of barium titanate in the form of an infinitely long cylindrical shell, and vibrating in a thickness mode, is considered. The equation of motion is derived and solved. The solution is specialized for the case where the circumference is large compared with the wavelength, and for this special case, the coupled-circuit equations are derived. Expressions are derived for the electrical

input admittance and impedance of the transducer and the constants of the corresponding equivalent circuits in the vicinity of resonance are established. NAVORD 1767.

MACHINERY

Trailer, tank, water, 400-gallon, 2 wheel, XM149E2 and XM149E6, by Fred A. Schuellerman and R. L. McVey. U. S. Aberdeen Proving Ground, Aberdeen, Md. May 1956. 31p photos, graphs. Order from LC. Mi \$3, ph \$6.30. PB 123722

First report on project no. TT3-744A-2. Dates of test: 7 Jan 1955-7 Feb 1956. Includes report of Automotive Engineering Laboratory tests, Sep 1955-Oct 1955.

1. Water tanks, Plastic - Tests 2. Trailers, Water - Tests 3. APG Report 55-162.

MEDICAL RESEARCH AND PRACTICE

Altitude tolerance and work capacity of dogs undergoing extensive pulmonary resection, by John A. Schilling, Rodney B. Harvey and Bruno Balke. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Feb 1956. 10p diagr, graphs, table. Order from LC. Mi \$1.80, ph \$1.80. PB 123031

The altitude tolerance and work capacity of dogs were tested during recovery from three operative procedures that removed in stages all but one lobe of the lung. Other functional and pathologic sequelae were observed. By these criteria a surprisingly good tolerance was indicated to removal of 60 percent of the original lung volume. Removal of more than 60 percent of the original lung volume produced a crippled animal with pathologic sequelae that seemed incompatible with life. AF SAM R 55-93.

Aviation medicine, an annotated bibliography, 1952 literature, by Arnold J. Jacobius and Madeleine J. Wilkins. U. S. Library of Congress. Technical Information Division. Nov 1956. 210p. Order from OTS. \$4. PB 121543

Biochemistry of tissue trauma: Muscle protein, by Carroll A. Handley and Richard A. Seibert. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jan 1956. 9p tables. Order from LC. Mi \$1.80, ph \$1.80. PB 123032

Muscles of rabbits subjected to cold injury at 0° and -5°C. for 30 minutes showed little damage after 24 hours. There were no significant differences in the weights of muscles or in the amount of myosin extracted from treated and untreated muscles. In

contrast to this, -15°C . cold injury for 30 minutes produced statistically significant changes if the treatment produced a solidly frozen muscle. The total amount of myosin extractable was decreased to one-half the control levels and, as a consequence, the ATPase activity and sulfhydryl content were decreased. The ratio of ATPase activity to milligrams of nitrogen and also the ratio of moles to sulfhydryl to moles of nitrogen increased. AF SAM R 55-89.

Caloric intake and energy expenditure in a sub-arctic environment, by E. R. Buskirk, M.

Kreider, R. Brebbia, N. Morana, F. Daniels, B. E. Welch, J. E. Mann, W. Insull, Jr., and T. E. Friedemann. U. S. Army. Quartermaster Research and Development Command. Environmental Protection Division. Quartermaster Research and Development Center, Natick, Mass. Mar 1956. 50p graphs, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 122895

Caloric intake and caloric expenditure were studied in eight men during 10 days of pre-bivouac, 12 days of bivouac and 8 days of post-bivouac. Fort Churchill, Manitoba, Canada was the test site. Mean ambient temperatures for the three periods were -25°C (-13°F), -31°C (-23°F), and -26°C (-15°F) respectively. Project reference 7-64-12-004C. QMC EP TR 33.

Contact cooling of the hand at -20°F ., by Farrington

Daniels, Jr. U. S. Army. Quartermaster Research and Development Command. Environmental Protection Division. Quartermaster Research and Development Center, Natick, Mass. Jan 1956. 25p drawing, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 122898

Cooling curves were obtained at eleven points on the hand and fingers of three men with bare hands exposed to air, grasping iron and aluminum pipes covered with an expanded plastic material, and grasping the bare iron pipes. Some of the points of contact with bare metal plunged in a straight line to below the freezing point of water. The favored position of the third finger in having slower cooling than the other fingers was apparent. The small finger was particularly vulnerable to rapid cooling. The importance of insulating metal equipment in the cold is discussed; such insulation is in many instances more feasible than trying to maintain dexterity by insulating the hand. Project reference 7-64-12-004. QMC EP TR 22.

Effects of prolonged exposure to low temperature on visual motor performance, flicker fusion and pain sensitivity, by Warren H. Teichner and John L.

Kobrick. U. S. Army. Quartermaster Research and Development Command. Environmental Protection Division. Quartermaster Research and Development Center, Natick, Mass. Jun 1954. 16p graphs, table. Order from LC. Mi \$2.40, ph \$3.30. PB 122902

One purpose of this study was to determine whether the effect of temperature was on the rate or on the limit of acquisition of skill on the pursuit-rotor. Another question was whether the effect of temperature was on the measure of performance alone or whether it also affects the learning process which is developed with the practice trials. In addition, incidental information was desired regarding the possible impairment and acclimatization of the critical frequency of flicker fusion (CFF) and of the threshold of radiant heat pain. This study aimed to obtain such information only pertaining to exposure to low temperatures. Continues research reported in PB 122900. QMC EPS 230.

Influence of X-ray on oxygen consumption by hematopoietic tissues of rats, by Maurice F. Sullivan

and Kenneth P. DuBois. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Feb 1956. 9p graphs, tables. Order from LC. Mi \$1.80, ph \$1.80. PB 123030

A study was made of the effects of whole body x-irradiation on the oxygen consumption by hematopoietic tissues of irradiated animals. With prolonged incubation periods of 3 hours the decline in the rate of endogenous respiration was much faster in the tissues from irradiated animals than in the case of unirradiated animals. The addition of various intermediates of the tricarboxylic acid cycle failed to alleviate the radiation-induced depression of oxygen consumption. Administration of cysteine or p-aminopropiophenone prior to x-ray reduced the amount of inhibition of endogenous respiration produced by 400 r of x-ray. AF SAM R 55-114.

Method of studying the tactual-kinesthetic sensitivity

of the hand, by Warren H. Teichner and Michael J. Zigler. U. S. Army. Quartermaster Research and Development Command. Environmental Protection Division. Quartermaster Research and Development Center, Natick, Mass. Nov 1953. 14p photo, graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 122901

A method for determining the tactual-kinesthetic sensitivity of the hand was developed and evaluated. The apparatus consisted of eleven brass discs which the subjects discriminated by hand in terms of difference in size. Both frequency of the judgment, larger-smaller, and latency of the judgment were obtained with the method of paired-comparisons. Since the differences between discs were all supra-threshold, the former measure did not yield a sufficient number of errors to be useful for the construction of a psychophysical scale. The latency measure, however, yielded meaningful results showing that the method being investigated might be useful for making inferences regarding the effects of temperature and handwear on the complex tactual-kinesthetic sensitivity of the hand. Project 7-95-25-001. QMC EPS 224.

Study of pilots' eye movements during visual flight conditions, by Thomas M. Edwards and Wayne D. Howell. U. S. Civil Aeronautics Administration, Technical Development and Evaluation Center, Indianapolis, Ind. Jun 1952. 25p photos, diagr, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 123576

To obtain further substantial information for establishing minimum angles of vision from the cockpit of airplanes, motion picture photographs were taken of pilots' eyes and heads while they performed critical maneuvers with aircraft during daytime visual flight conditions. CAA TDR 179.

Time trend of hyperlipoproteinemia after radiation injury, by Norman Weiner, Harry G. Albaum and Lawrence J. Milch. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Dec 1955. 8p photos, diagr, graphs. Order from LC. Mi \$1.80, ph \$1.80. PB 123029

Rabbits subjected to local radiation injury were found to develop, during the first week post-exposure, elevated plasma lipid levels which persisted for several weeks thereafter. The time curves of individual lipid and lipoprotein components are presented and the results discussed. Muscle histology and ATP levels are also presented to show the progression of local tissue changes after radiation. AF SAM R 55-139.

Visual-motor performance as a function of short-duration ambient temperature, by Warren H. Teichner and Robert F. Wehrkamp. U. S. Climatic Research Laboratory, Lawrence, Mass. Jan 1953. 10p photo, graphs, table. Order from LC. Mi \$1.80, ph \$1.80. PB 122900

For five days subjects were exposed for 20 minutes to ambient temperatures of 55^o, 70^o, 85^o, or 100^oF, and then given 15 trials on a task involving a high degree of visual-motor coordination. Performance was found to be poorer in temperatures both higher and lower than 70^oF. The results suggest that the amount of decrement in performance to be expected in temperatures under 70^oF may be greater than the amount to be expected in comparable temperatures above 70^oF. Project 95-25-001. Continued in PB 122902. QMC EPS 198.

METALS AND METAL PRODUCTS

Basic research on sintered titanium powder analogous to "SAP" for high temperature strength. Summary report, by E. P. Weber. Clevite Corporation, Cleveland, Ohio. Jun 1956. 44p photos, drawing, diagr, graph, tables. Order from OTS. \$1.25. PB 121559

Titanium hydride having an average particle size of 5 to 10 microns can be made, compacted, dehydrated, sintered and extruded into rod. The room temperature tensile properties, with respect to

strength and ductility, have been excellent. Thus, a high quality base powder has been achieved. Silicon can be coated on fine particles of titanium hydride by the vapor phase reduction of silicon tetrachloride by hydrogen produced during the decomposition of titanium hydride. Metallographic evidence shows that sintering and dehydrating can be accomplished without dissolving the silicon film on the original particle if the temperature does not exceed 800C (1472 F). Thorium oxide was found to be stable in titanium when sintered at 1200 C (2200 F), indicating that it can serve as the dispersed phase for dispersion hardening by mechanical mixing if a fine enough dispersion can be accomplished. Project 50120-G. Contract NOAs 55-505-C.

Causes for porosity and leakage in non-ferrous castings, by A. H. Hesse. U. S. Naval Research Laboratory. Aug 1940. 35p photos, drawings, graphs, tables. Order from LC. Mi \$3, ph \$6.30. PB 123316

1. Castings - Leakage
2. Castings - Porosity
3. Porosity
4. Alloys, Non-ferrous - Casting
5. NRL M 1650.

Causes for porosity and leakage in non-ferrous castings (The effect of replacing tin by nickel on the porosity, mechanical properties and corrosion resistance of tin bronze), by A. H. Hesse, E. T. Myskowski, R. H. Brouk and B. M. Loring. U. S. Naval Research Laboratory. Feb 1943. 47p photo, diagrs, graphs (part fold), tables. Order from LC. Mi \$3.30, ph \$7.80. PB 120614

It is concluded that the replacement of tin by nickel (a) decreases intercrystalline shrinkage porosity in one composition tested but not in another composition, (b) does not appreciably lower the physical properties of the basic compositions excepting the 7.5 and 9 percent nickel alloys in the G series, and (c) the extent to which tin is replaced by nickel in composition G and M and red brass for marine applications is determined by corrosion conditions. A complete record of corrosion tests completed and in progress is incorporated in six tables. Addenda: - Pt. I. Methane and gas porosity. - Pt. II. Resistance to corrosion. NRL M 2013.

Chemical surface treatment of titanium. Interim technical report under Contract no. DA 33-019-ORD-215, for the period Oct 31, 1952 to Apr 30, 1953, by H. A. Pray, P. D. Miller, and Richard A. Jefferys. Battelle Memorial Institute, Columbus, Ohio. May 1953. 43p photos, diagr, graphs, tables. Order from OTS. \$1.25. PB 111805

An extensive survey of chemical treatments of titanium and its alloys has produced two immersion treatments that offer useful and practical coatings on titanium alloys. These coatings, when

subjected to a low-temperature thermal treatment, possess additional properties of wear resistance, which reduce the galling tendency of titanium. The most notable aspect of this treatment is the production of a wear-resistant surface without change in the core properties of the titanium metal produced in treatments such as carburizing or nitriding. WAL R 401/45-26.

Corrosion of titanium, by D. W. Stough, F. W. Fink, and R. S. Peoples. Battelle Memorial Inst. Titanium Metallurgical Laboratory, Columbus, Ohio, Oct 1956. 184p photos, graphs, tables. Order from OTS. \$4.75. PB 121601

The corrosion properties of titanium and some titanium alloys are reported. The data were obtained from the results of laboratory investigations and from reports of the behavior of titanium in service. Included are corrosion rates in various environments, a description of industrial and military corrosion experiences with titanium, and the results of fundamental studies of the corrosion and passivating processes on titanium. BMI TML 57.

Creep buckling of integrally stiffened aluminum alloy panels, by C. W. King. North American Aviation, Inc. Structures Laboratory, Los Angeles, Calif. May 1956. 70p diagrs, graphs, tables. Order from OTS. \$1.75. PB 121466

A series of creep buckling tests have been run on flat compression panels of integral skin-stringer type construction using 2024-T4 and 7075-T6 materials. The tests were conducted at a constant bending moment, constant temperature, and uninterrupted time until failure. Each of the two materials was tested at four elevated temperatures with stress levels selected to effect creep failures over a range of time from fractional hours to an upper limit of 200 hours. The results are shown compared to a temperature-time parameter previously proposed for tensile creep rupture to indicate the similarities in stress-temperature-lifetime relationships for the different basic mechanisms of failure. Design curves for the structural configuration used in this investigation are presented in the form of constant-time failure curves. Project 1367, Task 70524. Covers work performed during the period 15 Jun 1954 to 31 Aug 1955 under Contract AF 33(616)-2599. AF WADC TR 55-349.

Development of titanium alloy powder production. Final report for period Aug 15, 1951-Aug 28, 1953 under Contract no. DA 33-019-ORD-322, by G. F. Davies. Brush Laboratories Co., Cleveland, Ohio. Aug 1953. 42p photos, drawing, diagrs, tables. Order from OTS. \$1.25. PB 111918

This report describes the methods of preparation and the evaluation of various titanium alloy powder scraps. The result of the program was to evolve:

1) An attritioning method for producing from alloy scrap powders of useable metallurgical grade having a minimum of added impurities. 2) A method for reducing scrap alloy turnings of reasonable purity to powder with a minimum of added impurities by mechanical mutilation and the application of a mercury technique. 3) A method for the reduction of massive titanium alloy scrap to powder by means of consolidating the irregular shaped scrap alloy into a billet and then reducing the billet by mechanical cutting technique under mercury to turnings. The mercury is then removed and the turnings in turn reduced by mutilation to powder. PN no. B-280. Project TB 4-15. Contract DA 33-019-ORD-328, Final report. WAL R 401/120-23.

Effects of specimen preparation on fatigue, by Franz H. Vitovec and Harold F. Binder. Minnesota. University. Minneapolis, Minn. Aug 1956. 53p photos, drawing, diagrs, graphs, tables. Order from OTS. \$1.50. PB 121576

The effect of surface preparation methods for plain specimens on the fatigue strength is reviewed. The various effects caused by machining, grinding and mechanical and electrolytical polishing are analyzed. A study of the penetration of plastic deformation caused by the notch preparation is presented. Data on the effect of lapping procedure on the Prot failure stress of SAE B1113 steel and SAE 1020 steel are reported. The direct stress fatigue properties of notched specimens from these two steels were not affected by the direction of lapping. AD 97211. Project 7360. Covers period of work from Jan-Nov 1955 under Contract AF 33(616)-2803. AF WADC TR 56-289.

Elastic constants in structural design with particular applications to titanium, by S. A. Gordon. Battelle Memorial Institute. Titanium Metallurgical Laboratory, Columbus, Ohio. Oct 1956. 184p diagrs, graphs, tables. Order from OTS. \$1. PB 121600

The elastic constants of materials and their application to design formulas are discussed. Studies are presented to show the effect of variations in these constants on the formulas in which they are used. Typical design curves are presented for titanium and 17-7PH for columns, buckling, and crippling of open sections, and torsion in cylinders. An analysis is also presented of several typical beams and columns to show the effect of the modulus of elasticity of titanium and 17-7PH on the over-all deflection of structures. The basic developments are reported so that additional design curves can be plotted for different elastic constants or materials of different strengths. BMI TML 56.

Fatigue-crack propagation in aluminum-alloy box beams, by Herbert F. Hardrath, Herbert A. Leybold, Charles B. Landers, and Louis W. Hauschild. U. S. National Advisory Committee for Aeronautics. Aug 1956. 33p photos, diagrs, graphs. Or-

der as NACA TN 3856 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123531

Eighteen box-beam specimens constructed according to four designs were subjected to fatigue tests to study fatigue-crack propagation and accompanying stress redistribution. At least two specimens of each design were constructed from each of the aluminum alloys 2024-T3 and 7075-T6. NACA TN 3856.

Further studies on stainless-steel hot cracking, by P. P. Puzak and H. Rischall. U. S. Naval Research Laboratory, Nov 1956. 12p photos, graphs, tables. Order from OTS. 50 cents. PB 121569

Additional studies were made on types 347 and 304 stainless steels, with special attention directed towards comparing test results for a Type 347 heat (which was established previously to be most susceptible to hot cracking) with those for a standard Type 304 heat (which was not susceptible). Liquidus and solidus temperatures for all materials were obtained by thermal-analysis techniques. The hot ductility and strength measured in the temperature range immediately below the region of normal incipient melting were low only for those heats which exhibited base-metal hot cracking. Microscopic examination of these specimens revealed the presence of grain-boundary liquation areas. Thus, the test data provide further evidence supporting the hypothesis that grain-boundary liquation is responsible for base-metal hot cracking of stainless steels. NRL R 4861.

General summary of the physical metallurgy of titanium alloys, by R. I. Jaffe. Battelle Memorial Institute. Titanium Metallurgical Laboratory, Columbus, Ohio. Oct 1955. 83p photos, graphs, tables. Order from OTS. \$2.25. PB 121603

This report is a short summary of the extensive literature on titanium-alloy physical metallurgy. It covers alloying elements and alloy types, and describes the general effects of interstitials. The mechanical properties of annealed alloys and the dependence of properties on structure are described. The second half of the report is devoted to heat treatment and thermal stability of alpha-beta and beta alloys. Finally, a short section on future trends in alloy development is presented. BMI TML 19.

Magnetic and structural properties of precipitating ferromagnetic systems. Annual summary report covering the period Sep 1, 1954-Aug 31, 1955 under Contract no. Nonr-1556(00), by Ami E. Berkowitz. Franklin Institute. Laboratories for Research and Development, Philadelphia, Pa. Aug 1955, 8p. Order from LC. Mi \$1.80, ph \$1.80. PB 123134

The purpose of this investigation is to clarify some of the relationships between various magnetic and structural properties of systems in which ferromagnetic precipitates appear. The experimental approach is to measure pertinent structural and magnetic properties of single crystal samples after different periods of aging in the two-phase field. The principal accomplishments during the past year have been the construction and calibration of the equipment for the magnetic measurement and thermal treatment of the samples, and the preparation of suitable crystal specimens of the Ni-Au alloys.

Pickling of steel castings, by C. W. Briggs. U. S. Naval Research Laboratory. Apr 1934. 66p photo, drawing, diagr, graphs, tables. Order from LC. Mi \$3.90, ph \$10.80. PB 120632

Unclassified.

1. Steel castings - Pickling - Tests 2. NRL M-1047.

Report of an investigation of the inert gas arc welding of aluminum using helium gas, by I. L. Stern and E. A. Fenton. U. S. Naval Shipyard, New York. Material Laboratory. Jan 1950. 35p photos, diagrs, fold, tables. Order from LC. Mi \$3, ph \$6.30. PB 122609

The comparative advantages of helium and argon gases for the inert gas arc welding of aluminum alloys with alternating current are described. Each gas appears to have individual characteristics which makes it preferable for a given application. The peculiarities of weld deposits on 61ST6 aluminum alloy using Al 43 filler metal are discussed and data relative to the characteristics of the weld deposits are presented. Laboratory project 5021-1, Progress report 5.

Research and development for the welding of titanium and titanium alloys. Final technical report under Contract no. DA-11-022-ORD-137 for the period Dec 10, 1951-Jan 31, 1953, by J. J. Chyle and Ivan Kutuchief. A. O. Smith Corporation, Milwaukee, Wis. Apr 1954. 79p photos, drawings, tables. Order from OTS. \$2. PB 111849

Welding tests were conducted on five types of titanium alloys containing chromium, iron, manganese, aluminum, and molybdenum, using filler metal in the form of strips removed from the parent plate material or wire of the same nominal composition as that of the parent alloy. The welding of the various alloys was performed with the inert-gas shielded tungsten-arc process, using helium as a shielding gas and a thoriated grade of tungsten electrodes in the welding torch. WAL R 401/89-76.

Selection of materials for high - temperature applications in airframes. Supplement to TML report 13, by S. A. Gordon and L. R. Jackson. Battelle Memorial Institute. Titanium Metallurgical Laboratory, Columbus, Ohio. Feb 1956. 30p diagrs, graphs, tables. Order from OTS. 75 cents. PB 121602

The Boeing Airplane Company conducted crippling tests on channel and angle sections on C-110M titanium alloys at temperatures up to 800F. Results of these tests are used to calculate the structural index, which is then compared with the theoretical structural index by using data from the compressive stress-strain curves of the materials involved. Reasonably fair agreement is obtained for the channels but rather poor agreement for the angles. Supplement to PB 111980. BMI TML R 13 Suppl.

Static strength of aluminum-alloy specimens containing fatigue cracks, by Arthur J. McEvily, Jr., Walter Ilg and Herbert F. Hardrath. U. S. National Advisory Committee for Aeronautics. Oct 1956. 54p photos, drawings, diags, graphs, tables. Order as NACA TN 3816 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123707

Seven configurations of specimens made of 2024 and 7075 aluminum-alloys in both rolled and extruded form were subjected to repeated axial loads until fatigue cracks of various lengths were formed. The specimens were then subjected to static tests to determine the residual static strength. Small cracks resulted in disproportionately large reductions of static strength, the reduction being greater for 7075 than for 2024 aluminum alloy. A simple method of analysis which predicts the observed results was developed and described. Supersedes RM L55D15a. NACA TN 3816.

Steel casting technique. Massachusetts Institute of Technology. Dept. of Metallurgy. Metal Processing Division. Foundry Section. Feb 1954. 40p photos, drawings, graphs, tables. Order from OTS. \$1. PB 111914

Apparatus has been developed with which it is possible to measure stress in a steel casting cooling under conditions of hindered contraction. Tearing stresses have been measured at temperatures ranging from 1700°F to 2500°F for plain carbon steels of various compositions. Effects of deoxidation practice, and manganese, silicon, carbon, sulphur and phosphorus contents were studied. Metallographic studies were made of different types of hot tears and non-metallic inclusions. It was found all cast steels studied could be made to tear (by hindered contraction) near the solids under very low stresses. Differences in tearing behavior due to composition or deoxidation practice were manifested only at temperatures below the solidus. Photos will not reproduce well. Project no. 6794. WAL R 311/23-38.

Steel castings for aircraft, by Harold F. Bishop. U. S. Naval Research Laboratory. Jun 1944. 14p photos. Order from LC. Mi \$2.40, ph \$3.30. PB 123322

1. Steel castings - Use in airplanes 2. Steel castings - Tests 3. NRL M 2310.

Study of technique for refinement of cast structures in aluminum. Final report under Contract no. DA-19-020-ORD-2004. Massachusetts Institute of Technology. Dept. of Metallurgy. Metal Processing Division. n.d. 126p photos, diags, graphs, tables. Order from LC. Mi \$6.30, ph \$19.80. PB 123907

The effects of grain size, and of melting and pouring atmospheres on mechanical properties of cast aluminum-4.5% copper alloy, were investigated. Work has also dealt with (1) directionality of mechanical properties of cast aluminum-copper alloy, (2) a theoretical analysis of causes of porosity in aluminum-copper alloy, (3) preliminary work on the effect of very low gas content on mechanical properties of aluminum-copper alloys produced under vacuum, (4) effect of alloy additions on increasing the yield strength of aluminum-copper alloys, and (5) practical foundry procedures which produce castings having mechanical properties completely equivalent to corresponding wrought material.

Survey of low-alloy aircraft steels heat treated to high strength levels. Part 3: Failure cases, by George Sachs. Syracuse University, Syracuse, N. Y. Jul 1954. 80p photos, drawings, graphs. Order from OTS. \$2. PB 121667

Part III presents descriptions of actual failures encountered in high-strength steel aircraft parts and of the experimentation performed for the purpose of analyzing the conditions of failure and determining the sources of it. AD 43818. For Parts 2, 4-6 see PB 123090, 121504-121506. AF WADC TR 53-254, Part 3. Contract AF 33(616)-392.

Use of blind heads in the manufacture of steel castings, by H. F. Taylor and E. A. Rominski. U. S. Naval Research Laboratory. Sep 1941. 36p photos, drawings, diags, graphs. Order from LC. Mi \$3, ph \$6.30. PB 122749

Studies are presented showing the practical value of "blind risers" as a worth while substitute for open risers. The theoretical aspects of the process are discussed in the light of present knowledge supplemented with experimental evidence obtained at Naval Research Laboratory and photographs of actual castings made in commercial shops. Operating foundry principles, precautions, advantages and disadvantages are discussed in detail. NRL M-1783.

Vibratory compacting of metal and ceramic powders. Part 3, by W. C. Bell and J. R. Hart. North Carolina State College. Dept. of Engineering Research, Raleigh, N. C. Mar 1956. 54p drawings, tables. Order from OTS. \$1.50. PB 121255

This investigation has been primarily concerned with the influence of particle size distribution on the sintering characteristics and physical properties of alumina, 15Ni-85TiC and 30Cr-70Al₂O₃ compositions from powders. Results are reported for a wide number of particle size distributions and sintering treatments. The use of vibratory and impact forces in the forming of small, intricate shapes is also reported. Project 7350, Task no. 70634. For Part 1 see PB 111435. Summarizes research from 2 Jul 1954 to 2 Jul 1955 under Contract AF 33(616)-73. AF WADC TR 53-193, Part 3.

METEOROLOGY AND CLIMATOLOGY

Aeronomic problem of helium, by M. Nicolet.

Pennsylvania State University. Ionosphere Research Laboratory, University Park, Pa. May 1956. 38p graphs, tables. Order from LC. M1 \$3, ph \$6.30. PB 123462

The escape of helium from the terrestrial atmosphere has been investigated, taking account of the simultaneous presence in the atmosphere of the isotopes helium-3 and helium-4. AF CRC TN 56-462. PSC IRL SR 86. Contract AF 19(604)-1304.

Drag coefficients for droplets and solid spheres in clouds accelerating in airstreams, by Robert D. Ingebo.

U. S. National Advisory Committee for Aeronautics. Sep 1956. 31p photos, drawing, graphs, tables. Order as NACA TN 3762 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123520

Linear accelerations for droplets and solid spheres (in clouds) in airstreams were determined from sphere diameter and velocity data obtained with a high-speed camera developed at the NACA Lewis laboratory. An empirical expression correlated drag coefficient with Reynolds number for the case of accelerating droplets (iso-octane, water, and trichloroethylene) and solid spheres (magnesium and calcium silicide). This expression was derived for a Reynolds number range of 6 to 400, which included a range of airstream pressure, temperature, and velocity conditions. Trajectory equations for spheres were also derived. NACA TN 3762.

Environmental aspects of ice fog, based on field studies at Eielson Air Force Base, Alaska, by

Gordon B. Bell, Jr. Stanford Research Institute, Stanford, Calif. Mar 1955. 80p photos, maps (part fold), graphs, tables. Order from LC. M1 \$4.50, ph \$12.30. PB 123906

Scientific report no. VII under Contract no. AF 19-(122)-634.

1. Fog, Ice - Measurements - Alaska 2. Meteorology - Observations - Alaska 3. Atmosphere - Temperature - Measurement - Alaska 4. Humidity - Measurements - Alaska 5. SRI Proj CU-473, Report no. 20.

Final report under Contract no. AF 19(604)-758.

Wentworth Institute, Boston, Mass. Jun 1956. 20p photos. Order from LC. M1 \$2.40, ph \$3.30. PB 123072

Services, materials, and facilities were provided in connection with the mechanical and electronic assembly of experimental instrumentation and its adaptation to balloon systems for use in the balloon

launching program being conducted by the Atmospheric Devices Laboratory of the Air Force Cambridge Research Center. Balloon instrumentation systems, including the gondolas and their experimental apparatus, as well as supporting equipment, power supplies, and associated cabling, were assembled and modified in the fulfillment of the purpose and scope of this contract. AF CRC TR 56-277.

Investigation of vertical-wind-shear intensities from balloon soundings for application to airplane- and missile-response problems, by H. B. Tolefson. U. S. National Advisory Committee for Aeronautics. Jul 1956. 33p diagr, graphs, tables. Order as NACA TN 3732 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123688

The daily upper-wind soundings taken at one station for a one-year period are analyzed to obtain data on the vertical-wind-shear intensities and frequencies for use in airplane- and missile-response studies. The results indicated maximum shear intensities of about 100 meters per second per kilometer occurring at altitudes from 10 to 15 kilometers during the winter and spring months. The application of these results to the calculation of the normal response of a missile in vertical flight is also considered briefly. NACA TN 3732.

Meteorological study of radar angels, by Vernon G. Plank.

U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Geophysics Research Directorate, Bedford, Mass. Jul 1956. 131p diagrs, maps, graphs, tables. Order from OTS. \$3.50. PB 121774

Under certain circumstances, pulsed radio and radar waves are reflected by invisible sources in the lower atmosphere. Such reflections are commonly called angels. This paper differentiates three general angel types and attempts to establish the meteorological conditions favoring a particular type of angel activity. Sources that might account for the echoes are investigated. Likely angel sources are described and their importance assessed. Of these sources, mineral and organic particles are found unimportant; insects and birds are found capable of explaining substantial angel activity, but not all activity; and refractive inhomogeneity sources are found most capable of fulfilling observational requirements. Previous work in the angel field is reviewed in the first Appendix. AD 98752. Modification of thesis - Massachusetts Institute of Technology. AF GRD P 52. AF CRC TR 56-211.

Origin of atmospheric argon, by M. Nicolet.

Pennsylvania State University. Ionosphere Research Laboratory, University Park, Pa. Jun 1956. 30p graphs, tables. Order from LC. M1 \$2.70, ph \$4.80. PB 123463

From analysis of geochemical data it is learned that radiogenic argon has been introduced into the terrestrial atmosphere. A40 was one of the first elements present in the atmosphere and, ever since the earth's formation, has acted as a screen by preventing solar X rays and ultraviolet radiation, at wavelengths less than 800A, from penetrating to the surface of the earth. AF CRC TN 56-469. PSC IRL SR 87. Contract AF 19(604)-1304.

Precipitation mechanisms in convective clouds, by T. W. R. East. McGill University. MacDonald Physics Laboratory. "Stormy Weather" Research Group. Jan 1956. 77p graphs. Order from LC. Mi \$4.50, ph \$12.30. PB 122362

The problem under study is the development of rain by some process which is possible in warm cumulus clouds, where the Bergeron process is impossible. The present work was concentrated on the processes occurring in the intermediate stage, in which the radii of the droplets increase from values in the neighbourhood of 10 microns to a broad range extending through 50 microns. Appendix 1. Computation of growth of drops. AF CRC TN 56-255. MW-22. Contract AF 19(122)-217.

Precipitation static problem. U. S. Naval Research Laboratory. Order separate parts described below from LC, giving PB number of each part ordered.

Second partial report, by Wayne C. Hall and Ross Gunn. Mar 1943. 38p photos, drawings, diagr, graphs, tables. Mi \$3, ph \$6.30. PB 120697

Unclassified 15 Dec 1953. For 1st and 3rd reports see PB 87206 and PB 120740.
1. Precipitation static - Reduction - Research
2. Dischargers, Static 3. NRL O-2025.

Fourth partial report being a progress report on Minneapolis investigations, by Ross Gunn. Apr 1944. 31p graphs (1 fold), table. Mi \$3, ph \$6.30. PB 120711

Unclassified 15 Dec 1953.
1. Precipitation static - Reduction - Research
2. NRL O-2271.

Relationships between weather and indicators of vertical motion, by Frederick Sanders. Massachusetts Institute of Technology. Dept. of Meteorology, Cambridge, Mass. Sep 1955. 22p diagr, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 122367

The probability of occurrence of cloudiness or precipitation is related to concurrent values of quanti-

ties which can be measured from charts of the atmospheric circulation pattern near the ground and in the middle troposphere. These quantities are considered to be indicative of the large-scale vertical motion in the troposphere. Two such quantities, the thickness advection and a quantity derived by Sutcliffe, are shown to be related to the probability of occurrence of cloud and precipitation in the expected sense. It is found that values of the Sutcliffe expression are highly correlated with vertical velocities computed from the thermotropic numerical prediction model, thus offering the forecaster an opportunity of assessing vertical motion from appropriate prognostic charts regardless of the method of their preparation. Scientific report no. 1 under Contract no. AF 19(604)-1305. AF CRC TN 55-866.

Signal Corps - Air Weather Service high-altitude radiosonde flights, Aug 1954, by M. Lowenthal and A. Arnold. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Nov 1955. 66p graphs, tables. Order from LC. Mi \$3.90, ph \$10.80. PB 122999

Dept. of the Army project no. 3-17-02-001. Signal Corps project no. 1052A. Unclassified 6 Jun 1956.
1. Winds, Stratospheric - Velocity - Measurements
2. Atmosphere, Upper - Data collection
3. Stratosphere - Temperature - Measurements
4. Radiosondes - Meteorological records
5. SCEL TM M 1711.

Simple electrical analog for the solution of the Ekman wind drift problem with the coefficient of eddy viscosity varying arbitrarily with depth, by K. G. Wilson, A. B. Arons and Henry Stommel. Woods Hole Oceanographic Institution, Woods Hole, Mass. Sep 1955. 21p diagrs, graphs. Order from LC. Mi \$2.70, ph \$4.80. PB 123074

A simple electrical analog using a "transmission line" consisting of discrete resistive-capacitive sections is set up to solve the Ekman wind drift equations for situations in which the vertical coefficient of eddy viscosity is a function of depth. The analog results are shown to be in good agreement with computed results in cases where computations were feasible. Unpublished manuscript. AD 71633. WHOI Ref 55-52. Contract Nonr-769-(00), NR 083-069.

Static locating system, by H. B. Maris. U. S. Naval Research Laboratory. Apr 1935. 20p photos, table. Order from LC. Mi \$2.40, ph \$3.30. PB 122800

1. Recorders, Static
2. Storms - Detection
3. Radio - Static
4. Atmosphere - Disturbances
5. NRL R-1146.

Study of the morphology of magnetic storms: Geomagnetic time. Scientific report no. 2 covering the period Sep 1-Nov 30, 1955 under Contract no.

AF 19(604)-1048, by Sydney Chapman and Masahisa Sugiura. Alaska. University. Geophysical Institute. Jan 1956. 18p graphs, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 122368

The relation between mean (or apparent) geomagnetic time and mean (or apparent) local time is shown analytically. A convenient graphical method of determining the difference between the two time-systems to 0.1 minute is given. AF CRC TN 56-263. Contract AF 19(604)-1048.

Velocity departures from geostrophic flow as measured from constant level balloon data, by Keith C. Giles and Roy E. Peterson. General Mills, Inc. Engineering Research and Development Dept., Minneapolis, Minn. Feb 1956. 24p photos, map, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 122216

Constant level balloon data are used to compute 89 smoothed hourly values of velocity, and a corresponding number of values of the balloon geostrophic velocity are obtained by considering the accelerations. These values are then compared with geostrophic winds computed from constant pressure maps. It is found that the direction of the balloon velocity approximates that of the geostrophic velocity very closely (with a probable error of $\pm 7.2^\circ$) and that the magnitude of the balloon velocity can be used by a regression equation to estimate the geostrophic speed. Scientific report no. 1 under Contract AF 19(604)-1180. AF CRC TN 56-269.

MINERALS AND MINERAL PRODUCTS

Piezobirefringence in diamond, by Edward Poin-dexter. Michigan. University, Ann Arbor, Mich. Aug 1955. 81p photos, diagr, graphs, tables. Order from LC. Mi \$4.80, ph \$13.80. PB 122984

The present study is in several ways the most extensive study of crystal piezobirefringence ever undertaken. An elaborate study of the sources of error in measurement was made. Improved techniques of observation were devised, which produced more consistent and accurate results. Previous piezobirefringence studies, even those on diamond, were limited to relatively low stresses. In the present work, stresses were carried to more than 30 times those employed in previous studies. No systematic attempt had previously been made to discover the dependence of the piezobirefringence effect on the wave-length of the light; the present study includes a complete survey of the range 4400 Å to 7700 Å.

Temperature gradients in molded shapes of Corning infrared transmitting glass, by Wilton R. Holm. U. S. Naval Research Laboratory. Oct 1943.

15p. Order from LC. Mi \$2.40, ph \$3.30. PB 120698

The temperatures of various cylinders, Fresnel lenses and globes of Corning infra-red transmitting glasses enclosing tungsten lamps of 50 to 1000 watts have been measured at a number of points on the inside and outside surfaces of the glass. Globes of 2566 glass of low thermal expansion coefficient were found to be more resistant to thermal shock than other glasses of similar spectral transmission characteristics, but it cannot be concluded that this glass could be used in exposed positions without being protected from sudden wetting. Unclassified 15 Dec 1953. NRL H 2180.

ORDNANCE AND ACCESSORIES

Dynamic system studies. Chicago. University. Advisory Board on Simulation, Chicago, Ill. Contract AF 33(038)-15068, Supplements 2 and 11. Project 7060. Order separate parts described below from OTS, giving PB number of each part ordered.

Part 1: Conclusions and recommendations. Sep 1956. 40p. \$1. PB 121596

This report, in 16 parts, represents the culmination of the assignment to determine the proper mission, equipmentation, operating procedures, and personnel for an engineering facility in the field of air weapon systems dynamics. This volume sets forth the fundamental conclusions and recommendations reached or agreed upon by the members of the Board's advisory committee, and resulting from a three-year study program. AD 97260. AF WADC TR 54-250, Part 1.

Part 2: Design of a facility, by B. E. Howard. Sep 1956. 35p diagr. \$1. PB 121597

The problem of designing a facility may be conveniently subdivided into five phases: The specific tasks of determining its mission, staff, method of operation, and equipment requirements. The mission of this facility is to supply information in the field of air weapon system dynamics. To solve all the problems arising requires a staff of 60 professional persons in three branches: task teams, equipment operation, and research services. Equipment required includes a dynamic system synthesizer, general analog computers, flight tables, and load, guidance and pilot simulators. The method of operation should follow careful scientific procedures in detailed problems, and integrate with other related facilities in at least eight phases of system development. AD 97264. AF WADC TR 54-250, Part 2.

Part 4: Technical staff requirements, by William R. Allen and Mary C. Weiss. Sep 1956.

A system dynamics laboratory requires a diversity of specialized personnel to accomplish its tasks. This technical staff can be organized conveniently into three branches: (1) System Analysis Branch, (2) Simulation Equipment Branch, (3) Technical Services Branch. The System Analysis Branch has responsibility for formulating and performing studies connected with aerial weapons systems. The Simulation Equipment Branch is responsible for the operation, maintenance, and design of the simulation equipment used in the studies. The Technical Services Branch furnishes information and advice to the system engineering team on such things as component response aerodynamics, thermodynamics, structures, military requirements, statistical evaluation of data, programming of digital check problems, and the like. AD 97312. AF WADC TR 54-250, Part 4.

Part 7: Digital computers, by Roger H. Farrell, Sep 1956. 130p tables. \$3.25. PB 121598

Earlier studies indicated that present day digital computers are not capable of real time computation required in physical simulation. However, mathematical simulation studies may be planned around the use of digital or analog computers. In the latter case digital computation can be used in problem preparation for and placement on an analog computer, and provides the only reliable method of checking analog accuracy in early stages of design work. To aid in estimating computing time and code complexity, a practical problem, which had been solved previously, was coded for OARAC. AD 97269. AF WADC TR 54-250, Part 7.

Part 13: Error studies, by Fred B. Wright, Jr. Sep 1956. 78p diagrs, tables. \$2. PB 121577

As a result of the studies performed by ABS, it is concluded that for linear systems with constant coefficients the methods of Winson greatly extended those of Murray and Miller in making an error analysis of a problem. In nonlinear systems, the Murray-Miller theory is the only one available, and the auxiliary computer method is the most reasonable one for utilizing this theory. Interpretation of machine solutions is not only a matter of numerical information. The principal problems are those of stability and linearization. Present error theory is in such a state that the modal behavior of solutions can be determined. Linear components being reasonably well understood, the pressing need is for information concerning the effect of nonlinear components on stability. AD 97266. AF WADC TR 54-250, Part 13.

Part 14: Error analysis for differential analyzers, by K. S. Miller and F. J. Murray. 97p diagr. \$2.50. PB 121706

An analog computer does not realize exactly the equations whose solution is desired. Rather

it realizes a different system whose solutions are to be used as approximations to the solutions of the first system. Since, in general, the new system will be of higher order (the "λ error" effect), novel methods are developed to justify the assumptions made concerning the solutions of the two systems and to give a theoretical basis for stability analysis of machine setup. The basic theory also includes the "linearization" process and the treatment of inaccuracies and perturbations (δ and ε errors). AD 97315. Prepared for publication by E. R. Spangler from research under Contract ONR 266-06. AF WADC TR 54-250, Part 14.

Part 16: Aerodynamic studies, by M. Saarlus and M. Z. Krzywoblocki. Sep 1956. 54p diagrs, graphs. \$1.50. PB 121651

The trajectory of an air vehicle is determined by Newton's laws. Aerodynamic forces are composed of body forces (gravity and thrust) and the surface forces (air reactions) which depend on (1) kinematics, (2) geometry, and (3) properties of the medium. No general expressions for the forces are available. General functional relations and the influence of the independent variables on the force and moment components are discussed. Expressions used in simulation are based on Taylor series and test measurements. Present efforts are directed toward the electronic solution of the differential equations giving rise to the forces. The goal is a mechanization of the appropriate equations of fluid motion, continuity, energy and state such as to provide continuous D. C. voltages representing the force and moment components, without the necessity of having exact explicit expressions for them. Modern trends in fluid dynamics relevant to this goal are discussed. AD 97261. AF WADC TR 54-250, Part 16.

Effect of inclusions upon the ballistic performance of 1½ - 2½ inch armor plate, by I. R. Kfamer and J. H. Goodyear. U. S. Naval Research Laboratory. Sep 1943. 18p photos, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120700

Unclassified 26 Sep 1955.

1. Armor plate - Ballistic tests - Effects of inclusions 2. NRL M-2159.

Effect of yaw upon penetration; the effect upon bullets of penetrating very thin duralumin sheets; the use of shielding structures in the form of gratings. Fifth partial report on light armor, by George R. Irwin and R. Alden Webster. U. S. Naval Research Laboratory. Jun 1939. 27p graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 122806

Unclassified 15 Dec 1953.

1. Ballistics, Exterior - Yaw 2. Armor, Aircraft - Tests 3. Projectiles - Penetration - Effect of yaw

4. Penetration - Armor 5. Duralumin - Penetrability tests 6. Ammunition, Small arms - Firing tests 7. NRL O 1540.

Location of armor for pilot protection, by G. R. Irwin. U. S. Naval Research Laboratory. Jan 1943. 10p. Order from LC. Mi \$1.80, ph \$1.80. PB 120684

Unclassified 15 Dec 1953. Plates 1 and 2 listed in Table of contents not included in report. Contents: Includes an addendum: - Study of possible concussion injury from a bullet impact on protective airplane armor. Report from Naval Medical Center, Nov. 13, 1942. (Project X-90, General 10).
1. Armor, Aircraft - Tests 2. Pilots, Air - Protective equipment 3. Seats, Pilot - Armored 4. Brain - Wounds and injuries 5. NRL O 1980.

Operational tests on gun director Mark 50 mod O. First report, by J. J. Fleming and J. H. Wright. U. S. Naval Research Laboratory. Sep 1943. 112p photos, diags, graphs, tables. Order from LC. Mi \$6, ph \$18.30. PB 120701

Unclassified 7 July 1955.
1. Mark 50 (Gun director) 2. Fire control equipment - Tests 3. NRL R-2137.

Velocity loss of a 1/2 inch model projectile when it penetrates 1/32-inch cold-rolled sheet steel, by Gilbert D. Kinzer and Alice C. Jantzen. U. S. Naval Research Laboratory. Mar 1944. 14p photos, diagr, graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 120743

Unclassified 15 Dec 1953.
1. Projectiles - Velocities - Measurement 2. Ballistic pendulum 3. Penetration - Steel - Gun projectiles 4. NRL O-2263.

Wax modelling studies of high-speed impact, by Wallace G. Clay and William S. Partridge. Utah. University. Dept. of Electrical Engineering, Salt Lake City, Utah. Jun 1956. 35p photos, diags, graphs, tables. Order from LC. Mi \$3, ph \$6.30. PB 123452

An investigation of wax-to-wax impact is presented in an attempt to "model" high-speed impact of metal into metal. Wax is chosen as the modelling substance because of its comparatively low sonic velocity and the physical similarity of wax craters to craters formed at the impact of metal into metal. The penetration of the impacting pellet is found to vary linearly with the cube root of the pellet mass and the pellet velocity to velocities in excess of twice the sonic velocity in the wax target. AD 88977. AF OSR TR 5. AF OSR TN 56-257. Contract AF 18(600)-1217.

PHOTOGRAPHIC AND OPTICAL GOODS

Applications of ranking in film research and the statistical analysis of ranks, by Allen L. Edwards. Pennsylvania State University, University Park, Pa. Sep 1955. 29p tables. Order from LC. Mi \$2.70, ph \$4.80. PB 123751

Ratings by personnel trained to evaluate training films can be used to assess films where construction and administration of tests is not feasible. The present report by an authority in statistical methodology describes ways of making statistical analyses of ranks. It is primarily of interest to those interested in developing rating forms for making evaluations by judges. See also SDC TR 269-7-57 (PB 123750). Instructional film research program. SDC Project 20-E-4. SDC TR 269-7-59. Contract N6onr-269.

Evaluation of instructional films by a trained panel using a film analysis form, by L. P. Greenhill. Pennsylvania State University, University Park, Pa. Sep 1955. 70p tables. Order from LC. Mi \$3.90, ph \$10.80. PB 123750

A film analysis form was developed for use by trained film production personnel. A trainee film evaluation form was developed for evaluation by trainees while the film is in the final production stages. A high degree of correspondence was obtained between the prediction of the teaching effectiveness obtained with the two forms. Instructional film research program. SDC Human Engineering Project 20-E-4. SDC TR 269-7-57. Contract N6onr-269.

Luminous and spectral reflectance as well as colors of natural objects (albedo and color of terrain features), by Rudolf Penndorf. U. S. Air Force. Air Research and Development Command. Cambridge Research Center. Geophysics Research Directorate, Bedford, Mass. Feb 1956. 27p diags, graphs, tables. Order from OTS. 75 cents. PB 121775

The spectral reflectance of natural objects is taken from Krinov's measurements. Based on these data, the luminous reflectance (albedo) and the color parameters are computed for these objects. The results are compared with other published data. It is shown that most natural objects possess a dominant wavelength between 5700A and 5900A, i.e. in the greenish yellow part of the spectrum. Even for vegetative formations, as seen from a distance, the dominant wavelength is also in the greenish yellow spectral range. AD 98766. AF GRD P 44. AF CRC TR 56-203.

Relation of some measures of ability to measure of learning from sound motion pictures, by Robert Radlow. Pennsylvania State University, University Park, Pa. Sep 1955. 16p tables. Order from LC. Mi \$2.40, ph \$3.30. PB 123752

Instructional films should be prepared with the characteristics of the audience clearly defined.

Films may be of particular value for persons with certain mental abilities or deficiencies. This research was carried out to discover the relationship of various mental abilities to learning from films. Instructional film research program. SDC project 20-E-4. SDC TR 269-7-58. Contract N6-onr-269.

Study of the feasibility of local production of minimum cost sound motion pictures, by L. P. Greenhill. Pennsylvania State University, University Park, Pa. Jul 1955. 45p photo, diagrs, tables. Order from LC. Mi \$3.30, ph \$7.80. PB 123024

A series of successful films were made by unskilled enlisted men using a specially designed kit of equipment and manual to explain its use. A typical ten minute film was shot in less than one day, was available for use in two weeks, at a very low cost. The films included an audio-visual record of demonstration; record of an outstanding instructor; demonstration of small equipment not readily visible to a group of trainees; record of a demonstration on a heavy device; and a record of instruction. The films were completely successful for their purpose and at the time of the report were still in use. Instructional film research program. SDC project 20-E-4. SDC TR 269-7-48. Contract N6-onr-269.

PHYSICS

General

Analysis of laminar incompressible flow in semiporous channels, by Patrick L. Donoughe. U. S. National Advisory Committee for Aeronautics. Aug 1956. 25p drawings, graphs, tables. Order as NACA TN 3759 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123517

Perturbation solutions for laminar incompressible flow in semiporous and fully porous channels are compared. The perturbation parameter measures the amount of suction or blowing at the porous wall. The velocity profile and the wall friction parameter are more affected by suction or blowing for the semiporous channel than for the fully porous channel. For blowing through the wall, the pressure decreases in channel direction for both channels; with sufficiently high suction rates, the analysis showed that the pressure rises in flow direction for the fully porous channel. NACA TN 3759.

Calculation of axially symmetric cavities and jets, by P. R. Garabedian. Stanford University. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Sep 1955. 130p graphs, tables. Order from LC. Mi \$6.30, ph \$19.80. PB 123098

Several techniques are developed for the calculation of axially symmetric cavities and jets. An iterative scheme for the numerical solution of the free boundary problem is developed. SU AMSL TR 42. Contract Nonr-225(11), NR 041-086.

Computation with algebraic numbers, by Saul Gorn. U. S. Aberdeen Proving Ground. Ballistic Research Laboratories, Aberdeen, Md. Oct 1955. 79p diagrs, tables. Order from LC. Mi \$4.50, ph \$12.30. PB 122212

This report describes the computational procedure on EDVAC, and the research on algebraic numbers needed to design it, for an algorithm by Professor H. Cohn of Wayne University. The method employed is applicable to "regular" and cubic fields, and employs their uniquely determined structure constants. There are block flow charts of the computational procedure, which occupied almost one thousand words of internal storage. Dept. of the Army project 5B0306002. Ordnance research and development project TB 3-0007. APG BRL R 963.

Concerning the action of a finite group, by P. E. Conner. Princeton University. Institute for Advanced Study, Princeton, N. J. Mar 1956. 5p. Order from LC. Mi \$1.80, ph \$1.80. PB 122226

AD 86302. Project no. R-354-10-60.
1. Transformations (Mathematics) 2. Mathematical equations and solutions 3. Contract AF 18(600)-1109 (Supplemental Agreement No. 3 (55-782)).
4. AF OSR TN 56-144.

Condition of heat in a thin hemispherical shell, by K. Washizu and T. F. O'Brien. Massachusetts Institute of Technology. Aeroelastic and Structures Research Laboratory, Cambridge, Mass. Aug 1955. 36p graphs, tables. Order from LC. Mi \$3, ph \$6.30. PB 123130

In the present report, the transient temperature distribution is found for a thin hemispherical shell under an arbitrary axisymmetrical distribution of thermal inputs over the surface when the heat flow outward from the rim of the hemisphere is proportional to the temperature of the rim. This is one of the particular cases for which rigorous solutions can be obtained by making use of well known special functions. Since extensive tabulations of the necessary special functions are not usually available, the manner in which numerical solutions may be obtained from the limited tables is clearly outlined, and a numerical example is carried out. Contract N5-ori-07833, NR 064-259. MIT ASRL TR 25-19.

Conversion of inviscid normal-force coefficients in helium to equivalent coefficients in air for simple shapes at hypersonic speeds, by James N. Mueller. U. S. National Advisory Committee for Aeronautics. Oct 1956. 31p diagrs, graphs. Order as NACA TN 3807 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123706

A correlation factor applicable for converting inviscid aerodynamic normal-force coefficients of simple shapes in helium to equivalent coefficients in air is found by using calculations based on the shock-expansion method at Mach numbers of 12, 16, and 20. NACA TN 3807.

Elastic, plastic bending of a built-in circular plate under a uniformly distributed load, by Bekir Tekinalp. Brown University. Division of Applied Mathematics, Providence, R. I. May 1956. 15p diags, graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 123169

The paper contains an analysis of the bending moments and deflections of a uniformly loaded and built-in circular plate that is made of an incompressible elastic, plastic material obeying Tresca's yield condition and the associated flow rule. The analysis is simplified by assuming that any plate element is either entirely elastic or entirely plastic. This assumption is practically fulfilled for a sandwich plate; for a solid plate it represents a first approximation to the actual diagram of bending moment versus curvature. Dept. of the Army project 503-06-005. Ordnance project TB 3-0122. Unclassified. APG BRL TR 26. GDAM DA 798/26. Contract DA 19-020-ORD-798.

Exact and approximate treatments of the one-dimensional blast wave, by E. G. Harris. U. S. Naval Research Laboratory. Nov 1956. 15p graph, table. Order from OTS. 50 cents. PB 121562

A completely analytic solution is presented for a one-dimensional strong blast wave in a perfect γ -law gas. On the basis of qualitative information obtained from this exact solution, approximate expressions are derived for the dependence of the shock radius on time, total energy, and ambient density. These approximate expressions are applicable in any number of dimensions. The effects of ionization and dissociation on the properties of the blast wave are considered in a semi-quantitative manner. NRL R 4858.

Fluctuation dissipation theorem, by J. Weber. Maryland. University. College of Engineering. Glenn L. Martin Institute of Technology, College Park, Md. Aug 1955. 18p. Order from LC. Mi \$2.40, ph \$3.30. PB 123100

The fluctuation dissipation theorem (Nyquist formula) is shown to be exact and a number of generalizations of it are given, including a space time formulation which is useful in the quantum theory of fields. The more general theorems can be used to calculate expectation values of field operators, without use of the commutation relations. A well defined cut off procedure is given for calculating observable fluctuations in cases where the theorem gives infinite results. Contract Nonr-879(00).

General linear parabolic equation in two variables, by Robert H. Cameron. Minnesota. University, Minneapolis, Minn. Jan 1956. 5p. Order from LC. Mi \$1.80, ph \$1.80. PB 122229

It is shown how the general linear parabolic equation in two variables can be transformed into the generalized heat flow equation which has been previously studied by the author. Technical note 2 under Contract AF 18(600)-1144. Project R-354-10-71. AD 81059. AF OSR TN 56-67.

Limiting distributions in some occupancy problems, by Irving Weiss. Stanford University. Applied Mathematics and Statistics Laboratory, Stanford, Calif. Jul 1955. 36p. Order from LC. Mi \$3, ph \$6.30. PB 123045

The classical occupancy problem is concerned with the random distribution of a specified number of objects (r) in a given number of cells (N). Such problems arise in biology where the objects are bacteria randomly distributed on a ruled plate and in agriculture where the objects are airborne disease spores and the cells are plots of land bearing crops. The first part of this paper shows that if r, N tend to infinity in such a way that the expected proportion of unoccupied cells is constant, then a suitably chosen function of the number of unoccupied cells is asymptotically normally distributed. The second part shows, under different restrictions on the ratio of sample size to population, that in sampling without replacement the number of unselected elements has asymptotically a Poisson distribution. Technical report no. 28. SU AMSL TR 28. Contract N6onr-25140, NR 342-022.

Minimum principles of piecewise linear isotropic plasticity, by P. G. Hodge, Jr. Polytechnic Institute of Brooklyn. Dept. of Aeronautical Engineering and Applied Mechanics. Aug 1955. 34p diags. Order from LC. Mi \$3, ph \$6.30. PB 123226

A theory of plasticity is considered in which the yield function is a piecewise linear function of the stresses, the flow law is based on the plastic potential, and the strain-hardening is isotropic and linear. First, the flow law at a "corner" of the yield function is investigated in detail. Next, it is shown that the flow law at all points can be piecewise integrated to obtain some of the advantages of a deformation theory. Finally, two classical minimum principles of elasticity are extended to include certain cases of piecewise linear plasticity. PIB AL 298. Contract Nonr-267(00) NR 360-001.

Nonlinear voltaerra functional equations and linear parabolic differential systems, by Robert H. Cameron. Minnesota. University, Mimeoapolis, Minn. Sep 1955. 66p. Order from LC. Mi \$3.90, ph \$10.80. PB 122231

Theorems are obtained relating existence theorems (almost everywhere type) for solution of nonlinear Volterra functional equations, values of Wiener integrals, and minimality theorems for positive solutions of linear parabolic differential systems. An existence theorem for the latter systems is also obtained. Technical note 1 under Contract AF 18-(600)-1144. Project R-354-10-71. AF OSR TN 55-378.

Note on truncation and sufficient statistics, by Walter L. Smith. North Carolina State College. Institute of Statistics, Raleigh, N. C. Nov 1955. 11p. Order from LC. Mi \$2.40, ph \$3.30. PB 122403

Generalising earlier observations by Fisher and Hotelling, Tukey showed that if a family of distributions admits a set of sufficient statistics, then the family obtained by truncation to a fixed set, or by a fixed selection, also admits the same set of sufficient statistics. In this note Tukey's result is re-proved without assuming domination. It is shown that, under general conditions, if a sufficient statistic has one or more of the properties of completeness, bounded completeness, or minimality, before truncation, then it preserves such after truncation. The treatment is on the lines of the abstract discussion of sufficient statistics given by Halmos and Savage. AD 80547. Institute of Statistics mimeograph series, no. 140. CIT Report no. 17. Contract AF 18(600)-458. AF OSR TN 56-36.

On possible similarity solutions for three-dimensional incompressible laminar boundary layers. I. Similarity with respect to stationary rectangular coordinates, by Arthur G. Hansen and Howard Z. Herzog. U. S. National Advisory Committee for Aeronautics. Oct 1956. 30p drawing, table. Order as NACA TN 3768 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123700

Solutions of mainstream flow patterns for all possible incompressible laminar-boundary-layer flows having classical similarity with respect to rectangular-coordinate systems are derived. These solutions, which apply to a wide range of flows, are summarized in table form. NACA TN 3768.

On the eigenfunctions of many-particle systems in quantum mechanics, by Tosio Kato. New York University. Institute of Mathematical Sciences. Division of Electromagnetic Research. Apr 1956. 44p. Order from LC. Mi \$3.30, ph \$7.80. PB 123071

The continuity properties or singularities of the eigenfunctions of a many-particle system in non-relativistic quantum mechanics are investigated. It is shown that all eigenfunctions of such a many-particle system are continuous throughout the configuration space, and that the eigenfunctions have partial derivatives of first order (except at the Coulomb-type singular points of the potential) which

are bounded functions. The nature of the singularities of the eigenfunctions is described in greater detail. AF CRC TN 56-298. NYU RR CX-25. Contract AF 19(122) 463.

One dimensional step shock wave calculations for ideal gases, by Roger A. Strehlow. U. S. Aberdeen Proving Ground. Ballistic Research Laboratories, Aberdeen, Md. Apr 1956. 41p tables. Order from LC. Mi \$3.30, ph \$7.80. PB 124109

A method of calculating shock and reflected shock parameters for one dimensional shock tube flows is presented. It is based on Durham's method using the concept of mean specific heat. The procedure is adequate for the calculation of any ideal gas system where the average molecular weight of the gas does not change during passage of the shock or reflected shock. Tables of shock and reflected shock parameters are presented. A discussion of errors caused by calculation procedure and by changes in initial gas temperature is presented for a typical triatomic gas (N_2O). Dept. of the Army project 5B0302001. Ordnance Research and Development Project TB3-0110. APG BRL R 978.

Oscillation criteria for second-order linear differential equations, by Zeev Nehari. Carnegie Institute of Technology. Dept. of Mathematics, Pittsburgh, Pa. Jul 1956. 27p. Order from LC. Mi \$2.70, ph \$4.80. PB 123079

This paper is concerned with the differential equation $y'' + p(x)y = 0$, where $p(x)$ is a continuous non-negative function for $0 < x < \infty$. AD 88982. Technical report 12 under Contract AF 18(600) 1138. AF OSR TN 56-262.

Production of very high temperatures in the shock tube with an application to the study of spectral line broadening, by Eugene Bonner Turner. Michigan University. Engineering Research Institute, Ann Arbor, Mich. May 1956. 180p photos, drawing, diagrs, graphs, tables. Order from LC. Mi \$8.10, ph \$27.30. PB 122951

The work is mainly concerned with the shock waves at the end of the tube. A theory has been developed by which the interactions of the reflected shock with the interface can be explained. Included also is a development of the hydrodynamic equations for partially ionized gases along with methods for obtaining numerical solutions. The shock tube has been used as a spectrographic light source for the study of spectral line broadening under known conditions of temperature and density. Measurements have been made on the delay time for ionization behind the shock in xenon. A large part of the work has been the design and construction of the equipment. This included the shock tube itself, which was built expressly for the production of strong shocks, the revolving drum cameras, the vacuum and pressure systems, and much auxiliary apparatus. AD 86309. Thesis - University of Michigan. Contract AF 18(600)-983. AF OSR TN 56-150. MU ERI Proj 2189.

Quaternion invariants of the Minkowski space, by William W. Lemmon, Tulane University, Dept. of Mathematics, New Orleans, La. Aug 1955. 72p. Order from LC. Mi \$4.50, ph \$12.30. PB 122960

1. Minkowski space 2. Lorentz transformation theory 3. Invariance - Theory 4. Electrodynamics - Theory 5. Quantum mechanics 6. Contract N7-onr-434, T. O. 3.

Rapid analytical method for calculating the early transient temperature in a composite slab, by W. F. Campbell, National Research Council of Canada, Division of Mechanical Engineering, Gas Dynamics Section, Apr 1956. 77p diags, graphs, tables. Order from LC. Mi \$4.50, ph \$12.30. PB 122954

The one-dimensional heat conduction problem in a slab made up of several layers, each with uniform thermal properties, may be solved analytically for a great variety of boundary conditions, for short times, by a method analogous to electric transmission line theory. Graphs of functions derived from the error function are included to air numerical calculation. The method is also applicable to some steady state harmonic heat conduction problems. NRCC ME 32.

Refraction of plane shock waves at a density interface, by P. Chiarulli and W. E. Langlois, Brown University, Division of Applied Mathematics, Providence, R. I. Jul 1955. 22p diags, graph. Order from LC. Mi \$2.70, ph \$4.80. PB 123055

1. Shock waves - Refraction 2. Shock waves - Mathematical analysis 3. Contract 562(10), NR 064-406 4. GDAM TR 122 5. GDAM A 11-122.

Refraction operators and ray tracing through cones of constant index, by F. D. Bennett, U. S. Aberdeen Proving Ground, Ballistic Research Laboratories, Aberdeen, Md. Feb 1956. 22p diagr. Order from LC. Mi \$2.70, ph \$4.80. PB 122213

A dyadic representation for Snell's law of refraction is derived and its properties discussed. Alternate forms are given. The problem of ray tracing through a cone of constant refractive index is formally solved in terms of the refraction dyadic. The class of rays which only pierce the cone once is exhaustively discussed. Dept. of the Army project 5B03-03-001. Ordnance research and development project TB 3-0108. APG BRL M 968.

Sound radiation by an infinite cylindrical shell in an infinite horizontal layer, by H. H. Bleich and M. B. Friedman, Columbia University, Dept. of Civil Engineering and Engineering Mechanics, New York, N. Y. Sep 1955. 10p diags. Order from LC. Mi \$1.80, ph \$1.80. PB 123097

The present study is concerned with the field far from the cylinder, in the case where the acoustic medium is a layer bounded by a horizontal plane free surface on one side and a plane rigid and horizontal surface on the other. It is intended to obtain a method for evaluating the effect of structural changes to the cylindrical shell on the sound field. CU-2-55 ONR 266(27) CE. Contract Nonr-266(27), NR 385-411, Technical report no. 2.

Theoretical analysis of heat transfer in regions of separated flow, by Dean R. Chapman, U. S. National Advisory Committee for Aeronautics, Oct 1956. 47p diags, graphs, tables. Order as NACA TN 3792 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123703

An analysis is made of the rate of heat transfer to regions of separated flow in compressible streams. The physical mechanism postulated applies in principle to both laminar and turbulent flow, and to conditions where gas is injected into a separated region. Under the special condition of zero boundary-layer thickness at the separation point, the analysis yields relatively simple equations. Detailed calculations are presented for laminar separations in compressible flow with Prandtl numbers between 0.7 and 10.0. NACA TN 3792.

Time varying solutions for the problem of the motion of superimposed positive and negative fluids, by J. J. Gibbons and A. C. Aikin, Pennsylvania State University, Ionosphere Research Laboratory, University Park, Pa. May 1956. 81p. Order from LC. Mi \$4.80, ph \$13.80. PB 123450

The problem concerning the electrodynamics of ionized media is considered from the standpoint of the self-consistent motion of charged fluids. The equations of motion of the fluids are given in Lorentz invariant form and exact solutions are found for cases involving simple symmetries. AF CRC TN 56-486. PSC IRL SR 85. Contract AF 19(604)-1304.

Turbulent diffusion of momentum and heat from a smooth, plane boundary with zero pressure gradient, by A. C. Spengos, Colorado Agricultural and Mechanical College, Dept. of Civil Engineering, Fort Collins, Colo. Feb 1956. 59p drawings, graphs. Order from LC. Mi \$3.60, ph \$9.30. PB 122370

Results of an experimental investigation of the turbulent diffusion of momentum and heat from a smooth, plane boundary with zero pressure gradient are presented. The velocities have been measured with hot-wire anemometers and the Reynolds stress distribution in the boundary layer has been computed from the measurements of the crossed-hot-wire anemometers. The temperatures have been measured with thermocouples, and the transferred

heat has been determined from the electrical input to the heated boundary. Data on the pertinent variables have been collected along the centerline of the boundary and at four cross-sections of the boundary layer. Scientific report no. 1 under Contract no. AF 19(604)-421. CER no. 56ACS4. AF CRC TN 56-259.

Turbulent-heat-transfer measurements at a Mach number of 3.90, by Maurice J. Brevoort. U. S. National Advisory Committee for Aeronautics. Jul 1956. 15p drawing, graphs, table. Order as NACA TN 3734 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123689

An axially symmetric annular nozzle was used to obtain essentially flat-plate data on turbulent-heat-transfer coefficients and temperature-recovery factors. The test results of this paper are for a Mach number of 3.90 and for a Reynolds number range of 6.3×10^5 to 7.0×10^7 . The heat-transfer-coefficient results are slightly higher than theoretical results for a Mach number of 4.0. The recovery factors show a decrease with Reynolds number from approximately 0.89 at 6.3×10^5 to approximately 0.86 at 7.0×10^7 . NACA TN 3734.

Turbulent shear spectra and local isotropy in the low-speed boundary layer, by Virgil A. Sandborn and Willis H. Braun. U. S. National Advisory Committee for Aeronautics. Sep 1956. 34p diagr, graphs. Order as NACA TN 3761 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123519

From measurements of turbulent shear spectra together with previously reported longitudinal turbulent energy spectra, the concept of local isotropy in a low-speed boundary layer was examined. Results of these measurements and measurements of the time derivatives of turbulent velocities in the x- and y-directions for various frequency bands showed no evidence of local isotropy in the boundary layer. Several methods (based on isotropy) of evaluating the turbulent dissipation term failed to give consistent answers, further emphasizing a lack of local isotropy. NACA TN 3761.

PHYSIOLOGY

Handbook of respiratory physiology. Respiratory physiology in aviation, edited by Walter M. Boothby. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Sep 1954. 192p photos, diagrs, graphs, tables. Order from OTS. \$5. PB 121739

Project no. 21-2301-0003. Contents: Foreword: Training for the recognition of oxygen emergencies in high-altitude flying, by Charles A. Lindbergh. - Pulmonary function: Historical, by C. G. Douglas.

The pressure-volume diagram of the breathing mechanism, by Wallace O. Fenn. - The sampling of alveolar gas, by Hermann Rahn. - Volume and partial pressures of respiratory gases at altitude, by W. M. Boothby, W. R. Lovelace, II, O. O. Benson, Jr., and A. F. Strehler. - Respiratory functions of blood, by F. J. W. Roughton. - The chemical and nervous control of respiration, by Hohwü Christensen. - Use of oxygen equipment, by Loren D. Carlson. - Physiological aspects of pressure cabins and rapid decompression, by Ulrich C. Luft. - Respiratory features of acclimatization to altitude, by R. L. Riley, A. B. Otis, and C. S. Houston. - The significance of high concentrations of carbon dioxide in aviation medicine, by Clayton S. White. AF SAM Proj 21-2301-0003.

Physical environment of the flyer, by Heinz Haber. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. 1954. 185p photos, diagrs, graphs, tables. Order from OTS. \$4.75. PB 121025

Formerly issued as PB 114621.

1. Atmosphere - Physical properties 2. Atmosphere, Upper - Physical properties 3. Solar radiation - Absorption 4. Flying - Physiological effects.

Physiology of load-carrying, VIII: Simulated sled pulling on the treadmill, by Jan H. Vanderble. U. S. Army. Quartermaster Research and Development Command, Environmental Protection Division, Quartermaster Research and Development Center, Natick, Mass. Jan 1956. 13p tables. Order from LC. Mi \$2.40, ph \$3.30. PB 122896

A laboratory study was conducted on the feasibility of simulating sled-pulling by applying posterior drag through a harness to men walking on a treadmill. The effects of walking at two different speeds with posterior pull and the effects of light and heavy clothing were also studied. It was found that application of a posterior pull is an extremely convenient method for producing a considerable increase in metabolic rate during exercise and may, therefore, be useful in varying heat production when several men are walking on one treadmill. For Parts I and IX see PB 113460 and 122899. Earlier parts issued by U. S. Office of the Quartermaster General Research and Development Division, Environmental Protection Branch. QMC EP TR 21.

PRINTING, PUBLISHING

Determination of RC-120-B facsimile equipment characteristics, by A. D. Waff. U. S. Naval Research Laboratory. Jun 1946. 100p photos, drawings, diagr, graphs, tables. Order from LC. Mi \$5.40, ph \$15.30. PB 120778

1. Facsimile equipment 2. NRL R 2885.

PSYCHOLOGY

Comparison of principles training and specific training using several types of training devices, by Thomas Vris. Pennsylvania State University, State College, Pa. Jul 1955. 30p photos, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 122856

For teaching a complex motor skill it was found that: 1. A three dimensional model and the actual equipment were equally effective and each is better than a two-dimensional aid. 2. When the task must be performed on other related equipment it is better to teach principles rather than specifics. 3. Principles training and specifics training were equally effective methods of instruction when two dimensional aids were used. Based on a doctoral dissertation "Response generalization in perceptual-motor thinking". Instructional film research program. SDC project 20-D-2. SDC TR 269-7-102. Contract N6onr-269.

Films and group discussions as a means of training leaders, by Carl J. Lange, Carl H. Rittenhouse and Richard C. Atkinson. George Washington University. Human Resources Research Office, Washington, D. C. Mar 1956. 43p tables. Order from LC. Mi \$3.30, ph \$7.80. PB 122875

1. Leadership, Military - Research 2. Training films - Audience participation 3. Training films, Audio-visual - Evaluation 4. GWU HRRO TR 27.

Rate of information transfer with seven symbolic visual codes: Motor and verbal responses, by Earl A. Alluisi and Paul F. Muller, Jr. Ohio State University. Laboratory of Aviation Psychology and Ohio State University Research Foundation, Columbus, Ohio. May 1956. 31p drawing, graphs, tables. Order from OTS. \$1. PB 121719

This report summarizes the results of two studies designed to determine the relative merits of seven symbolic visual codes with respect to the speed and accuracy of motor (key-pressing) and verbal read out under both self-pacing and forced-pacing experimental conditions. Section 1 contains summary data on the information transmission rates attainable with the seven symbolic codes, as well as some general remarks concerning the concept of stimulus-response compatibility. Section 2 contains the detailed results of the two experiments primarily upon which are based the data of Section 1. Project 7192. AF WADC TR 56-226. Contract AF 33(616)-43.

Studies in abstractive generalization. Comparisons between various human age groups and monkeys on similar learning tasks, by George Gentry, Sylvan J. Kaplan and Ira Iscoe. U. S. Air Force. School of Aviation Medicine, Randolph Field, Tex.

Jan 1956. 10p photos, graphs, tables. Order from LC. Mi \$1.80, ph \$1.80. PB 123033

One hundred nineteen subjects, including groups of monkeys, human adults, and 4-, 6-, and 12-year-old children were tested on two types of learning tasks. One task could be solved only by use of rote memory; the other could be solved either by that method or by the application of the principle of common feature which was integral to the task. The results demonstrated that all human subjects were able to employ the principle of solution to effectively facilitate rate of learning. The monkeys did not learn one task more rapidly than the other. For earlier report see PB 117099. AF SAM R 55-83.

Transfer of training from food reward to shock avoidance, by Sylvan J. Kaplan and William H. Melching. U. S. Air Force. School of Aviation Medicine, Randolph Field, Tex. Feb 1956. 6p tables. Order from LC. Mi \$1.80, ph \$1.80. PB 123034

The experiment was designed to determine if monkeys could learn a series of paired discriminations more rapidly if they received training on the first pair of the series in a food reward apparatus prior to being trained on the entire series on a shock avoidance apparatus. Results support the position that such special "pre-training" facilitates learning in the shock avoidance device. This study not only provides information for optimum training procedures with monkeys on shock avoidance apparatus, but likewise introduces problems related to the subject of "transfer of training." AF SAM R 55-82.

STRUCTURAL ENGINEERING

Bending tests of ring-stiffened circular cylinders, by James P. Peterson. U. S. National Advisory Committee for Aeronautics, Jul 1956. 14p photos, drawings, graphs, table. Order as NACA TN 3735 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123690

Twenty-five ring-stiffened circular cylinders were loaded to failure in bending. The results are presented in the form of design curves which are applicable to cylinders with heavy rings that fail as a result of local buckling. NACA TN 3735.

Interaction of bearing and tensile loads on creep properties of joints, by E. G. Bodine, R. L. Carlson, and G. K. Manning. Battelle Memorial Institute. Oct 1956. 23p photo, diags, graphs. Order as NACA TN 3758 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123697

The interaction of bearing and tensile loads on the creep behavior of joints was studied. A specimen was designed for this study which possessed some of the general features of pin and rivet joint connections and an apparatus was constructed to apply both bearing and tensile loads to the joint model. Deformation measurements were made by use of a photogrid printed on the joint model. NACA TN 3758.

Slip damping of press-fit joints under linearly varying pressure, by J. H. Klumpp and L. E. Goodman. Minnesota. University, Minneapolis, Minn. Sep 1956. 47p photo, diagrs, graphs, table. Order from OTS. \$1.25. PB 121760

Energy of vibration may be dissipated by microscopic slip on interfaces where machine elements are joined in a press fit. This report develops expressions for the damping and elastic properties of joints under a linearly varying clamping pressure. The predictions of the theory are compared with the results of controlled experiments. Correlation is made between the linear pressure joint and a uniform pressure joint which has been previously investigated. AD 97337. Project 7360, Task 73604. Covers work from Jun 1955 to Jun 1956. AF WADC TR 56-291. Contract AF 33(616)-2803.

Study of size effect in sheet-stringer panels, by J. P. Doman and Edward B. Schwartz. U. S. National Advisory Committee for Aeronautics. Jul 1956. 25p photos, diagrs, tables. Order as NACA TN 3756 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123696

An investigation was conducted to determine whether there are significant size effects in compressive strength of large Z-stiffened sheet-stringer panels as compared with geometrically similar smaller models and thus to ascertain whether the prediction of the strength of large panels by model tests is reliable. The specimens studied were manufactured from 7075-T6 aluminum alloy and included four representative types of panel designs, with full- and one-quarter-scale panels of each type. Appendix B: Statistical analysis. NACA TN 3756.

Theoretical and experimental yield loads of slabs with reinforced cutouts, by P. G. Hodge, Jr. and Nicholas Perrone. Polytechnic Institute of Brooklyn. Dept. of Aeronautical Engineering and Applied Mechanics. Aug 1955. 35p diagrs, graphs, table. Order from LC. Mi \$3, ph \$6.30. PB 123102

A method of computing upper and lower bounds on the carrying capacity of a plane slab with a reinforced output is presented. The slab is subjected to a uniaxial load which is either uniform or applied by means of a perfectly rigid clamp. The results are applied to several examples and are found to agree quite well with experimental values. PIB AL 326. Contract Nonr-839(11), NR 064-416.

Torsional stiffness of thin-walled shells having reinforcing cores and rectangular, triangular, or diamond cross section, by Harvey G. McComb, Jr. U. S. National Advisory Committee for Aeronautics. Oct 1956. 35p diagrs, graphs. Order as NACA TN 3749 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123694

A theoretical investigation is presented of the torsional stiffness of thin-walled aerodynamic surfaces filled with cores which stabilize the skins. Rectangular, slender triangular, and slender diamond cross sections are considered. Results for the torsional stiffness constants are shown graphically. NACA TN 3749.

TEXTILES AND TEXTILE PRODUCTS

Graphical relationships in cloth geometry for plain, twill, and sateen weaves, by Louis Love. U. S. Army. Quartermaster Research and Development Command. Textile, Clothing and Footwear Division. Quartermaster Research and Development Center, Natick, Mass. Sep 1955. 23p diagrs, graphs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 122903

Weavability graphs are presented which show the maximum theoretical textures of cotton fabrics in terms of Beta, the ratio of filling-yarn diameter to warp-yarn diameter, and cover factors for plain, 3-harness, 4-harness, and 5-harness satin weave fabrics. The legend for each graph includes the maximum cover factor and cotton conversion constant for yarns other than cotton. The graphs contain curves for Beta values of 0.5 to 2.0 in increments of 0.1. The equations used to develop the curves are presented and discussed. Yarn displacement of various weave fabrics in terms of yarn spacing and crimp is also presented in graphic form along with equations which can be used for the determination of both warp and filling crimps necessary in a wide range of weaves to achieve desired values of wave height and thread spacing. QMC TSR 90.

TRANSPORTATION EQUIPMENT

Aeronautics

Aircraft

Experimental study of Moreland's theory of shimmy, by James L. Edman. Bendix Aviation Corporation. Bendix Products Division, South Bend, Ind. Jul 1956. 52p photos, drawing, diagrs, graphs. Order from OTS. \$1.50. PB 121714

Full scale stability tests of a nose gear mounted on a rotating inertia wheel, and corroborative air-plane tests are described. Experimental values of equivalent viscous damping coefficient are compared with values predicted by Moreland's theory for some sixty test configurations. The influence of caster angle is shown theoretically and experimentally. The phenomena of overdamping and critical taxi speed, which are associated with partial collapse of damper function, are described and demonstrated. Design procedure is discussed. AD 110497. Project 1369. AF WADC TR 56-197. Contract AF 33(616)-2202, Task 70505.

Instruments

Air-flow-direction pickup suitable for telemetering use on pilotless aircraft, by Wallace L. Kard. U. S. National Advisory Committee for Aeronautics. Oct 1956. 25p photos, diags, graphs. Order as NACA TN 3799 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123704

A vane-type air-flow-direction pickup is described which is suitable for telemetering angle-of-attack and angle-of-sideslip data from rocket-propelled pilotless aircraft models. Test results which are presented show that the device performs well under high accelerations and is stable throughout a Mach number range from subsonic to above a Mach number of 2.5. Supersedes RM L53K16. NACA TN 3799.

Air Force program for improved flight instrumentation, by Lawrence Wright. U. S. Air Force. Air Research and Development Command, Wright Air Development Center. Flight Control Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Nov 1956. 44p photos, drawings. Order from OTS. \$1.25. PB 121763

This report outlines the nature, characteristics, and urgency of the problems that have led to the formation of an Air Force program for improved flight instrumentation. It describes the guiding principles, philosophies and goals that have molded the program into five simultaneously conducted efforts. These are programs of: 1. Technique development and human factor investigation. 2. "Whole Panel" instrumentation. 3. Supporting mathematical and analytical investigations. 4. Evaluation. 5. Product improvement. The report describes in detail an entirely new approach to the instrumentation problem that has promise of overcoming many existing instrument limitations and information deficiencies, and by simplifying the visual communication link more efficiently integrating the pilot into the overall control loop. Factors that must be considered and action that must be taken to insure timely implementation of improved instrumentation are outlined in broad terms. AD 110556. Project 6190. AF WADC TR 56-582.

Dash-pot fluid for stabilized bombing approach equipment, by Herbert A. Pohl. U. S. Naval Research Laboratory. May 1943. 14p graphs (1 fold), table. Order from LC. Mi \$2.40, ph \$3.30. PB 120625

Unclassified 11 Apr 1947.

1. Damping devices 2. Bombing equipment - Damping fluids 3. Pilots, Automatic - Damping fluids 4. NRL P-2058.

Drawings on 10 LG. (10³) gyro unit. Massachusetts Institute of Technology. Dept. of Aeronautical Engineering. Instrumentation Laboratory, Cambridge, Mass. Mar 1955-Jun 1956. 99 drawings only. Order from LC. Mi \$8.10, ph \$27.30. PB 124306

Unclassified July 20, 1956. Some may not reproduce well.

1. Gyros - Design 2. Contract AF 33(616)-2039.

Non-existence of steady acoustic lag in airborne pressure measuring systems, by G. B. Newman. Canada. National Aeronautical Establishment. Jul 1955. 10p diags, graph. Order from LC. Mi \$1.80, ph \$1.80. PB 122125

This short report is a corrigendum to PB 114861. It is established experimentally that the, so-called, acoustic lag in the tubing of pressure measuring systems is non-existent for the simple case when the time rate of change of pressure is supported by a theoretical analysis. NAEC LR 100a.

Study of limited-type ice removal and prevention systems (mechanical phase), by H. C. Johnson and E. G. Johnson. Research, Inc., Hopkins, Minn. Apr 1955. 84p photos, drawings, graphs, tables. Order from OTS. \$2.25. PB 121678

The requirements of aircraft icing protective systems have been gradually modified with the advent of the supersonic aircraft. A preliminary study is conducted herein of various methods of insuring that such an aircraft can be maintained sufficiently free of ice accretions to enable it to complete its basic mission. The study is limited to exclude thermochemical devices since these are being investigated by another agency. Charts and graphs are presented describing impingement characteristics, heat requirements, etc., to aid in system development. In addition, a section is included describing various components which comprise an icing system. The systems are analyzed from three viewpoints: the type of ice removal or preventive action at the icing surface, the duration of the period over which the system functions, and the degree of surface protection afforded. Conclusions are drawn wherever possible as to the feasibility of the various systems presented. However, a large percentage require experimental evaluation because of their simplified nature. AF WADC TR 55-262. Contract AF 33(616)-2548.

Tests of type RR-150 aircraft frequency indicator, by M. H. Schrenk. U. S. Naval Research Laboratory. Apr 1934. 9p photos, table. Order from LC. Mi \$1.80, pb \$1.80. PB 120641

Date of test; 1 Jul 1933-1 Apr 1934.

1. Indicators, Frequency - Tests 2. NRL A 1046.

Use of perforated inlets for efficient supersonic diffusion, by John C. Evvard and John W. Blakey. U. S. National Advisory Committee for Aeronautics. Sep 1956. 35p photo, drawings, diags, graphs. Order as NACA TN 3767 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123523

Supersedes RM E51B10.

1. Ducts, Air - Supersonic 2. Diffusers, Supersonic - Flow patterns 3. NACA TN 3767.

Wind-tunnel calibration of a combined pitot-static tube and van-type flow-angularity indicator at Mach numbers of 1.61 and 2.01, by Archibald R. Sinclair and William D. Mace. U. S. National Advisory Committee for Aeronautics. Oct 1956. 11p photo, drawings, graphs. Order AS NACA TN 3808 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123639

1. Instruments, Aeronautical - Research 2. Instruments, Aeronautical - Calibration 3. Pitot-static tubes - Wind tunnel tests 4. NACA TN 3808.

Engines and Propellers

Design of brittle-material blade roots based on theory and rupture tests of plastic models, by Andre J. Meyer, Jr., Albert Kaufman, and William C. Caywood. U. S. National Advisory Committee for Aeronautics. Sep 1956. 46p photos, drawings, graphs, tables. Order as NACA TN 3773 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123524

Supersedes RM E53C12.

1. Cermets - Materials 2. Turbines - Blades - Materials 3. Turbines - Blades - Vibration 4. Turbines - Stresses 5. Jet engines, Turbo-jet - Blades - Materials 6. NACA TN 3773,

Further investigation of the feasibility of the freeze-casting method for forming full-size infiltrated titanium carbide turbine blades, by E. M. Grala. U. S. National Advisory Committee for Aeronautics. Oct 1956. 19p photos, diagr, tables. Order as NACA TN 3769 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123632

1. Cermets, Titanium carbide - Casting 2. Cermets, Titanium carbide - Sintering 3. Turbines -

Blades, Ceramic 4. Turbines - Blades - Materials 5. NACA TN 3769.

Impingement of droplets in 60° elbows with potential flow, by Paul T. Hacker, Paul G. Saper and Charles F. Kadow. U. S. National Advisory Committee for Aeronautics. Oct 1956. 54p diags, graphs, tables. Order as NACA TN 3770 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123701

Theoretical trajectories were determined for droplets in air flowing through 60° elbows. The elbows were established by selecting as walls of each elbow two streamlines of a two-dimensional flow field produced by a complex potential function. These elbows are suitable for use in aircraft air-inlet ducts. Droplet impingement data are presented in terms of dimensionless parameters along with empirical equations so that the results can be applied over a wide range of conditions and elbow sizes. A comparison of the 60° elbow with previous calculations for a comparable 90° elbow indicated that the impingement characteristics of the two elbows are very similar. See also PB 110979. NACA TN 3770.

Investigation of three-dimensional cascades, by James E. Ash. Armour Research Foundation, Chicago, Ill. May 1956. 122p photos, drawings, diags, graphs, tables. Order from OTS. \$3.25. PB 121458

The actual flow conditions within the passages of a 14-inch diameter, four-bladed impeller of a mixed flow compressor have been investigated and compared with design values, which were based on axial symmetry and incompressible, nonviscous flow. The blades were designed as bound-vortex sheets, having a zero tangential component of vorticity, i.e., the velocity distribution in meridional planes is not disturbed by the blades. Flow surveys at the impeller outlet from hub to shroud and from blade to blade were made with a three-dimensional, spherical pitot probe mounted on the impeller. Project 3066, Task 70155. AF WADC TR 55-158. Contract AF 33(616)-2369.

Progress in development of a rig for testing variable area exhaust nozzles for turbojet engines fitted with afterburners, by R. J. T. Bruce and J. C. Vrana. Canada. National Aeronautical Establishment. May 1955. 29p photos, diags. Order from LC. Mi \$2.70, pb \$4.80. PB 122124

A test rig, consisting of a preheat combustion chamber and a Derwent N.A.E. type afterburner has been developed for testing variable area exhaust nozzles. Air is supplied by a centrifugal compressor set. The air mass flow available is about 50 lb./sec., and in order to test at the correct pressure ratios a nozzle that was designed for use on an engine having a larger mass flow, a water-cooled plug has been used to reduce the nozzle exit area. A test was conducted on a variable area nozzle that was designed in the Engineering Section of the N.A.E. NAEC LR 135.

Radiographic tests on XF4U-1 engine mount, SAE 4340 steel, by Herman F. Kaiser and Robert H. Hafner. U. S. Naval Research Laboratory. Mar 1941. 13p table. Order from LC. Mi \$2.40, ph \$3.30. PB 123305

1. Engines, Aircraft - Mounts - Tests 2. NRL M 1711.

Theoretical estimate of the effects of compressibility on the performance of a helicopter rotor in various flight conditions, by Alfred Gessow and Almer D. Crim. U. S. National Advisory Committee for Aeronautics. Oct 1956. 33p graphs. Order as NACA TN 3798 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123634

1. Wings, Rotating - Theory 2. Wings, Rotating - Loads 3. Helicopters - Loads 4. NACA TN 3798.

Airports and Airways

Symposium on airfield pavements for jet aircraft. Proceedings, April 17 and 18, 1952. U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif. 1952? 197p photos, drawings, diagrs, graphs, tables. Order from OTS. \$3.50. PB 121738

Contents: Effect of jet aircraft upon pavements, by J. C. Luppens. - U. S. Air Force airfield pavement requirements, by Gayle L. Smith. - Corps of Engineers approach to pavements for jets, by Charles R. Foster. - Corps of Engineers approach to pavements for jets, by F. M. Mellinger and B. U. Duvall. - Airfield pavements for jet aircraft, by Roy Faville. - Airfield pavements for jet aircraft, early planning and exploratory tests, by L. A. Palmer. - Outline of initial BUDOCKS field studies on pavements for jet aircraft, by L. A. Palmer. - NAVCERELAB's program, by J. A. Bishop. - Future trends in aircraft design, by Fred A. Payne, Jr. - Effect of jet aircraft on Portland cement concrete airfield pavements, by A. A. Anderson. - Asphaltic pavements for jet-operational airfields, by John Griffith.

Aerodynamics

Analysis of airspeed, altitude and acceleration data obtained from a twin-engine transport airplane operated over a feeder-line route in the Rocky Mountains, by Martin R. Copp and Mary W. Fetner. U. S. National Advisory Committee for Aeronautics. Oct 1956. 23p graphs, tables, map. Order as NACA TN 3750 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123695

Time-history data of airspeed, altitude, and acceleration obtained with the NACA VGH recorder from a twin-engine airplane operated by a regional feeder

airline in the Rocky Mountains are evaluated to determine the magnitude and frequency of occurrence of gusts and gust accelerations and the operating airspeeds and altitudes. The results obtained are compared with the results previously obtained from a representative short-haul and long-haul operation. Analysis of tests reported in PB 123527. NACA TN 3750.

Analysis of viscous incompressible and compressible flows through axial flow turbomachines with infinitesimal and finite blade spacing, by T. Paul Torda. Illinois. University. Dept. of Aeronautical Engineering, Urbana, Ill. Mar 1956. 113p diagrs, graphs, tables. Order from OTS. \$3. PB 121248

An historical review of the various turbomachine theories is given. The Lorenz channel theory is developed for the analysis of viscous flows through turbomachines. Both the infinitesimally and the finitely spaced blades are considered. The fictitious force field of the analysis of infinitesimally spaced blades is eliminated and the complete Navier-Stokes equations are solved. Numerical illustrative examples are included. Thirty-three references are given. Project 3066, Task 70154. AF WADC TR 55-231. Contract AF 33(616)-52.

Analysis of wind-tunnel tests to a Mach number of 0.90 of a four-engine propeller-driven airplane configuration having a wing with 40° of sweepback and an aspect ratio of 10, by George G. Edwards, Donald A. Buell, Fred A. Demele and Fred B. Sutton. U. S. National Advisory Committee for Aeronautics. Sep 1956. 170p photos, diagrs, graphs, tables. Order as NACA TN 3790 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123528

Experimental data published in NACA TN 3789 (PB 123527) are analyzed. The effects of operating propellers on the longitudinal characteristics of the model are separated into various components to illustrate the origin, nature, and intensity of each. The analysis indicates certain configuration changes which would reduce the adverse effects of propellers on the longitudinal stability. Supersedes RM A54F14. For results of tests see PB 123527. NACA TN 3790.

Equations and procedures for numerically calculating the aerodynamic characteristics of lifting rotors, by Alfred Gessow. U. S. National Advisory Committee for Aeronautics. Oct 1956. 21p diagr, table. Order as NACA TN 3747 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123693

Equations and procedures are presented for numerically determining the aerodynamic characteristics of lifting rotors. The equations are general and can account for stall and compressibility effects, as well as variations in hub and blade configurations, that are normally omitted from conventional analytical

rotor treatments. The application of the method to solution by automatic computing machines is discussed. NACA TN 3747.

Factor affecting transonic leading-edge flow separation, by George P. Wood and Paul B. Gooderum. U. S. National Advisory Committee for Aeronautics. Oct 1956. 43p photos, diags, graphs. Order as NACA TN 3804 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123705

1. Flow, Mixed - Theory 2. Flow, Laminar - Theory 3. Flow, Turbulent - Theory 4. Shock waves - Boundary layer 5. Boundary layer - Interactions 6. Wings - Boundary layer - Measurement 7. NACA TN 3804.

Low-speed wake characteristics of two-dimensional cascade and isolated airfoil sections, by Seymour Lieblein and William H. Rudebush. U. S. National Advisory Committee for Aeronautics. Oct 1956. 49p diags, graphs, tables. Order as NACA TN 3771 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123702

1. Compressors, Axial - Flow 2. Cascades (Aerodynamics) - Theory 3. Wings - Wake 4. NACA TN 3771.

Review of the hypersonic research carried out at Princeton University from 1949-1955, by S. M. Bogdonoff. Princeton University. James Forrestal Research Center. Mar 1956. 18p photos, graph. Order from OTS. 50 cents. PB 121218

This report presents a summary of the results obtained between 1949 and 1954 on studies of flow at hypersonic speeds carried out by the Aeronautical Engineering Department of Princeton University. Theoretical and experimental studies were made concentrated on the effects of viscosity, and experimental results were obtained at Mach numbers from 11 to 15. Significant deviations between the theory based on conventional boundary layer approximation and the experiments were found. Although there was some indication that these results were due to leading edge effects, no concrete results were obtained as to the direct causes for the discrepancies. Some early studies on the effect of condensation are also presented. Project 1363, Task 70114. AF WADC TR 55-211. Contract AF 33(038)-250.

Stability derivatives of cones at supersonic speeds, by Murray Tobak and William R. Wehrend. U. S. National Advisory Committee for Aeronautics. Sep 1956. 43p diags, graphs. Order as NACA TN 3788 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123526

1. Damping derivatives - Stability 2. Bodies of revolution - Aerodynamics 3. Stability, Longitudinal - Dynamic tests 4. Flow, Supersonic - Theory 5. NACA TN 3788.

Tentative method for calculation of the sound field about a source over ground considering diffraction and scattering into shadow zones, by David C. Pridmore-Brown and Uno Ingard. Massachusetts Institute of Technology. Sep 1956. 33p diags, graphs. Order as NACA TN 3779 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123525

A semiempirical method is given for the calculation of the sound field about a source over ground considering the effects of vertical temperature and wind gradients as well as scattering of sound by turbulence into shadow zones. The diffracted field in a wind-created shadow zone is analyzed theoretically in the two-dimensional case and is shown to be similar to the results obtained for a temperature-created shadow field as given in NACA TN 3494 (PB 118738). NACA TN 3779.

Theoretical and analog studies of the effects of nonlinear stability derivatives on the longitudinal motions of an aircraft in response to step control deflections and to the influence of proportional automatic control, by Howard J. Curfman, Jr. U. S. National Advisory Committee for Aeronautics. 1955. 23p diags, graphs. Order as NACA 1241 from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 25 cents. PB 122491

1. Stability, Longitudinal - Theory 2. Controls, Automatic 3. Damping derivatives - Stability 4. NACA 1241.

Theoretical and experimental investigation of the lift and drag characteristics of hydrofoils at subcritical and supercritical speeds, by Kenneth L. Wadfin, Charles L. Shuford, Jr. and John R. McGehee. U. S. National Advisory Committee for Aeronautics. 1955. 24p photos, drawings, diag, graphs, table. Order as NACA 1232 from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 25 cents. PB 122486

Supersedes RM L52D23a and contains additional information from recently declassified NACA RM L51B13.

1. Hydrodynamics - Theory 2. Hydrofoils - Hydrodynamics 3. NACA 1232.

Theoretical and experimental investigation of the subsonic-flow fields beneath swept and unswept wings with tables of vortex-induced velocities, by William J. Alford, Jr. U. S. National Advisory Committee for Aeronautics. Aug 1956. 91p photo, diags, graphs, tables. Order as NACA TN 3738 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123505

1. Flow, Compressible - Theory
2. Flow, Incompressible - Theory
3. Wings, Swept - Downwash
4. Wings, Swept - Wake
5. Wings, Unswept - Downwash
6. Wings, Unswept - Wake
7. NACA TN 3738.

Theoretical pressure distributions for some slender wing-body combinations at zero lift, by Paul F. Byrd. U. S. National Advisory Committee for Aeronautics. Apr 1956. 39p diags, graphs. Order as NACA TN 3674 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 122514

1. Airplanes - Pressure distribution
2. Bodies of revolution - Theory
3. NACA TN 3674.

Theoretical wave drag of shrouded airfoils and bodies, by Paul F. Byrd. U. S. National Advisory Committee for Aeronautics. Jun 1956. 40p drawings, graphs, table. Order as NACA TN 3718 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123492

1. Flow, Supersonic - Theory
2. Bodies of revolution - Aerodynamics
3. Bodies of revolution - Drag
4. NACA TN 3718.

Thermal conditions associated with aircraft in flight, by Martin H. Bloom. Polytechnic Institute of Brooklyn. Dept. of Aeronautical Engineering and Applied Mechanics. Mar 1956. 76p graphs, tables. Order from OTS. \$2. PB 121257

An account is given of forced-convection aerodynamic heat transfer conditions for no-slip flow over impermeable surfaces. An important aim is to suggest to structural specialists methods and formulas for estimating boundary-condition data required for the determination of temperature distributions in bodies in flight. Laminar and turbulent conditions on flat and curved surfaces are considered. Explicit formulas are stated where possible. Project 1347, Task 70131. AF WADC TR 55-169. Contract AF 33(616)-116.

Three-dimensional transonic flow theory applied to slender wings and bodies, by Max A. Heaslet and John R. Spreiter. U. S. National Advisory Committee for Aeronautics. Jul 1956. 73p drawings, graphs. Order as NACA TN 3717 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123686

1. Bodies of revolution - Aerodynamics - Effect of Mach number
2. Flow, Mixed - Theory
3. Wings - Span load distribution
4. NACA TN 3717.

Transition-flight tests of a model of a low-wing transport vertical-take-off airplane with tilting wing and propellers, by Powell M. Lovell, Jr. and Lysie P. Parlett. U. S. National Advisory Committee for Aeronautics. Sep 1956.

30p photo, drawings, graphs, table. Order as NACA TN 3745 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 123510

1. Stability, Longitudinal - Dynamic tests
2. Controls, Lateral - Tests
3. Controls, Longitudinal - Operation - Tests
4. NACA TN 3745.

Wind-tunnel investigation of a number of total-pressure tubes at high angles of attack, subsonic, transonic, and supersonic speeds, by William Gracey. U. S. National Advisory Committee for Aeronautics. May 1956. 30p diags, graphs. Order as NACA TN 3641 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 122505

1. Tubes, Pressure - Tests
2. Instruments, Measuring - Pressure
3. NACA TN 3641.

Wind-tunnel investigation of the effect of clipping the tips of triangular wings of different thickness, camber, and aspect ratio, transonic bump method, by Horace F. Emerson. U. S. National Advisory Committee for Aeronautics. Jun 1956. 183p photo, diags, graphs, tables. Order as NACA TN 3671 from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C. PB 122511

1. Wings, Triangular - Aerodynamics
2. Wings, Triangular - Taper - Effects
3. Wings, Triangular - Wind tunnel tests
4. Mach number - Effect
5. Flow, Transonic
6. NACA TN 3671.

Rockets and Jet Propulsion

Near noise field of a jet engine exhaust. U. S. National Advisory Committee for Aeronautics. Order from National Advisory Committee for Aeronautics, 1512 "H" St., N. W., Washington 25, D. C., giving NACA TN number of each part ordered.

I: Sound pressures, by Walton L. Howes and Harold R. Mull. Oct 1956. 51p photos, drawing, graphs. NACA TN 3763. PB 123698

1. Flow, Jet mixing - Noise
2. Noise, Exhaust - Elimination
3. Nozzles, Jet - Noise reduction equipment
4. Jet engines, Turbo-jet - Noise - Measurement
5. NACA TN 3763.

II: Cross correlation of sound pressures, by Edmund E. Callaghan, Walton L. Howes, and Willard D. Coles. Sep 1956. 53p photos, diags, graphs, tables. NACA TN 3764. PB 123521

Appendix: Correlation computer, by Channing C. Conger and Donald F. Berg.

1. Noise, Exhaust
2. Sound - Speed - Effect of pressure
3. Jet engines, Turbo-jet - Noise - Measurement
4. Loads, Aerodynamic
5. NACA TN 3764.

Marine Transportation

Decontamination of landing craft at San Jose Island,

by G. H. Fielding, J. E. Johnson and J. A. Krynitsky. U. S. Naval Research Laboratory. Jul 1946. 131p photos, tables. Order from LC. Mi \$6.90, ph \$21.30. PB 123329

Unclassified 15 Dec 1953.

1. Decontamination - Equipment 2. Chemical warfare - Protection 3. Chemical warfare agents - Decontamination 4. NRL P 2914.

Hydrodynamic characteristics of modified rectangular flat plates having aspect ratios of 1.00,

0.25, and 0.125 and operating near a free water surface, by Kenneth L. Wadlin, John A. Ramsen and Victor L. Vaughan, Jr. U. S. National Advisory Committee for Aeronautics. 1955. 52p photos, drawings, diagrs, graphs. Order as NACA 1246 from Superintendent of Documents, Government Printing Office, Washington 25, D. C. 40 cents. PB 123539

Supersedes TN 3079 (PB 113704) and TN 3249 (PB 115511).

1. Wings - Boundary layer 2. Wings - Aspect ratio 3. Hydrofoils - Hydrodynamics 4. Hydrodynamics - Theory 5. NACA 1246 6. NACA TN 3079 Revised 7. NACA TN 3249 Revised.

Infrared radiation by the USS Breeman during tests at sea of SSD,

by J. A. Sanderson. U. S. Naval Research Laboratory. Nov 1944. 15p drawings, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 123272

Unclassified 15 Dec 1953.

1. Infrared radiation - Measurements 2. Meters, Radiation - Infrared - Tests 3. NRL H 2408.

Measurement of vibration amplitudes and frequencies on the USS Juneau CL-119,

by Chester B. Cunningham and E. E. Bissell. U. S. Naval Research Laboratory. Aug 1946. 9p photo, table. Order from LC. Mi \$1.80, ph \$1.80. PB 122764

Unclassified 15 Dec 1953.

1. Vibration - Measurements 2. Ships - Vibration 3. NRL V-2961.

Modification of JM-1 sono buoy equipment for use in torpedo timing,

by John R. Kauke. U. S. Naval Research Laboratory. Aug 1945. 11p diagrs, graphs. Order from LC. Mi \$2.40, ph \$3.30. PB 122650

1. Torpedoes - Timing equipment 2. Buoys, Radio-sonic - Equipment 3. NRL R 2551.

Photoelastic investigation of stresses in the main deck plating in way of uptake openings,

by H. B. Maris. U. S. Naval Research Laboratory. Apr 1939. 16p photos, diagrs. Order from LC. Mi \$2.40, ph \$3.30. PB 123251

Date of tests, May 1938 - Jan 1939.

1. Deck openings - Stresses 2. NRL H 1526.

Reflection and transmission of ultrasonic waves by a solid plate in water and their effect on ultrasonic model theory,

by Marvin S. Weinstein. U. S. Naval Ordnance Laboratory, White Oak, Md. Jan 1951. 21p diagrs, graphs, table. Order from LC. Mi \$2.70, ph \$4.80. PB 122431

Reflection and transmission of ultrasonic waves at a frequency of one megacycle by a solid aluminum plate immersed in water are studied experimentally and found to agree with theory. The results obtained are used to establish general requirements for modeling a submarine for ultrasonic test purposes. Recommendations for further study are set forth. Unclassified. NAVORD 1746.

Report of test on photo-elastic investigation of destroyer deck structure,

by H. B. Maris, and John A. Sanderson. U. S. Naval Research Laboratory. Dec 1935. 25p photos, diagrs, tables. Order from LC. Mi \$2.70, ph \$4.80. PB 120674

1. Deck openings - Stresses 2. NRL P 1227.

Report on photoelastic investigation of stresses surrounding reinforced rectangular deck openings,

by H. B. Maris. U. S. Naval Research Laboratory. Sep 1937. 45p photos, drawings, table. Order from LC. Mi \$3.30, ph \$7.80. PB 120436

1. Deck openings - Stresses 2. NRL H-1401.

Scale model tests of high-temperature, high pressure steam piping, CV9 class vessel,

by Eugene Pardue, Paul Symonds and Irwin Vigness. U. S. Naval Research Laboratory. Jul 1943. 40p photos, diagrs (part fold), tables. Order from LC. Mi \$3, ph \$6.30. PB 120572

Unclassified 15 Dec 1953.

1. Steam pipe lines - Models - Tests 2. NRL O 2108.

Sonar tanks and measuring equipments,

by John D. Wallace and E. W. McMorrow. U. S. Naval Air Development Center, Aeronautical Electronic and Electrical Laboratory, Johnsville, Pa. Feb 1956. 67p photos, drawing, diagrs (part fold), graphs, tables. Order from LC. Mi \$3.90, ph \$10.80. PB 123004

This report is a description of the development of equipments and techniques for making measurements on underwater transducers. NADEVCCEN used a circular tank with no special linings, and directed its effort to develop a suitable electronic pulse test equipment. It was concluded that the accuracy and

reliability of the calibration facilities, measurement techniques, and the use of the round wooden tank for underwater transducer evaluation, as stated in this report, are satisfactory. Bur. of Aeronautics TED project ADC EL 46001, Final report. Appendix A: Technique for rapid calibration of hydrophones using random noise fields. - Appendix B. Calibration repeatability of AN/SSQ-2 sonobuoy hydrophones at NADEVCON. NADC-EL-5575.

Submarine mine cable and associated test sets for use with controlled mines, by D. F. Scheets. U. S. Naval Ordnance Laboratory, White Oak, Md. Jun 1952. 20p graphs, tables. Order from LC. Mi \$2.40, ph \$3.30. PB 120833

1. Cables, Submarine - Testing 2. NAVORD 2552.

Submarine propulsion systems. First partial report, by E. G. Lunn. U. S. Naval Research Laboratory, Nov 1935. 48p drawings (1 fold), diags, tables. Order from LC. Mi \$3.30, ph \$7.80. PB 120468

Unclassified 26 Sep 1955.

1. Submarines - Propellants 2. NRL P 1216.

Subsurface warfare. History of Division 6, National Defense Research Committee, by John Herrick. U. S. Research and Development Board, Washington, D. C. Jan 1951. 140p photos. Order from LC. Mi \$6.90, ph \$21.30. PB 122341

The present volume tells the story of part of the organization which NDRC established in April, 1941. It is the story of Division 6 (originally Section C-4) of NDRC; the sub-surface warfare division, its principal activities, and some of its accomplishments. NDRC Div. 6.

Test of model QA underwater sound equipment, manufactured by Audio Research, Inc., by R. H. Herrick and S. A. Greenleaf. U. S. Naval Research Laboratory. Dec 1934. 52p diagr, graphs, tables. Order from LC. Mi \$3.60, ph \$9.30. PB 120498

Unclassified.

1. QA (Underwater sound equipment) 2. Sound, Underwater - Receiving equipment - Tests 3. NRL R-1102.

Theoretical study of the speed of fall of depth charges in water, by John M. Ide and F. M. Osborne. U. S. Naval Research Laboratory. Nov 1941. 26p graphs, tables. Order from LC. MI \$2.70, ph \$4.80. PB 120676

1. Ballistics, Underwater - Theory 2. Depth charges - Velocity 3. NRL S 1803.

Transmission of sound in sea water: Absorption and reflection coefficients and temperature gradients, by E. B. Stephenson. U. S. Naval Research Laboratory. Oct 1935. 23p graphs, table. Order from LC. Mi \$2.70, ph \$4.80. PB 122656

1. Acoustics, Underwater - Research 2. Sound, Underwater - Absorption 3. Sound, Underwater - Transmission 4. NRL S 1204.

Underwater visibility, by L. H. Dawson. U. S. Naval Research Laboratory. Jan 1937. 26p photos, graphs. Order from LC. Mi \$2.70, ph \$4.80. PB 120645

Unclassified.

1. Visibility, Underwater 2. Diving equipment 3. Filters, Glass - Optical 4. NRL H-1338.

WATER SUPPLY, SANITATION AND PUBLIC HEALTH

Symposium on advanced base water supply and sanitation. Report, Oct 7-8-9, 1953. U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif. 1953? 418p photos, drawings, diags, graphs, tables. Order from OTS. \$7. PB 121037

Contents: Medical aspects of water supply at advanced bases, by Otto L. Burton. - Problems of water supply and sanitation, by Abel Wolman. - Water supply as it affects logistics of naval advanced bases, by P. W. Roberts. - Water supply as it affects logistics in army field operations, by F. H. Whitley. - Theories and problems of distillation, by Allen Latham, Jr. - Scale control in compression distillation of sea water, by W. F. Langelier. - Desalting sea water, by Emory N. Kemler. - Disinfection of water, by J. C. Morris. - Water purification methods and problems, by Charles H. Spaulding. - Corps of Engineers' development of field water supply and equipment, by Harry N. Lowe, Jr. - Filter aids and septums - their problems, by G. R. Bell. - Sewage and waste disposal, by Harvey G. Rogers. - Recovery, clarification and reuse of laundry waste water, by H. J. Wollner. - Water supply in disasters, by Harold Farnsworth Gray. - Some aspects of sanitation and water supply in the Arctic, by Lloyd K. Clark. - Water supply and sanitation for small groups of men in arid regions, by C. G. Flittle. - Large-scale military water-supply operations in arid regions, by C. F. Hostrup. - Naval equipment review, by A. K. Goodman. - Determination of chlorine residuals, by Fred E. Stewart. - Current army water supply equipment, by Richard P. Schmitt.

MISCELLANEOUS

Report of NRL progress, U. S. Naval Research Laboratory, Jan 1957, 56p. Order from OTS, \$1.25. Also available at annual subscription rate of \$10 a year in U. S. A., foreign subscription rate \$13 a year. PB 121785

Contents: Articles: NRL Nuclear research reactor, by T. A. Bergstrahl, S. E. Golian, and E. N. Stirewalt. - Behavior of some magnetic materials at low temperatures, by W. E. Henry. - Intermolecular forces and the infrared spectra of solutions, by E. E. Ferguson. - Scientific program: Problems accepted. - Problem notes: Astronomy and astrophysics: Theoretical self-radiation of the atmosphere at a given elevation angle. . . Atmospheric attenuation of millimeter wave radiation from the sun and moon. . . Studies of the absorption by hydrogen clouds of the continuum radiation from three radio stars and a second radio-frequency search for interstellar OH. . . Feasibility study of a 500-ft diameter faceted paraboloid antenna. . . Effect of the earth's magnetic field on the spin of the satellite. . . An aerograph for improved temperature humidity measurements during aircraft flights. - Electricity: Design of minimum weight magnetic amplifier cores. - Mechanics: Miniature "hot" cell to be used for determining the effect of radiation upon the physical properties of structural materials. . . Effect of temperature on stress-bearing capabilities of cracked specimen of aircraft glazing materials. . . Comparison between calculated and measured shock parameters of a model submarine boiler. . . Strain gage factors for magnesium-indium alloys. . . Pressure-time study of valveless combustors. - Metallurgy and

ceramics: Each of fifty-six elements analyzed for in the NRL high-purity iron ingot, with an accuracy equal to or less than 1 ppm. . . Effect of atmosphere on creep-rupture properties. . . Dislocation damping at high temperature in metal single crystals. . . Effects of geometry on the properties of gun-metal castings. . . Device performs mechanical operations within vacuum analysis apparatus. - Nuclear and atomic physics: High-energy electron beam extracted from the NRL 22-Mev betatron. . . Four-channel rotating drum oscilloscope recording camera. . . A model for stream forms in magnetic fields. - Radio: Tactical to practical in preliminary servo-system design. - Solid-state physics: Luminescence in alkali halides. . . Poisson's ratio and Young's modulus calculated from values of longitudinal and transverse strains obtained from a hot-forged specimen of grade "A" nickel. - Papers by NRL staff members. - Patents. - Index of unclassified reports.

Responses of a variety of marine organisms to the wavelength, polarization, and intensity of light, combined with sound, temperature, and pressure. Annual progress report for the period 1 Jul 1954 to 23 Dec 1954 under Contract Nonr-1224(05), NR 163-232, by F. E. Smith and E. R. Baylor. Michigan. University. Dept. of Zoology, Ann Arbor, Mich. Dec 1954. 32p table. Order from LC. Mi \$3, ph \$6.30. PB 123918

The responses to physical and chemical parameters of the environment (pH, pressure, temperature, wavelength and intensity of light) were tested extensively on the inshore plankton population of the northeast Florida coast.

SELECTED LIST OF 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.

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Biology and Medicine

Medical survey of Marshallese two years after exposure to fallout radiation, by R. A. Conard, Bradford Cannon, C. E. Huggins, and J. B. Richards. Brookhaven National Lab., Upton, N. Y. Mar 1956. 18p. Order from OTS. 20 cents. BNL-412(T-80)

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Progress report for the month of August 1948, by A. C. Richardson, F. M. Stephens, Jr., and D. D.

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Uranium from phosphate rock. Quarterly report, by Iver Igelsrud, J. C. Goodrich, Oscar Tangel, E. F. Stephan, and John Chocholak. Battelle Memorial Inst., Columbus, Ohio. Feb 1949. Decl. Mar 1956. Contract W-38-094-eng-27. 34p. Order from LC. Mi \$3, ph \$6.30. BMI-JDS-170

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Determination of free acid in the presence of hydrolyzable ions, by Glenn L. Booman, Maxine C. Elliott, Robert B. Kimball, Fred O. Cartan and James E. Rein. Phillips Petroleum Co. Idaho Operations Office. Sep 1956. Contract AT(10-1)-205. 12p. Order from OTS. 20 cents. IDO-14387

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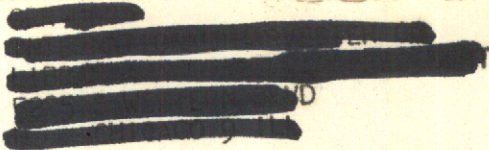
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